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# 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

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## Made-in-India howitzer Advanced Towed Artillery Gun System undergoes trials in Maharashtra

*Developed by the Defence Research and Development Organisation, the howitzer, with a striking range of around 50 km, is being readied for the Indian Army*

Ahmednagar: The made-in-India howitzer Advanced Towed Artillery Gun System (ATAGS) underwent trials in Maharashtra's Ahmednagar on Sunday. Developed by the Defence Research and Development Organisation (DRDO), the gun, with a striking range of around 50 km, is being readied for the requirements of the Indian Army.

The Advanced Towed Artillery Gun System (ATAGS) project was started in 2013 by DRDO to replace older guns in service in the Indian Army with a modern 155mm artillery gun. For the purpose, the DRDO laboratory Armament Research and Development Establishment (ARDE) partnered with private players Bharat Forge Limited, Mahindra Defence Naval System, Tata Power Strategic Engineering Division and public sector unit Ordnance Factory Board (OFB) for this purpose.

The ATAGS howitzer was first publicly showcased at 68th Republic Day parade in 2017.

Notably, in recent steps to make the DRDO “leaner, mean, and more result-oriented”, the Centre has merged two DRDO laboratories to create a new one to conduct focused research on terrain and avalanches along the borders with China and Pakistan. The two new labs merged by the Centre are the Manali-headquartered Snow and Avalanche Studies Establishment (SASE) and the other is the Delhi-based Defence Terrain Research Establishment.

In November, India also successfully tested its new projectile weapon – the Quick Reaction Surface to Air Missile (QRSAM) system – off the coast of Odisha’s Balasore. The missile reportedly hit its target directly during the test.

“The missile launch took place from ITR Chandipur at 3:50 pm off the Odisha coast. The missile is propelled by a single-stage solid-propellant rocket motor and uses all indigenous subsystems. The missile is canisterised for transportation and launch using a mobile launcher capable of carrying 6 canisterised missiles,” the Union Ministry of Defence said in a release.

<https://www.timesnownews.com/india/article/made-in-india-howitzer-advanced-towed-artillery-gun-system-undergoes-trials-in-maharashtra-watch/691246>



Howitzer Advanced Towed Artillery Gun System | Photo Credit: ANI

## महाराष्ट्र के अहमदनगर में आर्टिलरी गन सिस्टम का भारतीय सेना ने किया ट्रायल

*DRDO मेड इन इंडिया होवित्जर एडवांस्ड टेड आर्टिलरी गन सिस्टम का ट्रायल किया गया। डीआरडीओ द्वारा विकसित की गई इस बंदूक को भारतीय सेना की जरूरत को ध्यान में रखते हुए बनाया गया है। इसकी मारक क्षमता लगभग 50 किलोमीटर की लंबी दूरी है।*

*By Sachin Kumar Mishra*

मुंबई: DRDO: दुश्मनों को मुंहतोड़ जवाब देने के लिए महाराष्ट्र के अहमदनगर में रविवार को मेड इन इंडिया होवित्जर एडवांस्ड टेड आर्टिलरी गन सिस्टम का ट्रायल किया गया। डीआरडीओ द्वारा विकसित की गई इस बंदूक को भारतीय सेना की जरूरत को ध्यान में रखते हुए बनाया गया है। इसकी मारक क्षमता लगभग 50 किलोमीटर है। सेना इससे दुश्मन को मुंहतोड़ जवाब देगी। गौरतलब है कि इससे पहले चीन के साथ वास्तविक नियंत्रण रेखा (एलएसी) पर जारी तनाव के बीच भारतीय वायुसेना ने चीनी वायुसेना के संभावित खतरों से निपटने के लिए कसर कसी है। इसीलिए वायुसेना ने दस स्वदेशी आकाश मिसाइलों का सफल परीक्षण किया था।

आकाश की मारक क्षमता को परखने के लिए भारतीय वायुक्षेत्र में 'दुश्मन' के विमानों को दस अलग तरीकों से मार गिराया गया। सरकार के सूत्रों के मुताबिक, भारतीय वायु सेना ने सैन्य अभ्यास के दौरान आकाश मिसाइलों और कंधे से हवा में मार करने वाली इग्ला मिसाइलों का सफल परीक्षण किया। विगत हफ्ते इन दस मिसाइलों का परीक्षण आंध्र प्रदेश के सूर्यलंका परीक्षण रेंज में किया गया। लक्ष्य पर दागी गई सभी आकाश मिसाइलों ने सीधा और सटीक प्रहार किया। लड़ाई के दौरान दुश्मन के विमानों को मार गिराने के लिए ये मिसाइलें संयुक्त गाइडेड हथियारों से लैस हैं।

इस मिसाइल को हाल ही में अपग्रेड किया गया है। अब यह मिसाइलें पहले के मुकाबले अधिक आसानी से दुश्मनों को निशाना बना सकेंगीं। डीआरडीओ लगातार इस दिशा में काम कर रहा है कि आकाश मिसाइलें और भी ऊंचे अक्षांशों में सफलता से लक्ष्यों को भेदें। यह मिसाइलें चीन के पांचवीं पीढ़ी के जे-20 युद्धक विमानों को मार गिराने में सक्षम हैं। यहां तक कि यह दुश्मन के रेडिएशन रोधी मिसाइलों से लैस विमानों को भी मार गिराने में सक्षम है।



*DRDO मेड इन इंडिया होवित्जर एडवांस्ड टेड आर्टिलरी गन सिस्टम का ट्रायल किया गया। डीआरडीओ द्वारा विकसित की गई इस बंदूक को भारतीय सेना की जरूरत को ध्यान में रखते हुए बनाया गया है। इसकी मारक क्षमता लगभग 50 किलोमीटर की लंबी दूरी है।*

<https://www.jagran.com/maharashtra/mumbai-made-in-india-howitzer-advanced-towed-artillery-gun-system-undergoing-trials-in-ahmednagar-21140012.html>

# Amid China border conflict, IAF testfires 10 Akash missiles to 'shoot down' enemy fighters

By *Ajit K Dubey*

New Delhi: Amid threat from the Chinese Air Force on the Line of Actual Control (LAC) in the ongoing conflict, the Indian Air Force (IAF) carried out around 10 testfirings of the home-grown Akash air defence missiles to validate different scenarios to shoot down enemy aircraft that may violate the Indian air space during conflicts.

The testfirings conducted at the Suryalanka testfiring range in Andhra Pradesh last week were highly successful as a majority of the Akash missiles fired at the targets scored a direct hit.

"Around 10 Akash missiles were fired by the Air Force during the Combined Guided Weapons Firing 2020 exercise to practice different engagement scenarios during conflicts to shoot down enemy planes. Most of the missiles scored a direct hit at the target," government sources told ANI here.

The IAF tested the Akash missiles and the Iгла shoulder-fired air defence missiles during the exercise. Interestingly, both these systems are at present deployed along the LAC in Eastern Ladakh and other sectors for taking out any enemy aircraft trying to violate the Indian air space.

The Akash, sources said, is one of the most successful indigenous weapon systems and would be fulfilling the desire of the defence forces to fight wars with indigenous weapons.

The missile was recently upgraded and is being equipped with a seeker which will help it to take down targets with greater ease than before.

The Defence Research and Development Organisation (DRDO) has been working on the Akash Prime missile system which will make it capable of engaging with targets at very high altitude locations too.

The DRDO also has made modifications to make the system more effective during the ongoing conflict, where the Chinese are deploying their so-called stealth planes like the J-20 fifth-generation fighters.

Due to the integration of the missile system with other systems, the stealth features of the missile have gone up significantly and can surprise enemy fighter jets equipped with anti-radiation missiles.

The Cabinet Committee on Security recently cleared seven squadrons of the missile systems for ₹5,500 crore for the Air Force.

The force will deploy these missile systems on the borders along with Pakistan and China to maintain a strict vigil against enemy aircraft, drones, and surveillance aircraft.

Akash is a medium-range mobile surface-to-air missile defence system developed by the Defence Research and Development Organisation and produced by Bharat Dynamics Limited and Bharat Electronics Limited.

<https://www.aninews.in/news/national/general-news/amid-china-border-conflict-iaf-testfires-10-akash-missiles-to-shoot-down-enemy-fighters20201204144801/>



Akash air defence missiles firing by Indian Air Force during the CGWF-2020 exercise

## **Akash missiles test fired successfully**

*Able to engage aerial threats upto the maximum range of 25 km and upto an altitude of 18 km, operating at a speed range of 1.8 to 2.5 Mach*

Hyderabad: The Indian Air Force has successfully test fired the Akash Missiles at Suryalanka test firing range in Andhra Pradesh during the Combat Guided Weapons Firing 2020 exercise.

This exercise was aimed at practising different engagement scenarios during conflicts to shoot down enemy planes. Several test trials have also been done in the past which were proved to be successful, Bharat Dynamics Limited said in a statement today.

Designed and developed by the DRDO, Akash is one of the most successful, indigenously-made missiles inducted into the Indian Army and Air Force.

### **Specifications**

Bharat Dynamics Limited (BDL) has manufactured Akash Missile, which has the capability to engage aerial threats upto the maximum range of 25 km and upto an altitude of 18 km., operating at a speed range of 1.8 to 2.5 Mach.



The Akash Weapon System consisting of Akash Missile along with a complement of Ground Support Equipment is capable of tracking 64 targets in the background and launch eight missiles against four targets simultaneously. The system is fully automatic with quick response time from target detection to kill. The Open system architecture ensures adaptability to existing and futuristic Air Defence environments. It has high immunity against active and passive jamming and has in-built safety features with IFF. The system has a secured mode of communication between combat elements and is self-sufficient in electrical power with in-built power sources.

The missile is used against aerial targets such as helicopters, fighter aircrafts, UAVs, etc. The missile has been recently upgraded with a seeker which will facilitate to neutralize targets with less efforts than before. The upgraded version will be capable of engaging with targets at very high altitude locations too.

BDL — along with DRDO — is geared up for delivery of Akash Prime to Indian Army with Seeker and high altitude capability. This capability to meet the user requirements has been achieved in a short span of time with the design support of DRDO.

BDL has supplied the missile to Indian Army and Indian Air Force and is expecting further orders from the services. The company is also exploring to offer Akash for export to foreign countries. BDL has already received export leads from some countries expressing interest in procuring the Missile.

<https://www.thehindubusinessline.com/news/national/akash-missiles-test-fired-successfully/article33259316.ece>

## IAF successfully testfires 10 Akash missiles to hit enemy targets

*The Indian Air Force (IAF) on Friday carried out 10 testfirings of the home-grown Akash air defence missiles at the Suryalanka test range to validate different scenarios to shoot down enemy aircraft that may violate the Indian air space during conflicts*

*By Manjeet Singh Negi*

New Delhi: The Indian Air Force (IAF) on Friday carried out 10 testfirings of the home-grown Akash air defence missiles at the Suryalanka test range to validate different scenarios to shoot down enemy aircraft that may violate the Indian air space during conflicts.

"Around 10 Akash missiles were fired by the Air Force at the Suryalanka test range and most of them secured direct hits against the target simulating as enemy aircraft," top government sources told India Today TV.

The indigenous Akash missile is deployed on the Line of Actual Control (LAC) in Eastern Ladakh as part of Indian deployment to thwart any aerial attacks from the adversary. The testfirings conducted at the Suryalanka testfiring range in Andhra Pradesh last week were highly successful as a majority of the Akash missiles fired at the targets scored direct hits.

IAF tested the Akash missiles and the Igla shoulder-fired air defence missiles during the exercise. Interestingly, both these systems are at present deployed along the LAC in Eastern Ladakh and other sectors for taking out any enemy aircraft trying to violate the Indian air space. The Akash, sources said, is one of the most successful indigenous weapon systems and would be fulfilling the desire of the defence forces to fight wars with indigenous weapons.

The missile was recently upgraded and is being equipped with a seeker which will help it to take down targets with greater ease than before. The Defence Research and Development Organisation (DRDO) has been working on the Akash Prime Missile System which will make it capable of engaging with targets at very high altitude locations too.

The DRDO also has made modifications to make the system more effective during the ongoing conflict, where the Chinese are deploying their so-called stealth planes like the J-20 fifth-generation fighters. Due to the integration of the missile system with other systems, the stealth features of the missile have gone up significantly and can surprise enemy fighter jets equipped with anti-radiation missiles.

