

Dec  
2021

# समाचार पत्रों से चयित अंश Newspapers Clippings

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

खंड : 46 अंक : 254 22 दिसंबर 2021

Vol.: 46 Issue : 254 22 December 2021



रक्षा विज्ञान पुस्तकालय  
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**Press Information Bureau**  
**Government of India**  
**Ministry of Defence**

*Tue, 21 Dec 2021 7:24PM*

## **Indigenously developed Armoured Engineer Reconnaissance Vehicle inducted into Indian Army**

The first set of indigenously developed next generation Armoured Engineer Reconnaissance Vehicle was inducted into the Corps of Engineers of Indian Army in a solemn function attended by Gen MM Naravane, the Chief of Army Staff at Pune today.

The system has been designed by Defence Research and Development Organisation (DRDO) and manufactured by Ordnance Factory Medak & Bharat Electronics Limited, Pune. Despite the various restrictions imposed by the COVID pandemic since the last one year, supply of the vehicle to Indian Army has been on schedule. The vehicle is capable of carrying out reconnaissance of water obstacles and boggy patches for execution of engineer tasks with capabilities to carry out reconnaissance and provide real time update to force commanders. The system will enhance existing engineer reconnaissance capabilities of Indian Army and would be a major game changer in support of mechanised operations in future conflicts.



<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1783990>



*Wed, 22 Dec 2021*

## **Indian Army inducts first set of next-gen Armoured Engineer Reconnaissance Vehicle**

*The Armoured Engineer Reconnaissance Vehicle will enhance the existing engineer reconnaissance capabilities of the Indian Army. As per army officials, it would be a major game-changer in support of mechanised operations in future conflicts.*

*By Sangeeta Nair*

Indian Army Chief General Manoj Mukund Naravane flagged off and inducted the first set of indigenously developed next-generation Armoured Engineer Reconnaissance Vehicle at Bombay Engineering Group (BEG) on December 21, 2021.

The Armoured Engineer Reconnaissance Vehicle will enhance the existing engineer reconnaissance capabilities of the Indian Army. As per army officials, it would be a major game-changer in support of mechanised operations in future conflicts.

The Armoured Engineer Reconnaissance Vehicles have been fully designed and developed within India. These next-generation vehicles can match the speed of the tanks and help in conducting mechanised operations on the Western Front, stated Lt General Harpal Singh.



Armoured Engineer Reconnaissance Vehicle

### Armoured Engineer Reconnaissance Vehicle (AERV)- Top 7 Facts You Need to Know!

1. The Armoured Engineer Reconnaissance Vehicle (AERV) is an Indian military engineering vehicle. It has been jointly developed by Vehicle Research and Development Establishment, Ahmednagar and Pune's Research and Development Establishment and manufactured by Ordnance Factory Medak.
2. The Armoured Engineer Reconnaissance Vehicle is a vehicle that has been designed to meet the tactical and combat requirements of Military Engineers.
3. The vehicle helps combat engineers carry out terrestrial and underwater surveys in hostile terrains.
4. The Armoured Engineer Reconnaissance Vehicle also provides Combat Engineering Support for operations in deserts, plains and riverine terrains.
5. The combat engineers use the vehicle to carry out surveys to facilitate offensive and defensive operations and facilitate the construction of assault bridges across water obstacles.
6. The vehicle is not fitted with a gun but it has specialised equipment, including an echo-sounder, GPS, laser range finder and a water current meter.
7. The Armoured Engineer Reconnaissance Vehicle is currently in service with the Corps of Engineers in the Indian Army.

#### Significance

The Armoured Engineer Reconnaissance Vehicle will enhance the existing engineer reconnaissance capabilities of the combat engineers within the Indian Army.

Army chief General Manoj Mukund Naravane said that induction of this indigenous equipment (AERVs) will give a boost to operations especially on the western front and an imp step towards the 'AatmaNirbhar Bharat' in manufacturing defence equipment.