<https://www.indiatoday.in/india/story/iaf-testfires-10-akash-missiles-hit-enemy-targets-1746811-2020-12-04>



The indigenous Akash missile is deployed on the Line of Actual Control (LAC) in Eastern Ladakh as part of Indian deployment to thwart any aerial attacks from the adversary. (Photo: Twitter/@IAF\_MCC)



## बड़ी कामयाबी: वायुसेना ने आसमान में 'आकाश' से 10 बार मार गिराए दुश्मन के लड़ाकू विमान

नई दिल्ली: चीन के साथ चल रहे तनाव के बीच भारतीय वायुसेना ने लगातार अपनी ताकत में इजाफा कर दुश्मनों पर अपनी पकड़ मजबूत किए हुए है। भारतीय वायुसेना ने 10 आकाश मिसाइलों का सफल परीक्षण किया है। आकाश एक मध्यम दूरी की सतह से हवा में मार करने वाली मिसाइल रक्षा प्रणाली है, जिसे रक्षा अनुसंधान और विकास संगठन द्वारा विकसित किया गया है। इसके साथ ही भारत डायनेमिक्स लिमिटेड और भारत इलेक्ट्रॉनिक्स लिमिटेड द्वारा इन मिसाइल को निर्मित किया गया है।

वायुसेना अधिकारियों ने बताया कि भारतीय वायु सेना ने अभ्यास के दौरान आकाश मिसाइलों और कंधे से हवा में मार करने वाली मिसाइलों का सफल परीक्षण किया। इन मिसाइलों का परीक्षण आंध्र प्रदेश के सूर्यलंका परीक्षण रेंज में पिछले सप्ताह किया गया। लक्ष्य पर दागी गई अधिकांश आकाश मिसाइलों ने सीधा प्रहार किया। लड़ाई के दौरान दुश्मन के विमानों को मार गिराने के लिए ये मिसाइलें संयुक्त गाइडेड हथियारों से लैस हैं।



आकाश मिसाइल (फाइल फोटो) - फोटो: ANI

### एलएसी पर तैनात की 'आकाश'

खास बात यह है कि इन दोनों प्रणालियों को वर्तमान में पूर्वी लद्दाख और अन्य क्षेत्रों में वास्तविक नियंत्रण रेखा (एलएसी) के साथ तैनात किया गया है ताकि दुश्मन के किसी भी विमान को भारतीय वायु अंतरिक्ष का उल्लंघन करने के लिए बाहर निकाला जा सके।

### स्वदेशी हथियार प्रणालियों में से एक है यह मिसाइल

आकाश मिसाइल को लेकर भारतीय वायु सेना से जुड़े एक अधिकारी ने कहा कि आकाश सबसे सफल स्वदेशी हथियार प्रणालियों में से एक है और यह रक्षा बलों की स्वदेशी हथियारों से युद्ध करने की इच्छा को पूरा करेगा। आकाश मिसाइल को हाल ही में अपग्रेड किया गया है और जो इसे पहले की तुलना में अधिक आसानी के साथ लक्ष्य को मार गिराने में मदद करेगा।

### डीआरडीओ ने विकसित की है आकाश मिसाइल

परमाणु हथियार ले जाने की क्षमता रखने वाले आकाश मिसाइल सिस्टम को भारतीय रक्षा अनुसंधान व विकास संगठन (डीआरडीओ) ने डिजाइन किया है। इसकी हर एक मिसाइल 30 किलोमीटर के दायरे में 19 किलोमीटर की ऊंचाई तक लक्ष्य को भेद सकती है। करीब 4 हजार किमी/घंटा की सुपरसोनिक गति वाली आकाश मिसाइल का वजन 720 किलोग्राम और लंबाई 5.8 मीटर है। यह 60 किलोग्राम विस्फोटक ले जा सकती है।

### स्वदेश निर्मित राजेंद्र रडार से लैस

इसे स्वदेश निर्मित राजेंद्र रडार से लैस किया गया है। एक मिसाइल डिफेंस सिस्टम में चार लांचर, एक राजेंद्र रडार होते हैं और हर लांचर पर तीन आकाश मिसाइल तैनात की जाती हैं। एक लांचर एक समय में

16 लक्ष्य को ट्रैक कर सकता है यानी 64 लक्ष्यों पर हर समय नजर रहती है और राजेंद्र रडार के एक इशारे पर एक साथ 12 आकाश मिसाइल अलग-अलग लक्ष्य भेदने निकल जाती हैं।

बता दें कि डीआरडीओ आकाश प्राइम मिसाइल प्रणाली पर भी काम कर रहा है, जो इसे बहुत अधिक ऊंचाई वाले स्थानों पर भी लक्ष्य हासिल करने में सक्षम बनाएगी।

<https://www.amarujala.com/india-news/amid-china-border-conflict-iaf-testfires-10-akash-missiles-to-shoot-down-enemy-fighters?pageId=5>



Sat, 05 Dec 2020

## पल में दुश्मनों के विमान को मार गिराएगा 'आकाश', भारतीय वायुसेना ने किया 10 मिसाइलों का परीक्षण

**Akash missiles: आंध्र प्रदेश के सूर्यलंका परीक्षण रेंज में पिछले सप्ताह इन मिसाइलों का परीक्षण किया गया। लक्ष्य पर दागी गई अधिकांश आकाश मिसाइलों ने सीधा प्रहार किया**

नई दिल्ली: वास्तविक नियंत्रण रेखा पर चीन (China) के साथ तनाव के बीच भारतीय वायुसेना (Indian Air Force) अपनी ताकत को दिनों-दिन बढ़ाने में जुटी हुई है। शुक्रवार को भारतीय वायुसेना ने 10 आकाश मिसाइलों (Akash missiles) का सफल परीक्षण किया है। आकाश एक मध्यम दूरी की सतह से हवा में मार करने वाली मिसाइल रक्षा प्रणाली है, जिसे रक्षा अनुसंधान और विकास संगठन (DRDO) ने विकसित किया है। इसे भारत डायनेमिक्स लिमिटेड और भारत इलेक्ट्रॉनिक्स लिमिटेड द्वारा इन मिसाइल को निर्मित किया गया है।

आंध्र प्रदेश के सूर्यलंका परीक्षण रेंज में पिछले सप्ताह इन मिसाइलों का परीक्षण किया गया। लक्ष्य पर दागी गई अधिकांश आकाश मिसाइलों ने सीधा प्रहार किया। न्यूज एजेंसी ANI के मुताबिक, लड़ाई के दौरान दुश्मन के विमानों को दो पल में मार गिराने में सक्षम ये मिसाइलें संयुक्त गाइडेड हथियारों से लैस हैं। भारतीय वायु सेना ने अभ्यास के दौरान आकाश मिसाइलों और कंधे से हवा में मार करने वाली मिसाइलों का परीक्षण किया।



इन दोनों प्रणालियों को वर्तमान में पूर्वी लद्दाख और अन्य क्षेत्रों में एलएसी के साथ तैनात किया गया है. (फोटो साभार: ANI)

### पूर्वी लद्दाख और एलएसी के अन्य क्षेत्रों में तैनात

रिपोर्ट्स के मुताबिक, इन दोनों प्रणालियों को वर्तमान में पूर्वी लद्दाख और अन्य क्षेत्रों में एलएसी के साथ तैनात किया गया है ताकि दुश्मन के किसी भी विमान को भारतीय वायु अंतरिक्ष का उल्लंघन करने के लिए बाहर निकाला जा सके।

### आकाश मिसाइल को किया गया अपग्रेड

आकाश मिसाइल के परीक्षण के बाद वायुसेना से जुड़े एक अधिकारी ने कहा कि आकाश सबसे सफल स्वदेशी हथियार प्रणालियों में से एक है और यह रक्षा बलों की स्वदेशी हथियारों से लड़ने की इच्छा को पूरा

करेगा। आकाश मिसाइल को हाल ही में अपग्रेड किया गया है और जो इसे पहले की तुलना में अधिक आसानी के साथ लक्ष्य को मार गिराने में मदद करेगा।

<https://hindi.news18.com/news/nation/amid-china-border-conflict-iaf-testfires-10-akash-missiles-shoot-down-enemy-fighters-3364269.html>



Mon, 07 Dec 2020

## Indian Navy wants to join IAF in fighter jet shopping

*Decision follows indigenous development proposal by Defence Research and Development Organisation*

*By Dinakar Peri*

New Delhi: The Navy is looking to combine its multi-role carrier-based fighter jet procurement tender along with the IAF tender for 114 fighters that is under way. The development comes following a decision to cut down the numbers to be procured following the indigenous development proposal by the Defence Research and Development Organisation (DRDO).

“We have the MiG-29K operating from the Vikramaditya and will operate from the Indigenous Aircraft Carrier (IAC)-I. To replace them, we have taken up a case for the Multi-Role Carrier Borne Fighters (MRCBF) which we are trying to do along with the IAF,” Navy Chief Admiral Karambir Singh said last week without elaborating. “The Navy has approached the IAF and we are awaiting their response,” another Navy official said on condition of anonymity.

On the Navy’s fighter procurement plans, Adm. Singh said the new development has been the Twin Engine Carrier Based Deck Fighter (TEBDF) which the DRDO and the Aeronautical Development Agency (ADA) have offered. He said they are working together to make sure that happens. It then “will have an indigenous deck based fighter for the Navy”.

Adm. Singh said many lessons have been learn from the Naval LAC-MK1 programme like the arrestor hook and under carriage and so on and more lessons are being learnt through the Shore-Based Test Facility (SBTF) in Goa. “My hope is that the TBDRF would be able to enter service sometime in the early 2030s.”

### Cutting down numbers

In 2017, the Navy has floated a Request For Information (RFI) to global fighter manufacturers and the response is being evaluated. However, with the new jet under development and also factoring in budgetary constraints, the Navy is in the process of cutting down the number of fighters from 57 to around 36. The final decision is awaited.

To further optimise the process, it is now looking to combine it with the IAF. However, it has to be seen how this is taken forward as the IAF RFI was open to both single and twin-engine fighters while the Navy has a stated requirement for a twin-engine jet to operate off its carriers.

The Navy has 45 Russian MiG-29K and it had said earlier there will not be enough aircraft to operate from both carriers. The response to the RFI from Boeing with its F-18 Super Hornet and Dassault Aviation with its Rafale jets are being evaluated. Both companies had said their jets can operate off the ski-jump of the Vikramaditya and in future the IAC-I Vikrant.



MiG-29K aircrafts are seen parked on the deck of INS Vikramaditya. File. | Photo Credit: REUTERS

In fact, a Navy team was to visit the US Naval Air Station in Maryland early this year to witness a demonstration from Boeing on the compatibility of its F-18 Super Hornet to take off and land from the decks of Indian carriers. However, the visit was deferred due to the pandemic.

<https://www.thehindu.com/news/national/navy-looking-to-combine-fighter-procurement-with-iaf-tender-for-114-jets/article33264017.ece>



Sun, 06 Dec 2020

## Indigenous quick reaction air defence system to be ready for production next year

*Laser beam technology ensures missile cannot be jammed*

*By Dinakar Peri*

New Delhi: The indigenous Quick Reaction Surface to Air Missile (QRSAM) being developed by the Defence Research and Development Organisation (DRDO) is expected to complete user trials in the next six months and be ready for production next year, according to a defence official.

The QRSAM is a critical requirement for the Army, which has been looking to replace existing air defence systems.

“The QRSAM is the country’s first indigenous mobile air defence system and meant for the Army’s Strike Corps to be mobile on vehicles. The development activity is complete and preparations are on for user trials. The Defence Acquisition Council has given conditional approval,” an official said. “In the next six months we want to finish user trials and by next year we will be ready by production,” the official added.

As per Chapter 4 of the new Defence Acquisition Procedure (DAP) 2020, if items are developed by a production agency there are single-stage user trials, which will further speed up the development process, the official stated.

### **90% indigenous**

The QRSAM has a range of 30 km and can target an altitude of up to 10 km. The system is currently 90% indigenous and will reach 99% incrementally. The whole software is indigenous and the code and logic everything built here, the official said.

The radar and control systems are manufactured by Bharat Electronics Limited (BEL), launcher by Larsen & Toubro (L&T) and the missiles by Bharat Dynamics Limited (BDL). Some electronics like IC, electro-optic system and detector are currently imported. “They will also be indigenised,” the official added.

The DRDO carried out two successful test firings in November after which it said the missile precisely hit a Banshee target and destroyed it completely. “This was achieved with a new indigenously developed technology of Laser Proximity Fuse (LPF) for pin-pointed accuracy of hit. Till date, all missiles used Radio Proximity Fuzes,” said another official. “The LPF was developed by Instruments Research and Development Establishment (IRDE) in the last two years with a specific push by [DRDO] Chairman Satheesh Reddy,” he added.

The first official explained that the laser beam ensures the missile cannot be jammed. Akash was the country’s first automated air defence system and QRSAM is the first indigenous on-the-move air defence system, he observed.

The system gives 360 degree coverage and has been customised on domestic Ashok Leyland 8x8 vehicles. The launcher has six missiles and can target six different targets in 360 degrees, the official said, adding that all components, the radar, launcher and support vehicles are mobile.



Quick Reaction Surface to Air Missile (QRSAM) System has achieved a major milestone by a direct hit on to a Banshee Pilotless target aircraft at medium range and medium altitude. File | Photo Credit: PTI

In November, the first test achieved the milestone of a direct hit while the second test proved the performance parameters of warhead, the DRDO had stated. The flight test was conducted in the deployment configuration of the system comprising of launcher, fully automated command and control system, surveillance system and multi-function radars.

<https://www.thehindu.com/news/national/indigenous-quick-reaction-air-defence-system-to-be-ready-for-production-next-year/article33260806.ece>



Sun, 06 Dec 2020

## Atal Tunnel – a Terrific Boost to National Security

*Besides fortifying India, this strategic achievement will add to China’s discomfort*

*By Sanjeev Kumar Joshi*

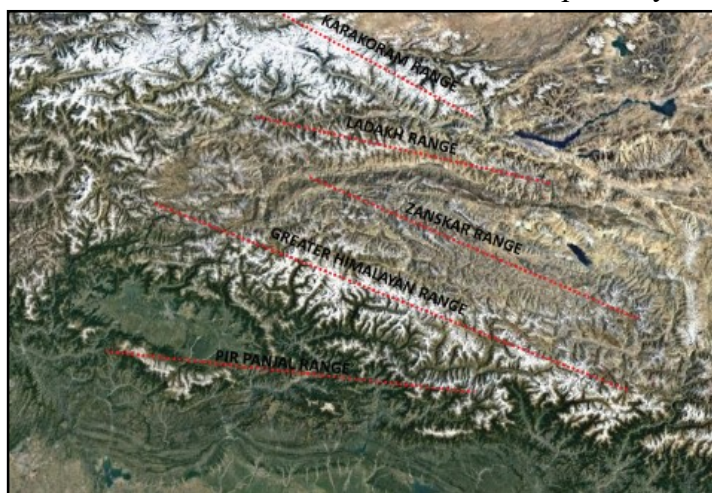
The world’s longest highway tunnel, Atal Tunnel, built under the Rohtang Pass in the eastern Pir-Panjal Range of the Himalayas on the Leh-Manali Highway in Himachal Pradesh is being called as an engineering marvel. During the inaugural speech on November 3, 2020, PM Narendra Modi said: “We could show our unflinching resolve today, when we were able to pierce through the impregnable Pir-Panjal Ranges”. The statement itself shows the confidence multiplied by this tunnel which joins the Pir-Panjal Ranges to the Great Himalayan Range.

### Challenges in the making:

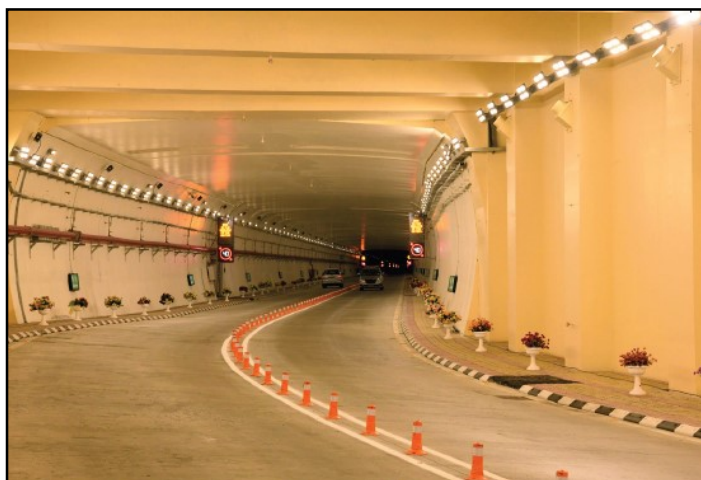
The construction of The Atal Tunnel, highest altitude tunnel in the world was full of many challenges. The Tunnel connects Manali (Kullu Valley) with Sissu (Lahaul-Spiti Valley). It is designed for traffic density of up to 3,000 cars and 1,500 trucks per day with a maximum speed of 80 km/hr. The Tunnel has many advanced features which make it unique in the world from an engineering point of view. Opening of the Atal Tunnel has not only reduced the distance of Manali to Leh by 46 km and tough climbs of vehicles to the Rohtang Pass but it has also reduced the danger of crossing roads full of avalanches.

The project was announced by the then Prime Minister Atal Bihari Vajpayee on June 3, 2000. The work was entrusted to Border Road Organization (BRO) on May 6, 2002. The BRO took guidance initially from one of the premier laboratories of DRDO working on snow, avalanches, and landslides, the SASE (renamed as DGRE).

The project started on June 28, 2010. Until mid of 2012, approximately 3.5 km of the tunnel digging was completed. However, a little progress was made in the next year due to



The Indian Himalayan Region and the movement of Western Disturbances. Image Courtesy: Sanjeev K Joshi



The Atal Tunnel. Image Courtesy: Shutterstock

heavy ingress of water in between the tunnel alignment at Serrih Nullah. By the end of 2014, the solution to the Serrih Nullah problem was achieved, and digging up to approximately 4.5 km of the tunnel was completed. Finally, in the mid of 2018, complete digging of tunnel length was achieved and in September 2018, the tunnel was used for evacuation of people stranded in Lahaul Valley.

### **Strategic significance**

Setting the strategic baseline of the Atal tunnel PM said: “Atal Tunnel is going to be the lifeline of a large part of Himachal Pradesh as well as the Union Territory of Leh-Ladakh. Now this vast area of Himachal Pradesh and Leh-Ladakh will always be connected to the rest of the country and move faster on the path of development. Atal Tunnel is also going to give a fresh boost to India’s border infrastructure.”

The Indian Himalayan Region (IHR), mostly covered by snow is majorly spread across the Union Territory of J&K and Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh in approximately 3 lakh sq. km and makes up 10% of India’s total geographical area. Low temperatures, glaciated high altitudes, lack of oxygen, and tough terrains make it the toughest place to survive. The region occupies the strategic position of the entire northern boundary, largely sharing north-west boundary with Pakistan and central, north-east boundary with Tibet and China. The IHR also has a low population density due to its geographic conditions and other infrastructural issues. Such conditions have made the infrastructure development very important for both the western and eastern borders due to extremist and expansionist forces on the other sides of the border.



The complete Himalayan Mountain Range is divided altitude-wise into following categories: Shiwalik, Pir-Panjaj, Great Himalayan Range, Jhanskar, Ladakh, and Karakoram Ranges. The Great Himalayan Range contains world’s tallest peaks, including Nanga Parbat, Annapurna, Mount Everest, and Kanchenjunga, extending approximately to 2,300 km, with an average altitude of 6,100 m. These ranges face maximum precipitation from Western Disturbances (WD). Due to the geographical location of mountains and meteorological situations arising due to the movement from WD, the Indian side of mountain ranges especially the Great Himalayan Range gets maximum precipitation of snow. This makes the Indian side of mountainous borders very tough to survive. The further rarity of oxygen makes survival even more difficult.

Leh hence becomes a strategically important location as it can cater both northwest and northeast equally well. To manage both the borders simultaneously, unhindered supply chain management of man and material becomes significant, which multiplies the requirement of transportable/operational Himalayan roads.

Due to heavy precipitation of snow on the Great Himalayan Range of the Indian side, earlier the roads used to remain non-operational for almost six months in a year. This used to hamper road dependent supply chain, resulting in an increase in the cost of survivability and border management. This long term disconnection from rest of the country was further hampering the economics of this region. Unemployment, rarity of population in border villages and movement of villagers to towns and cities was making a dent to the national security. The Atal Tunnel will now be able to fill this gap.

Opening of the Atal Tunnel and all-weather connectivity to Leh becomes more important due to Leh’s strategic connectivity with DS-DBO (Darbuk Shyok-Daulat Beg Oldi) area. A road is also constructed parallel to the LAC, called DSDBO road, scrolling through altitudes ranging from 13,000 ft. and 16,000 ft. As it connects Leh to DBO, virtually at the base of the Karakoram Pass that separates China’s Xinjiang autonomous region from Ladakh, strategic importance grows manifold. The DS-DBO highway provides the Indian military access to the section of the Tibet-Xinjiang Highway that passes through Aksai Chin. Hence it is evident that China is uncomfortable seeing Indian troops sitting so close to its illegally occupied territory and that too with the ease of

connectivity. Thus, the border connectivity via roads, tunnels has improved India's strategic posture towards defending national interests.

Opening of other important routes to Ladakh linking Darcha in Himachal Pradesh to Nimu via Padum in Kargil's Zaskar Valley will further provide a significant strategic benefit to all-weather connectivity and all-round growth of new Union Territory of Ladakh.

In totality, Atal Tunnel will not only ensure strong border management by providing a continued supply chain by opening the roads throughout the year but also ensure the strong economic growth of Lahaul and Spiti region of Himachal Pradesh and the new Union Territory Leh & Ladakh also. The Atal Tunnel will also ensure exponential increment in tourism and other employment opportunities thereby reducing the raring phenomenon of border villages too.

*(The writer is Technology Advisor to Secretary, Department of Defence (R&D) and to Chairman, DRDO)*



Sat, 05 Dec 2020

## **From Rafales, Su-30 MKIs & Tejas, why next-gen BrahMos Missile on Indian Air Force Jets can be a game-changer for India?**

*By Mansij Asthana*

While the Indian Air Force is planning to equip its advanced fighter jets with BrahMos, the question arises as to how the formidable weapon can be fired from combat aircraft such as the Rafales, Su-30MKIs, and HAL Tejas.

The BrahMos supersonic cruise missile has been developed from the P-800 Oniks, in a joint venture between the Indian DRDO and the Russian NPO Mashinostroyeniya. As of 2020, the missile is one of the world's fastest missiles in operation, reaching speeds of 1.2 kilometers per second.

While originally developed as an anti-ship cruise missile, different variants of BrahMos have been built, including surface-to-surface, land attack, and air-launched cruise missiles.

According to reports, the BrahMos-NG (Next Generation), which is a smaller and lighter version of the existing one, is compatible with the French-made Rafale.

The BrahMos-NG is expected to have the same range of around 290 kilometers along with a speed of Mach 3.5. Weighing around 1.5 tons, 5 meters in length, and 50 cm in diameter, the missile is 50 percent lighter and three meters shorter than its predecessor.

By the time the BrahMos NG missiles are ready by 2021, they could be deployed on the Rafales as either a twin or single-weapon loadout.

The 36 Rafales acquired by India are set to boost the IAF's attack capabilities as they will be loaded with 13 India-specific enhancements.

The fighters already boast the ability to take off from high altitude airbases like Leh and will don a killer look when armed with the BrahMos missile.

The BrahMos, along with the MBDA Scalp low-observable air-launched cruise missile, will provide the Indian armed forces with unique subsonic/supersonic stand-off attack options, which are not available with any other air force in the world.



The BrahMos missile has been developed as a tactical superiority weapon in order to provide the Indian armed forces an edge over its rivals, especially China.

The air-launched variant of the missile, called the BrahMos-A, has been integrated into the airframes of IAF's Su-30MKI aircraft.

According to Boris Obnosov, CEO of Tactical Missiles Corporation (TMC) JSC, the missile is likely to significantly increase IAF's capabilities.

“The BrahMos's launch range to the target is 300 km, while Su-30MKI jet fighter's range with air refueling is over 3,000 km – together. This provided [Indian] Air Force with a huge advantage in their actions in the Indian Ocean zone,” said Obnosov.

The Russian-made Su-30MKI is a state-of-the-art, all-weather, multi-role fighter jet that is capable of carrying out air defense, ground attack, and maritime missions.

According to India's Chief of Defense Staff, General Bipin Singh Rawat, the fighter when armed with BrahMos will prove to be vital in the Indian Ocean Region (IOR). “The Su-30MKI aircraft, along with the BrahMos, will be a game-changer and extensively enhance the security of the maritime domain.”

The missile has been looked forward as a key alternative on India's indigenous HAL Tejas fourth-generation fighter jet.

According to reports, the light fighter jet is likely to be deployed with the BrahMos-NG missile, which can destroy an enemy's AWACS (Airborne Warning and Control System) aircraft.

Also known as the ‘Eye in the Sky’, AWACS aircraft are considered integral to modern warfare, due to their ability to detect and track incoming fighters, cruise missiles, and drones much before ground-based radars, and direct friendly fighters during air combat towards enemy jets.

Since the AWACS is capable of monitoring enemy troop build-ups and the movement of warships, the Tejas fighters are seen to be immensely vital in shooting down such aircraft with the help of BrahMos missiles.

<https://eurasianimes.com/from-rafales-su-30-mkis-tejas-why-next-gen-brahmos-missile-can-be-a-game-changer-for-the-indian-air-force/>



Sat, 05 Dec 2020

## **UAE, Saudi Arabia interested in BrahMos Missile! Army Chief's visit to focus on deepening military ties**

*Next week the Indian Army Chief Gen MM Naravane will be on a four-day visit to the United Arab Emirates (UAE) and Kingdom of Saudi Arabia*

*By Huma Siddiqui*

Next week the Indian Army Chief Gen MM Naravane will be on a four-day visit to the United Arab Emirates (UAE) and Kingdom of Saudi Arabia. Besides meeting with his counterparts in these countries, he will also be meeting with other senior officials in both countries. According to sources, “In the first-ever visit by any Indian Army Chief to the Saudi Kingdom, he will address the Saudi National Defence College, besides other meetings with senior officials.” Gen Naravane's visit to UAE comes close on the heels of the recently concluded visit by the external affairs minister S Jaishankar's visit to the region.

Sources have confirmed to Financial Express Online, “From the Gulf Region countries including Qatar, UAE, and Saudi Arabia have expressed interest in buying the Indo-Russian



BrahMos Missile. The talks are still in the early stages and further discussions put on hold due to the global lockdown due to COVID-19.”

The Gulf countries which have been trying to diversify their economies are getting more interested in developing their defence industries which are still in their nascent stage. For these countries, India is a preferred partner. Earlier this week, India had condemned a missile attack that targeted an Aramco oil facility located in Saudi Arabia’s Red Sea city of Jeddah.

### **What did MEA say?**

“India stands in solidarity with the people of Saudi Arabia against such attacks,” the official spokesperson of MEA, Anurag Srivastava had said in response to a question-related to the attempted attack.

### **India’s GCC Outreach**

India has been focusing on several sectors for deepening cooperation in sectors including: Space, Maritime Awareness, Joint Defence Production & exports; security and trade cooperation. The main interest of the Gulf countries is mainly in shipbuilding, munitions, small arms, unmanned platforms and specially designed armoured vehicles. They are mostly interested in Russian, Chinese and Western platforms and systems.

### **India & UAE**

As has been reported by Financial Express Online, Prime Minister Narendra Modi has been to the UAE three times and has been conferred with the highest honour Sheikh Zayed medal.

UAE is playing a very significant role in the Persian Gulf crisis and for India’s well-being peace in West Asia is very critical. The Army Chief is likely to discuss the situation, the US-Iran relations as well as counter-terrorism cooperation.

When last year the UAE had announced an investment of \$ 75 billion in India, the leadership of Saudi Arabia had raised their investment to around \$ 100 billion and had also invited the Indian companies to explore their potential.

UAE has inked defence cooperation agreements with India. Also, the Indian Ordnance Factories had inked an agreement to supply ammunition to the Emirati Military.

The Gulf country has expressed interest in the ‘Made in India’ Akash surface-to-air missile system.

Has interest in the world’s fastest anti-ship cruise missile — BrahMos, which is Indo-Russian joint venture.

It is also looking at the indigenous Astra 70-km range air-to-air missile. This can be fitted on the French fighter jet ‘Mirage’ which the Air Force of that country is flying.

### **Update**

An Abu Dhabi based company Caracal International had been declared as L1 for the procurement of Indian Army’s Close Quarter Carabines (CQB). However, the order from the Indian Army had not been placed and the RfP for 93,895 CQB was cancelled. According to reports, the company is promising to manufacture the CQB in India and this, according to sources will be conveyed to the Army Chief next week. This was also raised during the recently concluded visit of the external affairs minister to UAE.

### **India & Saudi Arabia**

Both sides have already signed an agreement for the joint defence production of various components. The Kingdom has been keen on setting up its own manufacturing bases, however, has not been successful due to the lack of technical expertise and skilled workers.

### **Significance of the visit**

The visit is significant as it comes at a time when the world is still dealing with the global pandemic of COVID-19 and India and Chinese forces have been in a standoff since May 2020.

In the region, Bahrain is a host to the US 5th fleet and also plays a very important role in anti-piracy and counter-terrorism along with India. Bahrain also holds the SHADE (Shared Awareness and De-confliction) activities.

In 2019, both India and Saudi Arabia had conducted their first-ever joint naval exercise.

Since India is a traditional player in the Indian Ocean Region (IOR), Saudi Arabia is seeking a presence in the region. For further enhancing maritime security and a safe passage for international trade, both the countries have decided to work together with other Indian Ocean Rim Countries. And both are working towards a “Comprehensive Security Dialogue”.