<https://www.jagranjosh.com/current-affairs/indian-army-inducts-first-set-of-nextgen-armoured-engineer-reconnaissance-vehicle-1640087880-1>

## नवभारत टाइम्स

Wed, 22 Dec 2021

### इंजीनियर्स कोर में शामिल हुआ बख्तरबंद

### टोही, भारतीय सेना की बढ़ेगी ताकत

प्रणाली को रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) द्वारा डिजाइन किया गया है और आयुध निर्माणी मेडक तथा भारत इलेक्ट्रॉनिक्स लिमिटेड, पुणे द्वारा निर्मित किया गया है। रक्षा मंत्रालय ने बयान में कहा कि कोविड-19 महामारी के कारण प्रतिबंधों के बावजूद, इन वाहनों की आपूर्ति समय पर हो रही है।

*Edited by Vineet Tripathi*

नयी दिल्ली: देश में विकसित अगली पीढ़ी के बख्तरबंद इंजीनियर टोही वाहन (एईआरवी) के पहले सेट को मंगलवार को सेना की इंजीनियर्स कोर में शामिल किया गया। थलसेना प्रमुख जनरल एम एम नरवणे ने

पुणे के पास खड़की में बॉम्बे इंजीनियर ग्रुप (बीईजी) में एक समारोह में वाहनों को शामिल किया और उन्हें इंडी दिखाकर रवाना किया। सेना के बेड़े में इसके शामिल होने से आर्मी की ताकत में और इजाफा होगा।

### पहले बैच को किया गया शामिल

भारतीय थल सेना अध्यक्ष जनरल एमएम नरवणे ने मंगलवार को पुणे में इंजीनियर्स कोर में स्वदेश में विकसित किए गए अगली पीढ़ी के बख्तरबंद इंजीनियर टोही वाहनों (एईआरवी) के पहले बैच को शामिल किया। पुणे के बॉम्बे इंजीनियरिंग ग्रुप (बीईजी) में हुए कार्यक्रम में सेना अध्यक्ष ने कहा कि इन स्वदेशी उपकरणों और वाहनों से अभियानों में तेजी आएगी और पश्चिमी मोर्चे को इससे विशेष मदद मिलेगी।



### सीमाएं सुरक्षित होंगी- आर्मी चीफ

उन्होंने कहा कि इन वाहनों को शामिल करने के साथ ही हमने रक्षा उत्पादन में आत्मनिर्भर भारत के संकल्प की ओर एक और महत्वपूर्ण कदम उठाया है। जनरल नरवणे ने कहा कि पश्चिमी सीमा पर तैनात स्ट्राइक कोर और बख्तरबंद संरचनाओं के लिए एईआरवी की जरूरत लंबे समय से महसूस की जा रही थी। इस प्लेटफॉर्म से टोही प्रक्रियाओं में तेजी आएगी और हमारी सीमाएं अधिक सुरक्षित हो सकेंगी।

### इंजीनियरों के साथ साझेदारी

उन्होंने कहा, AERV की आवश्यकता लंबे समय से महसूस की जा रही थी, विशेष रूप से हमारे बख्तरबंद फॉर्मेशन स्ट्राइक कोर के लिए, जो मुख्य रूप से पश्चिमी सीमा पर काम कर रहे हैं... यह प्लेटफॉर्म टोही की प्रक्रिया को गति देगा जो पहले मैनुअल रूप से किया जाता था। इसका विकास डीआरडीओ और हमारे इंजीनियरों के साथ साझेदारी में किया गया है। यह उपयोगकर्ता और उद्योग के बीच सहयोग का एक बहुत अच्छा उदाहरण है। यह 'मेक इन इंडिया' समाधानों की ओर जाने का एक आदर्श उदाहरण है।

<https://navbharattimes.indiatimes.com/india/indigenously-developed-next-generation-aerv-inducted-into-army/articleshow/88418215.cms>



Wed, 22 Dec 2021

## Nipun anti-personnel mines: Army gets weapons boost for Pakistan, China borders

*The Corps of Engineers is showcasing the indigenously equipment in Pune, which were inducted into the army for carrying out anti-terror operations against the enemy as well as defending its own areas.*

*By Shankhyaneel Sarkar, Edited by Meenakshi Ray*

Pune: The Indian Army is set to receive indigenously designed and developed anti-personnel and anti-tank mines, which will help security personnel foil attempts made by adversaries on the borders with Pakistan and China.

“Indian Army's Corps of Engineers getting a new set of anti-personnel and anti-tank mines for acting as the first line of defence against enemy infantry and armoured columns or terrorist trying to infiltrate into own territory,” army officials familiar with the developments told news agency ANI.