<https://www.financialexpress.com/defence/uae-saudi-arabia-interested-in-brahmos-missile-army-chiefs-visit-to-focus-on-deepening-military-ties/2143348/>

## Defence News

# Defence Strategic: National/International



Press Information Bureau  
Government of India

Ministry of Defence

*Fri, 04 Dec 2020 6:38PM*

## Armed Forces Flag Day CSR Conclave: Raksha Mantri Shri Rajnath Singh urges industry to continue contributing generously to AFFD Fund

The second edition of the Armed Forces Flag Day CSR Conclave was organised as a webinar on 04 December 2020 in New Delhi. While presiding over the webinar Raksha Mantri, Shri Rajnath Singh said the government has recognized the role and importance of private sector in the development of the country. Since 2014, when the NDA came into power, the government has encouraged the private sector to grow. Raksha Mantri said the Defence sector which was out of bound for the private sector, is now open to welcome the Indian private sector also. He said some revolutionary steps have been taken to encourage private sector participation in the defence sector and urged the industries to come forward to take due advantage.

Raksha Mantri said in the process of fighting to safe guard the sovereignty of the country our forces sometimes even lay down their lives, or are rendered disabled. “Hence the rehabilitation and welfare of our Ex Servicemen, the next of kin of our martyrs and our disabled soldiers is the responsibility of all citizens” Raksha Mantri said. “The Flag Day provides us an opportunity to fulfill this responsibility by contributing to the AFFD fund” he added. Recalling the spirit of the services of our ex-servicemen, ESM, Raksha Mantri said even during the difficult days of Covid-19 pandemic, they assisted the local administration in works like contact tracing, community surveillance and quarantine management etc.

Raksha Mantri said during the last few years, with the generous contribution of Indian industry through CSR, there has been a substantial increase in the AFFDF. He thanked the industry for their contributions to the AFFD Fund last year and appealed them to continue contributing to this noble cause.

Secretary, Department of Ex Servicemen Welfare, Shri Ravikant said Kendriya Sainik Board (KSB) is committed to the welfare of the ex-servicemen and their dependents. Secretary, KSB Air Commodore B Ahluwalia, apprised the conclave of the welfare schemes funded out of the Armed Forces Flag Day Fund. KSB is the apex body of the Government of India, which formulates

policies for rehabilitation and welfare of ex-servicemen and their dependents. The AFFDF is administratively controlled by KSB

AFFD fund is used for the rehabilitation and welfare of next of kin of those soldiers who laid their lives in the line of duty, or were rendered disabled, old, non-pensioners, widows and orphaned children. They are given financial assistance through various schemes like penury grant, education grant, widow/daughter marriage grant etc.

Presently, there are more than 32 lakh ESM and around six lakh widows around 60,000 ESM are added every year due to early superannuation.

Corporate contributions to AFFDF are eligible for fulfilling the CSR obligation under section 135 of Companies Act, 2013 as it adheres to “Measures for the benefit of Armed Forces Veterans, War Widows and their dependents” (Clause VI of Schedule VII of the Companies Act, 2013).

Contributions to AFFDF are exempted from Income Tax under section 80 G (5) (vi) of Income Tax Act 1961

Secretary, Defence Production Shri Raj Kumar and Industry leaders and CSR heads participated in this conclave.

Armed Forces Flag Day will be observed all over the country on 07<sup>th</sup> December 2020 like previous years. Since 1949, the day is observed to honour the martyrs as well as men and women in uniform, who valiantly fight on our borders to safeguard the country’s honour.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1678360>

# The Tribune

Sat, 05 Dec 2020

## Army reforms: Dy Chief to handle operational issues

By Ajay Banerjee

New Delhi: In what sets the ball rolling for structural reforms at the top within the Indian Army, a new post of Deputy Chief Strategy has been carved out, all operational issues have been clubbed under one vertical to be headed by him.

There is no creation of an additional post or a financial outgo as the already sanctioned and existing post of Director General Rashtriya Rifles has been re-named as the Deputy Chief Strategy.

The Deputy Chief Strategy will have various tasks under him to include running operations to intelligence gathering to operational logistics like moving like fuel, vehicles and equipment. Also, strategy planning will be under the same official.

The Director General Military Operations (DGMO), Director General Military Intelligence (DGMI), DG Operational Logistics, DG Strategy Planning and the newly created post of DG Information Warfare (DGIW) will be under the Deputy Chief Strategy.

The DGIW will have the media outreach wing under him that includes tackling misinformation of social media and timing release of information, pictures and videos to the media — newspapers, TV and websites.

At present, each of these DG’s reported separately to the Vice Chief of the Indian Army, who is burdened with multiple issues and it created communication gaps in smooth functioning. The day-

New Carved Post	Posts under Deputy Chief
Deputy Chief Strategy	DGMO, DGMI, DG Operational Logistics, DG Information warfare and DG Strategy planning

to-day operations of the entire Army are managed by the Vice Chief and that includes coordination with the Ministry of Defence.

This is the third post of the Deputy Chief of the Indian Army and by far the most important as it will deal with operations, intelligence, information and logistics. A formal sanction from the government has come and Lt General Paramjit Singh has been appointed as the new Deputy Chief Strategy.

He will replace the Director General Military Operations (DGMO) as one the Principal Staff Officers of the Army Chief.

<https://www.tribuneindia.com/news/nation/army-reforms-dy-chief-to-handle-operational-issues-180140>



Sat, 05 Dec 2020

## Indian Air Force shows its prowess with ‘Swarm Drone Technology’; Tweets Images:

In a recent tweet, the Indian Air Force has released images of its own swarm drone tests after news came out that India is accelerating its drone project. These images, according to experts, are a signal to adversaries across the country’s northern borders, which already possess such capability.

“Harnessing indigenous talent and technological capability, IAF is leading the way in using Artificial Intelligence to add to its combat potential. Swarm drones is a prime example,” the tweet mentioned, pointing towards the use of Artificial Intelligence technology with these drones.

Three images of the tests were also posted, showing a number of hexacopter UAVs (at least 15 of them) flying in a coordinated manner from an airbase. The images are, however, blurred. Whether the blurring is done intentionally or unintentionally is not known, but experts have stated that this could be to hide the characteristics and the manufacturing company of these drones.



Via Twitter. Via: Indian Air Force

### Why Swarm Drones?

Swarm drones is a concept where a large cluster (or many clusters) of unmanned aerial vehicles (UAVs) are flown together in contested or hostile airspace, in order to confuse the radar with a much bigger image of the actual target and achieve their assigned objective.

These drones (or robots) work in tandem with each other and are controlled either manually or autonomously by using processors on board.

These could be efficiently used in Suppression of Enemy Air Defenses/ Destruction of Enemy Air Defenses (SEAD/DEAD) roles, by giving a distorted image of bogeys on the radar, detecting the enemy radar sites and relaying that information to their operators.

If these drones are armed, these can also be used as kamikaze or strike roles, hitting the enemy Air Defense sites or other critical infrastructural assets. These can be used in many other areas as well, and their operational capabilities and scope are still being developed with innovative ideas.

Apart from military applications, its civilian usage is also being done in many ways like aerial demonstrations. This technology has been on a rapid rise in China, the biggest manufacturer and the user of military and non-military UAVs. They are even used as fireworks and other entertainment purposes among the Chinese population.

China has already made rapid advancements in the deployment of its military drone swarms. This year only, the country released a video of a 'barrage swarm' truck-mounted system tested for its military and is the first practical use of such system on this scale anywhere in the world.

<https://eurasianimes.com/indian-air-force-shows-its-prowess-with-swarm-drone-technology-tweets-images-watch/>



Sat, 05 Dec 2020

## टिड्डी-दल की तरह दुश्मन पर टूट पड़ने के लिए भारत के ड्रोन हैं तैयार, IAF ने शेयर की तस्वीरें

*आर्टिफिशियल-इंटेलीजेंस' की मदद से इस तकनीक से ड्रॉन्स का झुंड दुश्मन पर हमला करता है।  
एलएसी पर चल रहे टकराव के बीच सर्वम-ड्रॉन्स का परीक्षण भारत के लिए एक बड़ी  
उपलब्धि। चीन को सर्वम-ड्रॉन्स तकनीक में माहिरत हासिल है*

*नीरज राजपूत*

टिड्डी-दल की तरह दुश्मन पर टूट पड़ने वाली स्वदेशी 'सर्वम-ड्रॉन्स' तकनीक में भारत ने एक बड़ा कदम उठाया है। भारत ने ये ड्रॉन के झुंड वाली तकनीक का सफल परीक्षण ऐसे समय में किया है जब एलएसी पर चीन से पिछले सात महीने से टकराव चल रहा है। 'आर्टिफिशियल-इंटेलीजेंस' की मदद से काम करने वाले इन सर्वम-ड्रॉन्स तकनीक में माना जाता है कि चीन को माहिरत हासिल है।

शनिवार को भारतीय वायुसेना ने अपने आधिकारिक ट्विटर हैंडल पर सर्वम-ड्रॉन्स यानि ड्रॉन के झुंड की तस्वीरें साझा करते हुए लिखा कि "स्वदेशी प्रतिभा और तकनीकी क्षमता का उपयोग करते हुए आईएफएफ (इंडियन एयरफोर्स) अपनी लड़ाकू क्षमता को बढ़ाने के लिए आर्टिफिशियल-इंटेलीजेंस का उपयोग करने में अग्रणी है। सर्वम-ड्रॉन उसका एक प्रमुख उदाहरण है।"



इस सर्वम-ड्रॉन्स तकनीक में आर्टिफिशियल-टेक्नोलॉजी (एआई) के जरिए यूएवी और छोटे ड्रॉन्स को एक बड़े झुंड के जरिए आसमान में उड़ाया जाता है। इसका इस्तेमाल दुश्मन के टैंक, आईसीवी यानि इंफैंट्री कॉम्बेट व्हीकलस और सैनिकों और गोला-बारूद से भरे ट्रकों पर एक साथ बड़ा हमला करने के लिए किया जाता है। ये एक टिड्डी-जल की तरह दुश्मन पर हमला करते हैं इसलिए इन्हें सर्वम-ड्रॉन्स कहा जाता है। ऐसे ड्रॉन, मिसाइल या फिर बमों से लैस होते हैं। इस तरह के सर्वम-ड्रॉन्स का इस्तेमाल युद्ध के मैदान में दुश्मन के कम्युनिकेशन-सिस्टम और रडार्स को जाम करने के लिए भी इस्तेमाल किया जाता है।

आपको बता दें कि एक लंबे समय से देश की सशस्त्र-सेनाओं को सर्वम-ड्रॉन्स तकनीक की दरकार थी, खासतौर से जब से भारत का एलएसी पर चीन के साथ टकराव शुरू हुआ है। क्योंकि चीन को सर्वम-ड्रॉन्स और एआई तकनीक में काफी माहिरत माना जाता है। कुछ हफ्ते पहले ही चीन की पीएलए सेना ने एक वीडियो जारी कर दिखाया था कि कैसे सर्वम-ड्रॉन्स के जरिए फ्रंटलाइन पर तैनात सैनिकों को गरम-खाना पहुंचाया जा रहा है।

गौरतलब है कि हाल ही में आर्मेनिया और अजरबेजान के बीच हुए युद्ध में भी ड्रॉन्स का बड़ा इस्तेमाल किया गया था। माना जा रहा है कि अजरबेजान ने बड़ी तादाद में ड्रॉन्स का इस्तेमाल कर आर्मेनिया की सेना को बड़ा नुकसान पहुंचाया था। अजरबेजान ने इनके वीडियो भी रिलीज किए थे जिसमें दिखाई पड़ रहा था कि किस तरह से आर्मेनिया के टैंक, सैनिकों और आर्म्स-एम्प्युनेशन से भरे ट्रकों पर ये ड्रॉन हमला करते हैं।

<https://www.abplive.com/news/india/indian-air-force-shows-its-power-and-share-swarm-drone-technology-via-tweet-ann-1667181>



Sat, 05 Dec 2020

## India to position powerful steel hull boats to counter Chinese patrolling in Pangong Tso

*A senior official confirmed that India is manufacturing steel hull boat in order to counter the Chinese activities within the waters of Pangong Tso lake*

*By Mayank Singh*

New Delhi: India has pressed into raising its capacity to patrol the waters of the Pangong Tso which has become the genesis of the standoff between the Chinese PLA and the Indian Army since May, this year.

A senior official confirmed that India is manufacturing steel hull boat in order to counter the Chinese activities within the waters of Pangong Tso Lake.

There have been incidents of aggressive Chinese boat patrolling in the lake and have been ramming their boats into the Indian boats which have even led to fractures to the Indian troops in September 2019.

“The new boat will be more powerful, longer in length and will have steel hull which will be able to withstand the ramming activity which the PLA has been resorting to in the recent years to stop Indian Army from patrolling the water of the lake,” another source confirmed to *The New Indian Express*.

The new boat is being built indigenously and will be able to carry a platoon size troop count, between 24 to 30. Pangong Tso is located at about 14,000 feet and is 134 kilometer long of which one third, about 45 kilometers, is under the Indian control.

The patrolling in the lake has assumed importance since the unilateral mobilisation of the Chinese troops on the Finger 4 which lies on the Northern Bank of the Lake. “With the faster movement in the lake we will have an option to mobilise troops and counter the Chinese in this area.”

India has been claiming its area upto the location of the hill spur which is Finger 8 and Chinese have been trying to get upto Finger 2. With the standoff the Chinese have been stopping the Indian patrols much before Finger 4. Fingers are the names given to the mountain spurs jutting into the lake.

<https://www.newindianexpress.com/nation/2020/dec/04/india-to-position-powerful-steel-hull-boats-to-counter-chinese-patrolling-in-pangong-tso-2231914.html>



In this Sept. 14, 2017, file photo, a banner erected by the Indian army stands near Pangong Tso lake near the India China border in India's Ladakh area. (Photo | AP)

## How Indian Army plans deployment in Ladakh with temperatures as low -40 degree Celsius

### LEMOA activated

According to an October report by ET, India activated a key foundational pact with the US last month to acquire urgently needed high-altitude systems for soldiers deployed to forward areas along the Line of Actual Control in Ladakh who are likely to stay on through the winter as tensions with China continue. Sources said that 11,000 sets of extended cold weather clothing system (ECWCS) arrived late last month after India made an urgent request for assistance under a bilateral pact. These sets have come from the stockholdings of the US Army and have been dispatched to forward areas where troops are braving the cold.

### -40 degrees Celsius

ECWCS are vital to keep soldiers alive at extreme altitude and temperatures which could touch -40 degrees Celsius in winter. So vital was the need that a small number of the ECWCS systems that arrived included ones issued to US soldiers in the past.

### Fire and Fury Corps

India's Army has also been beefing up its stocks of food, ammunition, fuel and more importantly the winter gear. Major General Arvind Kapoor, Chief of Staff of the Fire and Fury Corps -- also known as the XIV Corps which has the mandate of securing the frontiers along the China and Pakistan borders from Kargil to Ladakh -- said the unit takes pride in its advance winter stocking. Our stocking levels, be it rations, fuel, oils and lubricants, tentage and heating appliances which includes bukhari (heaters) or kero-heaters, or be it ammunition, are in good numbers," Kapoor told PTI.



### Supply of fuel

Fuel also plays a critical role for the armed forces, especially in the Ladakh region where it is used by soldiers in forward areas to keep themselves warm in low temperatures. The corps also operates one of the highest altitude fuel, oil and lubricants depot. We supply fuel both for our vehicles as also for our men, for the bukharis to keep them warm in the bitterly cold weather on the frontline, said Brigadier Rakesh Manocha, in-charge of the logistics.

### Arctic tents

On tentage, officials said the indigenously developed Arctic tents can sustain temperatures up to minus 20 degrees, while the high-altitude tents have the capacity to sustain temperatures anywhere between minus 40 to minus 50 degrees. Both tentages and adequate winter clothing have also been supplied to the forward areas, an official said.

### All stocked up

The ration too has been stocked adequately, ranging from pre-cooked, packaged and canned items to food grains, they added. Brigadier A S Rathore said, We hold complete requirements of supplies for all troops which are deployed in the Ladakh sector. All warehouses are completely full to the brim.

<https://economictimes.indiatimes.com/news/defence/how-indian-army-plans-deployment-in-ladakh-with-temperatures-as-low-40-degree-celsius/all-stocked-up/slideshow/79589922.cms>

## Southern Naval Command conducts 'Operation Demonstration'

*The event showcased the potent capability of Indian Navy and provided an insight into operations at sea*

Kochi: Daredevil skills and daring armed operations were on display here on Friday at the Southern Naval Command's Operations Demonstration (Op Demo), organised as part of Navy Week-2020 celebrations.

The event showcased the potent capability of Indian Navy and provided an insight into operations at sea.

In view of prevailing COVID-19 restrictions, the event was conducted inside Ernakulam Channel, Kochi instead of the usual Rajendra Maidan frontage.



For representational purposes. (File | EPS)

The event was witnessed by Vice Admiral A K Chawla, Flag Officer Commanding-in-Chief Southern Naval Command, along with other invited dignitaries and some select personnel of SNC from the naval jetty of INS Venduruthy.

The demonstration commenced with MARCOS (Marine Commandos) carrying out simulated combat beach reconnaissance and assault, using inflatable watercraft, Gemini, followed by the programme brochure being delivered to the Chief Guest, a Defence release said here.

The two-hour-long demonstration included special operations by MARCOS from air and water, simulation of VBSS (visit, board, search and seizure) operations and helobatics by ALH and Chetak helicopters, including SAR (Search and Rescue) and 'Slithering Ops' demo .

Eight ships of the SNC undertook various demonstrations, including simulated firing of guns and helicopter landing demos on the deck of the ship.

The highlight of the day was the fast-paced Special Forces operations undertaken by the MARCOS, who displayed stealthy insertion into the enemy area and undertook demolition of an offshore enemy installation, it said.

In addition, specially trained sniffer dogs of the Navys Explosive Ordnance Disposal team demonstrated its special capability of detecting an explosive device for the team to later dispose off safely, the release said.

A contingent of 30 men from INS Dronacharya performed a 'continuity drill', showing skills in weapon handling.

The display concluded with a Beating Retreat by the naval band and the ceremonial sunset ceremony, after which all naval ships in the harbour were simultaneously illuminated. These events mark the beginning of activities leading to yearlong celebration of Swarnim Vijay Varsh being celebrated till December 16, 2021, the release said.

<https://www.newindianexpress.com/nation/2020/dec/04/southern-naval-command-conducts-operation-demonstration-2231916.html>



## Indian Navy carries out exercise with Russia on Navy Day

*The exercise is aimed at enhancing interoperability, improving understanding  
and imbibing best practices between Indian and Russian navies*

*By Abhishek Bhalla*

New Delhi: The Indian and Russian navies are carrying out a two-day passage exercise (PASSEX) in the Eastern Indian Ocean Region (IOR) on December 4 and 5. A similar exercise was carried out by the US Navy earlier as part of Indian Navy's outreach programme to work closely with friendly nations.

"The exercise is aimed at enhancing interoperability, improving understanding and imbibing best practices between both the friendly navies, and would involve advanced surface and anti-submarine warfare exercises, weapon firings, seamanship exercises and helicopter operations," the Indian Navy said.

The exercise involves the participation of Russian Federation Navy guided-missile cruiser Varyag, the large anti-submarine ship Admiral Panteleyev and medium ocean tanker Pechenga.

Indian Navy is being represented by indigenously constructed guided-missile frigate Shivalik and anti-submarine corvette Kadmatt along with integral helicopters.

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

This particular exercise, which is being conducted in the Eastern Indian Ocean Region, reflects the strong long-term strategic relationship between the two countries and particularly, defence cooperation in the maritime domain, said the Indian Navy.

With China's growing presence in the IOR, the Indian Navy is looking at enhancing its maritime diplomacy. Recently the four-nation Malabar Exercise was conducted in the Bay of Bengal and Arabian Sea where navies of US, Japan, Australia and Indian participated. Australia's participation after 13 years was significant as the the four nations got together for war games in the seas.

"Indian Navy (participated) in 13 bilateral and multilateral exercises this year. The most recent exercise, Malabar, with US, Japanese and Australian Navies, contributed to enhanced cooperation and trust," Indian Navy Chief Admiral Karambir Singh had said in a press conference held on December 3.

"As part of the Government of India's vision of 'Neighbourhood First', the Indian Navy undertook Joint EEZ surveillance with Maldives, Seychelles and Mauritius, as well as Coordinated Patrols (CORPATs) with Bangladesh, Thailand and Indonesia," he added.

This PASSEX with Russia would be another step towards strengthening Indo-Russian defence relations, the Indian Navy said.

The two navies have built a robust relationship through regular exercises such as INDRA Navy conducted biennially, with the last edition held in the northern Indian Ocean Region on September 4 and 5 this year.

<https://www.indiatoday.in/india/story/indian-navy-carries-out-exercise-with-russia-on-navy-day-1746819-2020-12-05>



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



Sat, 05 Dec 2020

## Garden Reach Shipbuilders & Engineers to launch Project 17A Nilgiri-Class Stealth Frigate for Indian Navy

*According to a Tweet published on December 4, 2020, Garden Reach Shipbuilders & Engineers (GRSE) has announced the launch of the 1st ship of the prestigious Project 17A Nilgiri-Class Stealth Frigate for the Indian Navy that will be held on December 14, 2020. A total of seven ships will be built at Mazagon Dock and GRSE*

The construction of the first Project 17A Nilgiri-class stealth frigate started in 2017 and the first ship is expected to be delivered by 2022. The contract was signed with the two shipyards in February 2015. The steel cutting ceremony was held on 17 February 2017 which marked the commencement of construction. The first ship is expected to be commissioned by August 2022.

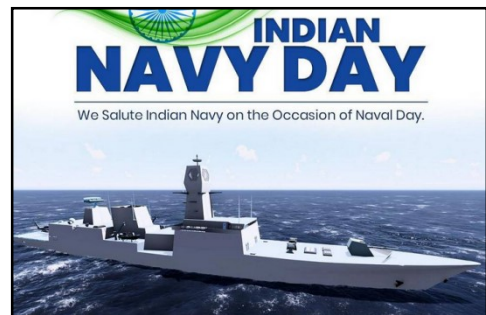
The P17A frigates are state-of-the-art Guided Missile Frigates. Each of these ships will have a length of 149 meters with a displacement of approximately 6,670 tons. P17A Stealth Frigates are being built with the latest Integrated Construction Methodology with enhances pre-outfitting to enhance quality and reduce build periods considerably. She will have a covered mooring deck and the number of antennae on the ship will be reduced by using EL/M-2248 MF-STAR AESA radar. The P17A will also feature better roll stabilization and a discreet visual profile.

The crew complement of the P17A frigate will be reduced from the existing 257 (including 35 officers) to about 150 by using high levels of automation, which will reduce the operational costs by around 20 percent and result in higher operational availability of the warships.

The P17A frigate will be powered by a combined diesel and gas (CODAG) type propulsion system including two MAN Diesel 12V28/33D STC developing 6000 kW each) and two General Electric LM2500 gas turbines. The ship will have the capability to reach a top speed of 28 kn (52 km/h) with a maximum cruising range of 2,500 nmi (4,600 km) at 28 kn (52 km/h) and 5,500 nmi (10,200 km) at 16–18 kn (30–33 km/h). The stern vessel's deck will be able to accommodate two medium-sized helicopters such as HAL Dhruv or Sea King Mk. 42B helicopters

The P17A will be armed with 32 Barak 8 surface-to-air missiles, eight BrahMos anti-ship missiles, one BAE 5 inch 62-caliber Mk 45 naval gun, two AK-630M 30mm rotary cannon CIWS (Close-In Weapon System), two RBU-6000 ASW anti-submarine rocket launchers, and two triple torpedo tubes.

<https://navyrecognition.com/index.php/news/defence-news/2020/december/9376-garden-reach-shipbuilders-engineers-to-launch-project-17a-nilgirai-class-stealth-frigate-for-indian-navy.html>



Artist rendering of new Indian Navy P17A Nilgiri-class stealth frigate. (Picture source Garden Reach Shipbuilders & Engineers)

# Indian Armed Forces Flag Day 2020

## theme, history, and significance

*Indian Armed Forces Flag Day 2020 will be observed in the country on December 7, 2020.*

*Read more to know about the Indian Armed Forces Flag Day 2020*

*By Rohan Patil*

Indian Armed Forces Flag Day 2020 will be celebrated tomorrow on December 7. It is an annual day that is observed to honour the martyrs and the men in uniform who serve our country. The day is an ode to all of the soldiers of our country. People pay their respects to the soldiers in whichever way they can. Soldiers are one of the greatest assets of any country and they hold a greater significance in keeping the country intact.

As Indian Armed Forces Flag Day 2020 is coming close, a lot of people have been curious to know about the Indian Armed Forces Flag Day 2020 theme, Indian Armed Forces Flag Day history and its significance. For all the people who are curious about the Indian Armed Forces Flag Day 2020, here is everything you need to know about it.



### **Indian Armed Forces Flag Day history**

On August 28, 1949, a committee was set up under the then Defence Minister of India. The committee decided that Flag Day will be observed annually on December 7. The primary idea behind the Indian Armed Forces Flag Day was to distribute small flags to the civilians and collect donations for the soldiers in return. Over the years the day has gained more significance as it considers that it is the responsibility of the general population of India to take care of the families of the armed forces personnel who fight to keep the country safeguarded.

### **Indian Armed Forces Flag Day 2020 theme**

There is no specific theme about the Indian Armed Forces Flag Day 2020. The day is an ode to all the uniformed soldiers of our country who protect the citizens at all costs. The country is forever indebted to such heroes who lay down their lives in their service to their motherland. The day can be celebrated by donating towards the Armed Forces Flag Day Fund by the Indian government. People also wish each other a Happy Indian Armed Forces Flag Day.

### **Indian Armed Forces Flag Day significance**

It becomes the duty of citizens of a country to not only show our admiration for the martyrs and the living heroes who were wounded while doing their duties but also to their families who have been a crucial part of this sacrifice. The Indian Armed Forces Flag Day is mainly observed to Rehabilitate those wounded in battle casualties, for the welfare of serving soldiers and their families and the welfare of ex-servicemen and their families. It has gained immense significance as it brings to the forefront our commitment of looking after our war disabled Soldiers, Veer Naris and the families of martyrs who have sacrificed their lives for the country.

<https://www.republicworld.com/lifestyle/festivals/indian-armed-forces-flag-day-2020-theme-history-and-significance.html>

## India considers French offer of six Airbus multi-role mid-air refuellers

*According to a former Indian Air Force chief, the Airbus 330 MRTT platform has much larger wings of Airbus 340 as a result of which the aircraft can refuel two fighters mid-air at the same time through drogues (attached to wing pods) or a central refuelling boom system*

*By Shishir Gupta*

New Delhi: India is considering a French proposal to acquire six Airbus 330 multi-role transport tanker aircraft on a government-to-government basis for expanding the Indian Air Force (IAF) strike capability through latest mid-air refuelers. IAF as of now operate seven Russian IL-76 M refuellers with Pakistan acquiring same four refuellers from Ukraine and China operating three same Russian refuellers along with vintage 10 others modified versions of Russian bombers.

According to South Block sources, while IAF wanted to get an Airbus 330 MRTT on wet lease from a British company, the French proposal involves selling 5–7-year-old six aircraft for the air force with a certification of another 30 years of platform life at a much-reduced rate. IAF has been eager to acquire MRTT since the past decade with the previous RFP expiring without any results.



According to a former Indian Air Force chief, the Airbus 330 MRTT platform has much larger wings of Airbus 340 as a result of which the aircraft can refuel two fighters mid-air at the same time through drogues (attached to wing pods) or a central refuelling boom system. The best part about the Airbus aircraft is that it can transport 260 personnel in cabin and fuel in the cargo hold due to highly efficient and high-powered engines. The MRTT can be turned into purely a tanker or transport or air ambulance or all three at the same time with a total crew of three.

Mid-air refuellers are a key to expanding the operational envelope of the IAF and Indian Navy carrier-based fighters by extending their range. According to the former IAF chief, a mid-air refueller can be used to extend the flight of a Su-30 MKI or Rafale flying from Port Blair all the way up to Sunda, Lombard and Malacca Straits for freedom of navigation missions.

“The French proposal is a win-win for IAF as the international market for aerial platforms is down due to Covid-19 pandemic. The aircraft does not guzzle fuel and has high power engines to operate from high altitude air bases in Ladakh like Leh, Thoise and Nyoma at the same time transport troops or conduct medical evacuation if required,” said a senior IAF official.

<https://www.hindustantimes.com/india-news/india-considers-french-offer-of-six-airbus-multi-role-mid-air-refuellers/story-70sYwYarTrtUMQcE0wvV7N.html>

# France की इस मदद से बढ़ेगी Indian Airforce की ताकत, चीन को लगा झटका

*भारत सरकार लद्दाख में सतर्क रहना चाहती है। भारत को मित्र देश फ्रांस ने बड़ी मदद की है जिससे वायुसेना की ताकत कई गुना बढ़ जाएगी*

**खास बातें**

1. फ्रांस देगा मल्टी रोल ट्रांसपोर्ट टैंकर एयरक्राफ्ट्स
2. एक दशक से जारी है कोशिश

नई दिल्ली: भारत और चीन के बीच वास्तविक नियंत्रण रेखा (Line Of Actual Control) पर तनातनी अब तक बरकरार है। दोनों देशों के बीच कई स्तर की वार्ता हो चुकी है और सामान्य गति से आगे भी बढ़ रही है। फिर भी भारत सरकार लद्दाख में सतर्क रहना चाहती है। भारत को मित्र देश फ्रांस ने बड़ी मदद की है जिससे वायुसेना की ताकत कई गुना बढ़ जाएगी।

**फ्रांस देगा मल्टी रोल ट्रांसपोर्ट टैंकर एयरक्राफ्ट्स**

आपको बता दें कि पूर्वी लद्दाख में जारी सीमा विवाद के बीच भारतीय वायुसेना (IAF) अपनी ताकत और अधिक बढ़ाने जा रही है। यह ताकत कोई और नहीं बल्कि राफेल विमान देने वाला भारत का 'दोस्त' फ्रांस ही बढ़ाएगा।



विदित हो कि भारत सरकार फ्रांस के एक प्रस्ताव पर विचार कर रही है, जिसमें वह 6 एयरबस 330 मल्टी रोल ट्रांसपोर्ट टैंकर एयरक्राफ्ट्स खरीदेगी। यह एक मल्टी-रोल मिड-एयर रिफ्यूएल एयरक्राफ्ट है और इसके आने से लद्दाख में भारतीय वायुसेना की स्थिति पहले की तुलना में और भी बेहतर हो जाएगी।

**एक दशक से जारी है कोशिश**

उल्लेखनीय है कि फ्रांस के साथ डील के बारे में रक्षा मंत्रालय के शीर्षस्थ अधिकारियों के बीच बैठक भी हुई है। सूत्रों के से मिल रही जानकारी के मुताबिक भारतीय वायुसेना ब्रिटिश कंपनी से लीज पर एयरबस 330 MRTT को लेना चाहती है और फ्रांसीसी प्रस्ताव में कम दरों पर 5-7 साल पुराने एयरक्राफ्ट्स शामिल हैं।

उल्लेखनीय है कि वायुसेना पिछले एक दशक से एमआरटीटी एयरक्राफ्ट्स को खरीदने के लिए काफी उत्सुक रही है क्योंकि ये वायुसेना की ताकत को कई गुना बढ़ा देगा। वर्तमान परिस्थितियों को देखते हुए ये डील बहुत महत्वपूर्ण होने जा रही है।

<https://zeenews.india.com/hindi/zee-hindustan/national/indian-airforce-can-be-get-many-fighter-equipments-front-france-china-in-trouble/800951>

## ‘MH-60 Romeo in all its glory’: Lockheed Martin shares photo of chopper for Indian Navy

*India had signed \$2.6 billion deal in 2019 to buy 24 MH-60 Romeo helicopters from Lockheed Martin. The multi-mission helicopters can detect, track and attack submarines and surface ships*

*Edited By Amit Chaturvedi*

New Delhi: American defence manufacturer Lockheed Martin on Friday shared the photo of MH-60 Romeo chopper in Indian colours. The chopper will be inducted in the Indian Navy.

“This #NavyDay, we are proud to share the first look of the #IndianNavy’s #MH60R in all its glory. #RomeoForIndia,” Lockheed Martin posted on Twitter.

India had signed \$2.6 billion deal in 2019 to buy 24 MH-60 Romeo helicopters from Lockheed Martin.

Designed for hunting submarines as well as knocking out ships and conducting search-and-rescue operations at sea, the Lockheed Martin-built helicopters would replenish India’s aging fleet of British-made Sea King helicopters.

The multi-mission helicopters can detect, track and attack submarines and surface ships.

On Friday, the US also approved the sale of \$90 million worth of military hardware and services to India in support of its fleet of C-130J Super Hercules military transport aircraft.

The Pentagon said that the proposed sale ensures the previously procured aircraft operates effectively to serve the needs of the Indian Air Force (IAF), the Army and the Navy transport requirements, local and international humanitarian assistance, and regional disaster relief.

This proposed sale will support the foreign policy and national security of the United States by helping to strengthen the US-Indian strategic relationship and improve the security of a “Major Defence Partner”, according to the the Defence Security Cooperation Agency (DSCA) of the Department of Defence.

The DSCA also said that India continues to be an important force for political stability, peace and economic progress in the Indo-Pacific and South Asia region.

India and the United States have been ramping up defence ties in recent years with joint military exercises, exchanges and exchanges. They held their first 2+2 ministerial in September 2018 - a simultaneous meeting for their defence and foreign ministers. They ended years of discussions and back-and-forth and signed two enabling agreement LEMOA (Logistics Exchange Memorandum of Agreement) and COMCASA (Communications Compatibility and Security Agreement) in recent years to improve interoperability between their militaries.

In 2016, the US had designated India as a “Major Defence Partner” intending to elevate defence trade and technology sharing to a level commensurate with that of its closest allies and partners.

<https://www.hindustantimes.com/india-news/mh-60-romeo-in-all-its-glory-lockheed-martin-shares-photo-of-chopper-for-indian-navy/story-fH5W76IeSKlhUEllRWJbbK.html>



The MH-60 Romeo chopper which will be inducted in the Indian Navy.(Twitter/@LMIndiaNews)

## **Exclusive: China sets up 3 villages near Arunachal, relocates villagers**

*China disputes the legal status of the boundary in this region and Chinese maps continue to show 65,000 square kilometres of territory south of the line as being a part of Beijing's South Tibet Region*

*By Vishnu Som*

New Delhi: China has constructed at least 3 villages, approximately 5 kilometres from the Bum La pass which lies close to the tri-junction between India, China and Bhutan in western Arunachal Pradesh.



At least 3 more enclaves have been added to a village in the area. High-res: [here](#) and [here](#)

Beijing disputes the boundary between India and China in this region and the new constructions here could be a significant step towards reinforcing its territorial claims along the Arunachal Pradesh frontier.

"China has been using a strategy of settling Han Chinese and Tibetan members of the Communist Party along the India border to strengthen its territorial claims and escalate border intrusions," says China-watcher Dr. Brahma Chellaney. "Like it used fishermen in the South China Sea, China uses civilian resources - herders and grazers - as the tip of the spear to intrude into Indian-patrolled Himalayan areas."

The new satellite images presented in this report come a week after high-resolution satellite images appeared of Chinese village construction in Bhutanese sovereign territory, just seven kilometres from the Doklam face-off site between Indian and Chinese forces in 2017.

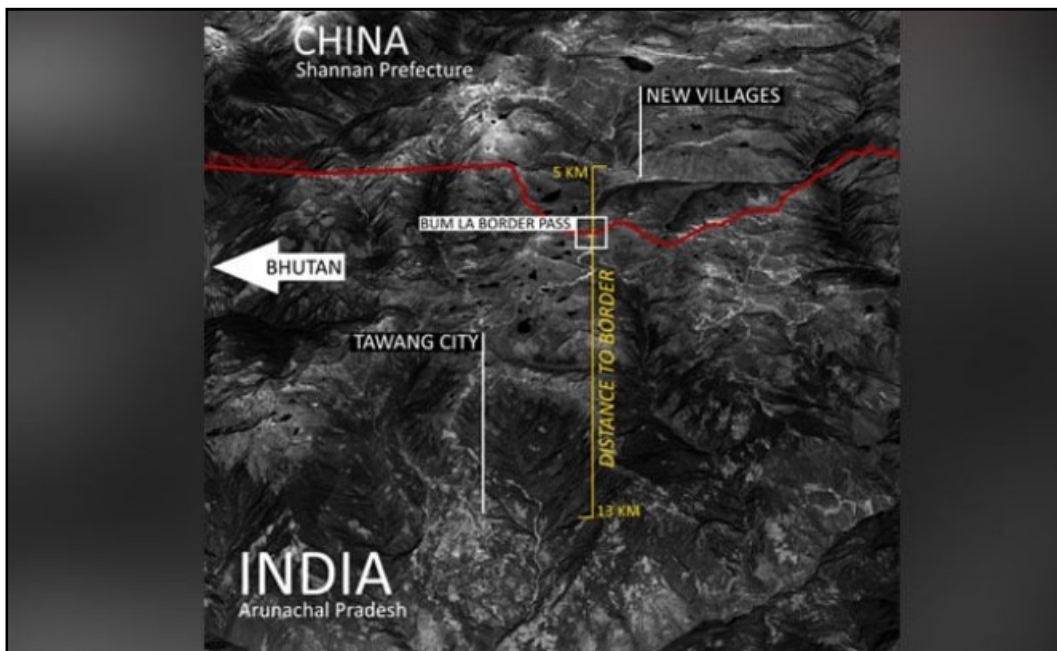
The villages shown in this report lie within Chinese territory and were being constructed at the same time that Indian and Chinese soldiers faced off in Eastern Ladakh, in the worst crisis the two nations have faced since the 1962 war. That standoff continues with tens of thousands of soldiers

having hunkered down for a long deployment through the intense winter after eight rounds of military talks failed to achieve a breakthrough.



At least 3 more enclaves (villages) have been added to a village already constructed in the area by February, 2020.

The images presented in this report, acquired from Planet Labs, show a single village having been constructed in the area by February 17, 2020. This features more than 20 structures, thought to be chalets, which can be easily distinguished through their red roofs. The second image, dated November 28, 2020, shows the addition of three additional enclaves with at least 50 structures. NDTV is aware of the presence of at least one more enclave in this area with 10 structures. Each enclave is within one kilometre of one another. All of the enclaves are connected with tarred, all-weather roads.



Map showing location of new Chinese enclaves near the Bum La border which lies near the tri-junction between India, China and Bhutan. High-res: [here](#)



China disputes the legal status of the boundary in this region and Chinese maps continue to show 65,000 square kilometres of territory south of the line as being a part of Beijing's South Tibet Region. India, which has rejected Beijing's claim for decades, insists that the historic McMahon line proposed by the British administrator Sir Henry McMahon at the 1914 Simla Convention defines the boundary here.

In September 2017, the Chief of Defence Staff, General Bipin Rawat, then Army Chief, had warned of China's efforts at 'salami slicing' into Indian territory. "As far as [the] northern adversary is concerned, the flexing of muscle has started. The salami slicing, taking over territory in a very gradual manner, testing our limits of threshold is something we have to be wary about," the General had warned.



**Exclusive: China Sets Up 3 Villages Near Arunachal, Relocates Villagers**

This is precisely what has been happening across the Sino-Indian frontier - in Doklam (near Sikkim) in 2017, across eastern Ladakh this year and potentially near the tri-junction in western Arunachal Pradesh as the images in this report indicate.

Significantly, construction across the Bum La pass is exactly what the Chinese government mouth piece, Global Times, identified in a detailed report in August which looked at infrastructure construction in the Shannan Prefecture which borders Arunachal Pradesh. "For residents who set up a home close to the border line, herding is patrolling and living is guarding the frontier," the report said. The new villages are a stark contrast from the dwellings of villagers in the past. "The new houses have water, electricity and internet access." Significantly, Cona, a crucial border county in Shannan which shares a 213 kilometre boundary with India plans "to relocate 3,222 people of 960 families to the weakly controlled areas on the borders on a voluntary basis."

The Deputy Party Secretary, who is the Chief of Cona county is quoted in the Global Times article as saying, "The India-controlled areas are just a mountain away."

<https://www.ndtv.com/india-news/exclusive-china-sets-up-3-villages-near-arunachal-pradesh-relocates-villagers-2334869>

## Business Standard

Sat, 05 Dec 2020

### Pixxel to launch remote-sensing satellite on ISRO rocket in early 2021

*With India allowing private companies to operate within the premises of Isro, this is expected to create huge opportunities for the country's fledgling aerospace start-ups*

*By Peerzada Abrar*

Bangaluru: Pixxel, a private satellite-imaging company, will launch its first remote-sensing satellite on the Indian Space Research Organisation (Isro) workhorse rocket Polar Satellite Launch Vehicle (PSLV) in early 2021. For this, the Bengaluru-based firm has entered into an agreement with NewSpace India Limited (NSIL), a Government of India company under the Department of Space. Earlier, the company's first satellite was scheduled to be launched towards the end of this year on a Russian Soyuz rocket.

The agreement with NSIL is one of its kind and one of the first since the setting up of IN-SPACe, the authorisation and regulatory body under the Department of Space (DoS) to enable private players undertaking space activities in India.

The DoS and Pixxel will work in collaboration to enhance utilisation and maximise the benefits of space assets for India. This first-of-a-kind private earth-observation mission will help provide solutions to many pressing environmental and agricultural issues, among other things.

“The Department of Space is happy to have one of India's leading private space startups, Pixxel, on board this mission. We realise the potential that Pixxel's earth-imaging satellites have to solve some pressing issues of our time and we are looking forward to a positive outcome from this launch,” said DoS Secretary K Sivan. “With the establishment of IN-SPACe, we will also be partnering with other private players that can help India achieve more milestones in the future.”

Founded in 2019 by then 21-year-olds, Awais Ahmed and Kshitij Khandelwal, Pixxel, is building a constellation of earth-imaging small satellites that will provide global coverage every 24 hours once fully deployed. The satellites will collect high-throughput information-rich data that will be analysed using artificial intelligence and machine-learning models. This would help make organisations more efficient in a plethora of sectors ranging from agriculture to urban monitoring.

“We are very excited to initiate this ambitious journey in association with NSIL/Isro. We are elated with the fact that India's first commercial private satellite will now launch on an Indian rocket,” said Awais Ahmed, CEO, Pixxel. “This is not only a proud moment for us as an organisation but also as citizens to work with our nation's capabilities. Many thanks to the Indian government for opening up access to our country's space infrastructure to the private sector.”

This week, Department of Space (DoS) and Agnikul Cosmos, a Chennai-based launch vehicle startup, signed a non-disclosure agreement under the newly proposed IN-SPACe entity. Agnikul is pioneering 3D printed single-piece rocket engines and building an orbital-class launch vehicle that can take small satellites to space. Their vehicle is - Agnibaan - a rocket that will be capable of carrying up to 100 kg of payload to low Earth orbits up to 700 km with a plug-and-play engine



Pixxel co-founders Awais Ahmed (on the right) and Kshitij Khandelwal (on the left)

configuration. It will now be able to work with various Isro centres to get access to technical information and facilities necessary to go forward with their launch vehicle development.

“We encourage new players such as Agnikul to explore disruptive technologies and break away from the conventional methods of manufacturing launch vehicles,” said Sivan, who is also chairman of Isro.

With India allowing private companies to operate within the premises of Isro, this is expected to create huge opportunities for the country’s fledgeling aerospace start-ups. These could range from building and launching rockets and satellites to providing space services commercially and even being part of planetary exploration missions, say industry insiders. Valued at around \$7 billion, the Indian space industry is just around 2 per cent of the global market that stands at around \$360 billion.

However, the participation of start-ups in the space sector has largely been minimal so far. Their participation will be the key towards building India's very own aerospace companies such as Maxar, Elon Musk’s SpaceX and Rocket Labs, according to experts.

Pixxel recently signed an agreement with Silicon Valley-based in-space satellite transportation and infrastructure company Momentus Inc, to launch its second satellite into space. The launch is scheduled for next year on top of a SpaceX Falcon-9 to SSO orbit (Sun-synchronous orbit), a particular kind of polar orbit.

Momentus has gained significant traction since its founding in 2017. It has attracted dozens of customers ranging from private commercial space companies to the likes of aerospace giant Lockheed Martin and US space agency NASA. It has formed important industry partnerships, most notably with Elon Musk's SpaceX.

[https://www.business-standard.com/article/companies/pixxel-to-launch-remote-sensing-satellite-on-isro-rocket-in-early-2021-120120401457\\_1.html](https://www.business-standard.com/article/companies/pixxel-to-launch-remote-sensing-satellite-on-isro-rocket-in-early-2021-120120401457_1.html)



*Sat, 05 Dec 2020*

## **ISRO comes through with RS2020**

*By Arup Dasgupta*

On November 20, 2020, the Department of Space unveiled its Draft SpaceRS Policy-2020 and SpaceRS NGP-2020 documents and sought comments from the public. At first glance these are excellent documents which cover almost each and every wish list of geospatial professionals in India. So let us “begin at the beginning and and go on till we come to the end: then stop”. Well, not quite, as there are some suggestions to add. We always ‘want some more’!

The documents are interesting. The first document, Draft SpaceRS Policy-2020 is a short document of just over a page which sets down among others, interestingly, the role of the Department of Space in issuing guidelines and procedures which are contained in the following document, SpaceRS NGP-2020. This was not done for the earlier Remote Sensing Policies.

### **End to End Service**

The Policy invites private industry to provide “end to end space based remote sensing services, that includes building and operating space assets, establishing ground stations, satellite data acquisition and dissemination, to compete as a provider of space based remote sensing capabilities within and outside India, on commercial basis”. To this end the document lays down some very bold and far reaching policies.

### **Unshackling the Data**

The document, SpaceRS NGP-2020 does that with panache. All Indian Remote Sensing (IRS) satellite data with resolution 5m and coarser is now ‘free and open’. IRS thus joins Landsat and

Copernicus systems in making data freely available worldwide. This will satisfy many end users, particularly the academia who are always short of funds, students and the public who can now see what remote sensing is all about first hand.

IRS data with resolution better than 5m and up to and including 50 cm data is also 'open' but priced as the Department feels that these types of data have a commercial value. These will be available from designated PSU/CPSE (read INSPACe).

Data with resolution finer than 50 cm is restricted. More on this later.

What is most interesting is the statement "All available archived satellite data and satellite derived thematic data shall be made available for further value addition, research and development purposes on 'as is where is' condition". So will ALL archived data irrespective of the resolution be available now? Interesting thought.

### **Opening up to Industry**

The policy aims to "promote Indian Industries to carry out space based remote sensing activities within and outside India". This recognition that Indian industry can also market remote sensing data globally is a major shift in policy. Earlier, IRS satellite data of the US and European regions were marketed respectively, by US and European partners of Antrix Corporation Limited (ACL). No attempt was made by ACL to set up its own subsidiaries abroad. As a result IRS data lost its identity and became one of many datasets marketed by the partners. What will this policy do to the revenue in terms of royalty that ACL was earning from its overseas partners? Will the partners also distribute the data freely?

Now that coarse IRS data upto 5 m is free it is unlikely that industry will be interested in marketing these except as value added commercial products and services. Perhaps, industry might be more interested in marketing open and commercial IRS data, value added data and services.

Notwithstanding this, by freeing up Indian industry, entrepreneurs like Pixxel Space who are developing a constellation of remote sensing satellites for global data acquisition, can enter this field, hopefully with INSPACe providing the support where needed.

### **Easy Access to Satellite Remote Sensing Data over India**

Industry is now free to market remote sensing data and services originating from space based remote sensing systems operated by Indian companies to Indian users directly. A process of registration of the service provider is required so that the Government knows which are the space assets being used.

Read in conjunction with the data rules this clearly points to the group of commercial data with resolution better than 5 m and up to 50 cm. This is a huge change from the earlier policy which freed up data upto 1 m but the distribution was always through National Remote Sensing Centre (NRSC).

**Form A** is meant only for establishing space assets by Indian entities. **Form B** is for establishing the ground segment of tracking, telemetry, control and data reception of these assets in India. **Form C** will be needed to be filled by Indian entities who wish to disseminate the data from Indian and Foreign satellites to Indian users.

Foreign satellite data being marketed by their agents in India will have to apply for registration under **Form C**. Earlier such data was canalised through NRSC which caused a degree of heartburn among the users as it added to the delay in receiving the data. This will definitely ease the process and take NRSC out of the loop.

### **Restrictions**

As mentioned earlier, data finer than 50 cm is restricted but its distribution is not prohibited. **Form D** covers the distribution of such data. Additional authorisation will be needed for distribution of data of certain zones or regions notified by the Government of India. There is a call for shutter control. However, the policy implicitly recognises that with so many data providers such control will be difficult to implement and thus looks at the control on distribution.

It is not clear how this policy will prevent foreign satellite operators from distributing such data over India to foreign entities. There is a clause which declares it 'illegal' to distribute such data without authorisation. How will this be enforced?

Further, there is also an interesting clause which reads, "We hereby also agree to abide (by) non-disclosure obligations and keeping the confidentiality of such data dissemination". Very interesting! Since the authorisation is for sensitive data over Indian territory what is the implication?

### **Government Areas of Work**

While throwing open the area of civil remote sensing to industry, the Department of Space will continue to work on non-commercial areas like long term sustainable development initiatives, climate change studies, societal applications and disaster mitigation. It will provide continuity of service for these areas while also concentrating on "the development of remote sensing systems with newer technologies (that) needs to be taken up for realising innovative applications and R&D. Such remote sensing systems will be brought into operation for sustainability by the Government and shall be pursued by DOS".

This does not preclude private industry from following the same goals but when it comes to strategic requirements the document draws the line. Development of such systems will use indigenous technology and will be directly under the control of the Government through DOS.

### **INSPACe the PSU under DOS**

INSPACe will be the agency to provide the authorisations as per the Forms A through D. It will also be the agency to provide the state-of-the-art DOS facilities, which it will access at no/notional cost, to the industry on commercial terms.

All current and future civilian remote sensing systems and ground facilities and services like IRS will be transferred to and be operated by INSPACe on commercial terms. The responsibility of the continuity of IRS and other such space based assets and services will also be the responsibility of INSPACe. The interesting point is that INSPACe may use the state-of-the-art DOS facilities at no/notional cost to manufacture satellites and associated ground segment to assure continuity of service of IRS and other systems developed by ISRO.

All this indicates that as far as DOS personnel are concerned, status quo ante will remain. They will continue to work for the PSU (INSPACe) without the benefits due to a PSU employee. In this respect INSPACe appears to be a shell company like ACL.

### **Questions**

Will the free and open data and all archived data and derives thematic data be distributed on Bhuvan? That will surely be a big dampener as Bhuvan is painfully slow. Why not these data sets be put on the Cloud for better access? Why not INSPACe operate this facility or outsource it to a NGPE?

Since INSPACe will use all state-of-the-art DOS facilities at no/notional cost why cannot these facilities along with staff be transferred to INSPACe? ISRO R&D could access these facilities at no/notional cost. INSPACe will be using DOS state-of-the-art facilities at no/notional cost and charging commercial rates for these facilities to industry. Who will benefit from the profits? Will it be ploughed back into the R&D efforts of ISRO or only to the Consolidated Fund of India?

<https://www.geospatialworld.net/blogs/isro-comes-through-with-rs2020/>

## Optimising laser-driven electron acceleration

The interaction between lasers and matter is at the forefront of new investigations into fundamental physics as well as forming a potential bedrock for new technological innovations. One of the initiatives spearheading this investigation is the Extreme Light Infrastructure Nuclear Physics (ELI-NP) project. Here the project's High-Power Laser System (HPLS)—the world's most powerful laser—is just one of the tools driving electron acceleration with lasers, Direct Laser Acceleration (DLA). In a new paper published in *EPJ D*, Etele Molnar, ELI-NP, Bucharest, and co-authors study and review the characteristics of electron acceleration in a vacuum caused by the highest-power laser pulses achievable today looking for the key to maximum net energy gain.

In particular, the authors calculate the optimal values of the laser beam required to achieve maximum electron energy for different laser power levels. They observe that tuning certain aspects of a laser such as its beam waist—the point at which a laser beam has its minimum radius—can favorably increase the maximum acceleration of electrons in a vacuum for both linearly and circularly polarized lasers.

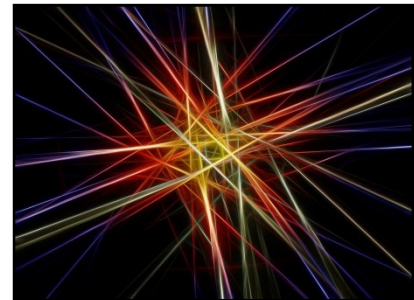
As may be expected, Molnar and colleagues find that the net energy of the electrons, and thus their acceleration, is raised with increased laser power for beams with optimal beam waists. The paper describes an average energy gain in electrons of a few MeV in full pulse interactions, in which the highest energy electrons possess is roughly 160 MeV. In other cases such as half-pulse interactions, however, the authors say that these energy gains are almost an order of magnitude greater—reaching up to 1 GeV.

In terms of future research, the paper puts forward other potential directions. For example, the researchers suggest a study with a focus on direct laser acceleration with higher Laguerre Gaussian modes—circularly symmetric beam profiles or lasers with cavities that are cylindrically symmetric—should follow the current paper.

**More information:** Etele Molnár et al, Optimizing direct laser-driven electron acceleration and energy gain at ELI-NP, *The European Physical Journal D* (2020). DOI: [10.1140/epjd/e2020-10423-x](https://doi.org/10.1140/epjd/e2020-10423-x)

**Journal information:** [European Physical Journal D](https://www.epj.org/)

<https://phys.org/news/2020-12-optimising-laser-driven-electron.html>



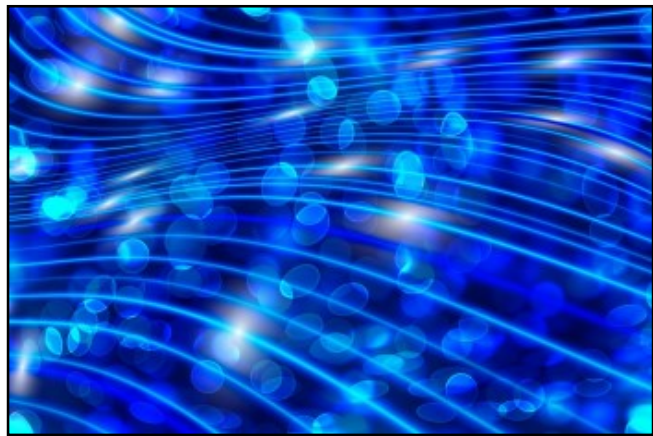
Credit: CC0 Public Domain

# Chinese photonic quantum computer demonstrates quantum supremacy

By Bob Yirka

A team of researchers affiliated with several institutions in China has built and tested a photonic quantum computer that demonstrates quantum supremacy. In their paper published in the journal *Science*, the group describes their computer, which they call Jiuzhang, and how well it performed while conducting Gaussian boson sampling.

Quantum computers have been in the news lately as scientists try to determine if they can meet expectations. Quantum computers could vastly outperform conventional machines on certain tasks. The goal is to achieve what has come to be known as "quantum supremacy"—where a quantum computer can outperform conventional computers on at least one type of task. Until now, only one computer has ever achieved this feat—Google's Sycamore device. And because the field is still so new, researchers around the world are working on vastly different designs. Sycamore was based on qubits represented by superconducting materials. In this new effort, the team in China has developed a photon-based quantum computer capable of carrying out a single specific type of calculation—boson sampling.



Credit: CC0 Public Domain

Boson sampling is a means for calculating the output of a straight-line optical circuit that has multiple inputs and outputs. It is carried out by constructing a machine in which photons are sent into a circuit in parallel, and once inside, are split by beam splitters. The split photons continue through the circuit, encountering mirrors and other beam splitters. Notably, if two photons happen to encounter the same splitter simultaneously, both unsplit photons will follow one of the paths away from the splitter. The process is repeated, resulting in a distribution of numbers that represent the network output. Conventional computers become bogged down very quickly when trying to calculate distributions of such a system. Jiuzhang was built to handle 100 inputs and 100 outputs using 300 beam splitters and 75 mirrors.

The researchers found that it took Jiuzhang approximately 200 seconds to provide an answer. They noted that it would have taken the world's fastest supercomputer approximately 2.5 billion years to carry out the same calculations—a clear example of quantum supremacy.

**More information:** Quantum computational advantage using photons, *Science* (2020). DOI: [10.1126/science.abe8770](https://doi.org/10.1126/science.abe8770), [science.sciencemag.org/content ... 2/02/science.abe8770](https://www.science.org/doi/content/10.1126/science.abe8770)

**Journal information:** *Science*  
<https://phys.org/news/2020-12-chinese-photonic-quantum-supremacy.html>

## Simplifying long-range quantum interactions in many-body systems

Calculations for certain quantum systems whose parts interact over long distances will be much easier to perform thanks to the work of a RIKEN physicist and his collaborator, who have extended an assumption that holds for materials with short-range interactions.

Famously dubbed "spooky action at a distance" by Albert Einstein, entanglement is one of the most fascinating aspects of quantum physics. It is an invisible connection between quantum systems that means that one system cannot be fully described without including the states of the others—a link that cannot be understood using classical mechanics.

Entanglement plays a central role in the physics of quantum systems made up of many parts needed to understand materials at low temperatures. One of the most rigorous ways to quantify entanglement is using entanglement entropy, which characterizes the complexity of a material's lowest energy state. A state with a zero entanglement entropy is classical and exhibits no quantum properties. States with a small but non-zero entanglement entropy can be described using relatively simple quantum theory. But states with larger entanglement entropy become very difficult to model mathematically.

In many materials, entanglement occurs over a short range, existing only between nearest neighbors. These systems have been shown to have a low entanglement entropy. Known as the area law conjecture, this assumption greatly simplifies modeling.

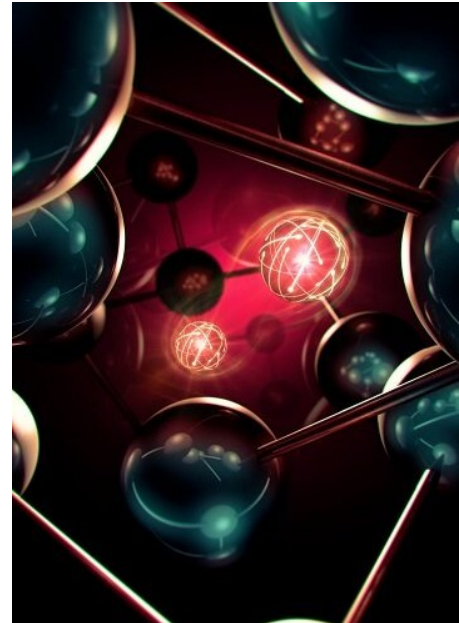
But some materials can exhibit unusual states of matter in which the interactions between atoms can be maintained over longer distances. And so the question arises: does the area law still hold in materials with non-local quantum connections? This is the question investigated by Tomotaka Kuwahara from the RIKEN Center for Advanced Intelligence Project and Keiji Saito from Keio University.

"Several numerical and theoretical studies have indicated that the area law is violated in long-range interacting systems," explains Kuwahara. "Our result is mathematically rigorous and settles the debate over the area law conjecture in one-dimensional, long-range interacting systems."

Providing a detailed proof of an area law is extremely challenging. Kuwahara and Saito simplified the mathematics of the problem by modeling a one-dimensional chain. They looked at a chain of long-range interacting magnetic particles. They decomposed the total system into two subsystems, left and right, and simulated the boundary as a series of discrete points. In this way, the pair showed that the entanglement entropy has a maximum possible value, which is a signature of an area law.

"The next step for us is to prove the area law conjecture in systems with more than one dimension," says Kuwahara. "We exploited several new mathematical techniques in our present study, and we hope to apply them to higher dimensional cases."

**More information:** Tomotaka Kuwahara et al. Area law of noncritical ground states in 1D long-range interacting systems, *Nature Communications* (2020). DOI: [10.1038/s41467-020-18055-x](https://doi.org/10.1038/s41467-020-18055-x)



Modeling long-range entanglement in quantum many-body systems is made easier by assuming the area law. Credit: Tony Melov/Science Photo Library





Sat, 05 Dec 2020

## Molecules convert visible light into ultraviolet light with record efficiency

Light-powered processes from hydrogen production to air purification could see a boost in performance under ambient light thanks to a new material system that can directly convert visible light into ultraviolet light with an efficiency that doubles previous records.

Developed by researchers at Kyushu University, the system achieves a light upconversion efficiency of 20% at high intensities and maintains relatively high performance even under weak light, making it promising for harnessing visible light already around us to drive applications requiring high-energy ultraviolet light.

While people often try to avoid ultraviolet light because of the damage it can do to skin, Nobuhiro Yanai, associate professor of Kyushu University's Faculty of Engineering, has been searching for ways to increase the number of these high-energy rays to power photocatalysts that enable a variety of useful reactions from producing hydrogen for use in fuel-cell vehicles to purifying indoor environments.

"Although dedicated light sources such as ultraviolet LEDs can be used to drive these reactions, they consume energy and increase complexity," explains Yanai. "Instead, a much more elegant solution is to harvest the sunlight and indoor ambient light that is already all around us."

However, these ambient light sources generally have a large portion of their energy in the lower-energy visible region and only a fraction of it in the ultraviolet, so researchers have been searching for ways to directly convert visible light with wavelengths longer than 400 nm into higher-energy ultraviolet light.

To do this, the research team led by Yanai and Nobuo Kimizuka has been focusing on a process called triplet-triplet annihilation. In this process, energetic states called triplets are formed on molecules following absorption of visible light. These "donor" molecules then give their triplets to "acceptor" molecules that can combine two triplets to create a single, higher-energy state that is released as ultraviolet light.

Until recently, the maximum reported efficiency of conventional upconversion from visible to ultraviolet light using triplet-triplet annihilation was about 10% and could only be achieved with visible light 1,000 times more intense than sunlight.

Yanai and his group now report in the journal *Angewandte Chemie International Edition* that they have smashed this record while also achieving greatly improved efficiencies under weak visible light from the sun and indoor LEDs.

"We have been trying to improve the efficiency of this process for more than five years, but we had been stuck at around 5%," says Yanai. "We finally were able to make a major leap through a new molecular design, which gave us the right molecules for excellent performance."



A newly developed molecular system in the glass tube on the right efficiently upconverts visible light even from typical LEDs into ultraviolet light through triplet-triplet annihilation. Developed by researchers at Kyushu University, the system achieves an upconversion efficiency of 20% under high-intensity light, doubling previous records, while also being relatively efficient even under weak light. Credit: Nobuhiro Yanai, Kyushu University

Poor efficiency of triplet-triplet annihilation by the ultraviolet-emitting acceptor molecules and quenching of the generated ultraviolet emission by the triplet-creating donor molecules have been two key issues limiting performance.

To overcome these problems, the researchers developed a novel acceptor molecule, named TIPS-naphthalene, that has a high triplet-triplet-annihilation efficiency and a low enough triplet energy to easily accept triplets from a molecule called Ir(C6)<sub>2</sub>(acac), a superior donor they previously found that does not strongly absorb the upconverted ultraviolet emission.

The combination of TIPS-naphthalene and Ir(C6)<sub>2</sub>(acac) successfully achieved the highest upconversion efficiency of 20.5% under high-intensity light.

Furthermore, the system also succeeds in significantly lowering the intensity of the excitation light required compared to conventional systems, achieving upconversion efficiencies of about 10% even at intensities similar to those of sunlight.

"This system can efficiently convert very low-intensity visible light to ultraviolet light. I was very surprised that we were able to obtain ultraviolet light even with the LEDs that I usually use at my office desk," comments Yanai.

The researchers attribute this performance to rigid bonding of the TIPS groups to the naphthalene center of the acceptor molecule helping suppress internal molecular movement that leads to energy losses and the TIPS groups themselves finely tuning the molecule's triplet energy while keeping the emission in the ultraviolet.

In addition to finding ways to continue to improve efficiency, the researchers are also exploring how to get the system to perform just as well out of solution to further simplify its application to a variety of light-driven processes.

**More information:** Naoyuki Harada et al, Discovery of Key TIPS-Naphthalene for Efficient Visible-to-UV Photon Upconversion under Sunlight and Room Light, *Angewandte Chemie International Edition* (2020). DOI: [10.1002/anie.202012419](https://doi.org/10.1002/anie.202012419)

**Journal information:** [Angewandte Chemie International Edition](https://phys.org/news/2020-12-molecules-visible-ultraviolet-efficiency.html)  
<https://phys.org/news/2020-12-molecules-visible-ultraviolet-efficiency.html>

## Researchers define immune system's requirements for protection against COVID-19

*Findings are important for vaccines, therapeutics and public health strategies to combat the COVID-19 pandemic*

### Summary:

***Researchers shed light on the role of antibodies and immune cells in protection against SARS-CoV-2, the virus that causes COVID-19, in rhesus macaques.***

Since the novel coronavirus emerged at the end of last year, scientists around the world -- including Beth Israel Deaconess Medical Center (BIDMC) immunologist Dan Barouch, MD, PhD -- have been developing vaccines to protect against COVID-19 and to put an end to the global pandemic. As of November 2020, three pharmaceutical companies released early data showing high rates of protection in Phase 3 human trials for their vaccines, but questions remain about how the body develops and maintains immunity after vaccination or infection.

In a new paper in the journal *Nature*, Barouch, Director of BIDMC's Center for Virology and Vaccine Research, and colleagues shed light on the role of antibodies and immune cells in protection against SARS-CoV-2, the virus that causes COVID-19, in rhesus macaques. "In this study, we define the role of antibodies versus T cells in protection against COVID-19 in monkeys. We report that a relatively low antibody titer (the concentration of antibodies in the blood) is needed for protection," said Barouch. "Such knowledge will be important in the development of next generation vaccines, antibody-based therapeutics, and public health strategies for COVID-19."

Building on previous findings that SARS-CoV-2 infection protects rhesus monkeys from re-exposure, Barouch and colleagues purified and collected antibodies from animals that had recovered from infection. They administered the antibodies at various concentrations to 12 uninfected macaques and observed that protection against SARS-CoV-2 challenge was dose dependent. Animals that received higher amounts of antibodies were protected more completely, while animals that received lower amounts of antibodies were protected less well. Similarly, when the researchers administered various concentrations of the purified antibodies to 6 macaques with active SARS-CoV-2 infection, those given higher doses demonstrated more rapid viral control.

In a second set of experiments, Barouch and colleagues evaluated the role of specific immune cells -- CD8+ T cells -- in contributing to protection against the virus by removing these cells from animals that had recovered from SARS-CoV-2 infection. Removal of these immune cells left the animals vulnerable to infection after re-exposure to SARS-CoV-2.

"Our data define the role of antibodies and T cells in protection against COVID-19 in monkeys. Antibodies alone can protect, including at relatively low levels, but T cells are also helpful if antibody levels are insufficient," said Barouch, who is also Professor of Medicine at Harvard Medical School, and a member of the Ragon Institute of MGH, MIT, and Harvard. "Such correlates of protection are important given the recent successful vaccine results from human trials, and the likelihood that these and other vaccines will become widely available in the spring; as a result future vaccines may need to be licensed based on immune correlates rather than clinical efficacy."

Co-authors include co-first author Katherine McMahan, co-first author Jingyou Yu, co-first author Noe B. Mercado, co-first author Lisa H. Tostanoski, co-first author Abishek Chandrashekar, co-first author Jinyan Liu, co-first author Lauren Peter, Esther A. Bondzie, Gabriel Dagotto,

Makda S. Gebre, Catherine Jacob-Dolan, Zhenfeng Li, Felix Nampanya, and Shivani Patel of BIDMC; co-first author Carolin Loos, Caroline Atyeo, Alex Zhu, and Galit Alter, of Ragon Institute of MGH, MIT, and Harvard; Laurent Pessaint, Alex Van Ry, Kelvin Blade, Jake Yalley-Ogunro, Mehtap Cabus, Renita Brown, Anthony Cook, Elyse Teow, Hanne Andersen, Mark G. Lewis, of Bioqual; and Douglas A. Lauffenburger of Massachusetts Institute of Technology.

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The authors declare no financial conflicts of interest. Barouch is a co-inventor on provisional SARS-CoV-2 vaccine patents (62/969,008; 62/994,630).

**Story Source:**

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1. Katherine McMahan, Jingyou Yu, Noe B. Mercado, Carolin Loos, Lisa H. Tostanoski, Abishek Chandrashekar, Jinyan Liu, Lauren Peter, Caroline Atyeo, Alex Zhu, Esther A. Bondzie, Gabriel Dagotto, Makda S. Gebre, Catherine Jacob-Dolan, Zhenfeng Li, Felix Nampanya, Shivani Patel, Laurent Pessaint, Alex Van Ry, Kelvin Blade, Jake Yalley-Ogunro, Mehtap Cabus, Renita Brown, Anthony Cook, Elyse Teow, Hanne Andersen, Mark G. Lewis, Douglas A. Lauffenburger, Galit Alter, Dan H. Barouch. **Correlates of protection against SARS-CoV-2 in rhesus macaques.** *Nature*, 2020; DOI: [10.1038/s41586-020-03041-6](https://doi.org/10.1038/s41586-020-03041-6)  
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