“The Indian Army is going to induct 7 lakh indigenously developed 'Nipun' anti-personnel mines which carry a potent mix of RDX,” a security official familiar with the developments also told ANI.

The Corps of Engineers is showcasing the indigenous equipment in Pune, which were inducted into the army for carrying out anti-terror operations against the enemy as well as defending its own areas.

Nipun mines were developed by an Indian firm in partnership with the Defence Research and Development Organisation (DRDO).

The Corps of Engineers are also carrying out trials of Vibhav and Vishal anti-tank mines, all of which are indigenously developed next-generation anti-tank mines.

The officials said along with these mines, Prachand, Ulka and Parth are also some of the new mines which will be inducted into the army after trials are conducted successfully. They also said some of these mines are at an advanced stage of user trials.

These mines possess greater stopping power against enemy tanks due to their advanced design and sensors.

The army said it started the induction of high head water pumps in areas at high altitudes along the Line of Actual Control (LAC) with China.

“The Indian Army started inducting 200 high head water pumps which can help pump water and fuel to locations at higher altitudes in those areas. Two hundred of these pumps are being inducted into the Corps of Engineers under the emergency procurement powers,” the official added.

<https://www.hindustantimes.com/india-news/nipun-anti-personnel-mines-army-gets-weapons-boost-for-pakistan-china-borders-101640085643926.html>



Nipun mines were developed by an Indian firm in partnership with the Defence Research and Development Organisation (DRDO).(ANI/Twitter)



Wed, 22 Dec 2021

## First line of defence: Army set to induct 7 lakh ‘Made in India’ landmines for China, Pak borders

*"Indian Army is going to induct 7 lakh indigenously developed 'Nipun' anti-personnel mines which carry a potent mix of RDX," an Army officer said.*

Pune: The Indian Army is getting new indigenously designed and developed anti-personnel and anti-tank mines which would act as the first line of defence against any attempt by adversaries on the China and Pakistan border to step on the Indian soil.

"Indian Army's Corps of Engineers getting a new set of anti-personnel and anti-tank mines for acting as the first line of defence against enemy infantry and armoured columns or terrorist trying to infiltrate into own territory," Indian Army officials told news agency ANI.

The anti-tank and anti-personnel mines are part of a display here where the Corps of Engineers is showcasing the indigenous equipment that has been inducted into the Army by it for carrying out operations against the enemy and defending its own areas.



Nipun mines were developed by an Indian firm in partnership with the Defence Research and Development Organisation (DRDO).(ANI/Twitter)

"Indian Army is going to induct 7 lakh indigenously developed 'Nipun' anti-personnel mines which carry a potent mix of RDX," an Army officer said. He said the mine has been developed by an Indian firm in partnership with the DRDO.

For taking care of the enemy tank regiments, the corps of engineers is carrying out trials of the Vibhav and Vishal next generation made in India anti-tank mines.

These highly effective mines have been developed for the Indian Army by DRDO, and are at an advanced stage of user trials. The new anti-tank mines have greater stopping power against enemy tanks due to their advanced design and sensors, Army officials said.

Prachand, Ulka and Parth are also some of the new mines that are coming up for induction into the services in the near future, the sources said.

The Indian Army has also started the induction of the high head water pumps to provide water to troops deployed on the high altitude areas along the Line of Actual Control with China,

"Indian Army started inducting 200 high head water pumps which can help pump water and fuel to locations at higher altitudes in those areas. 200 of these pumps are being inducted into the Corps of Engineers under the emergency procurement powers," said the officials.

<https://www.newindianexpress.com/nation/2021/dec/21/first-line-of-defence-army-set-to-induct-7-lakh-made-in-india-landmines-for-china-pak-borders-2398133.html>

## अमर उजाला

Wed, 22 Dec 2021

### चीन-पाक को चुनौती : भारत में निर्मित सात लाख बारूदी सुरंगों से सीमा पर बनेगी पहली रक्षा पंक्ति

सार

सूत्रों ने बताया कि निपुन, विभव और विशाल के अलावा तीन से अधिक नई बारूदी सुरंगों सेना में निकट भविष्य में शामिल की जा सकती हैं।

विस्तार

भारत में निर्मित सात लाख निपुन बारूदी सुरंगों के जरिए चीन और पाकिस्तान सीमा पर रक्षा की पहली पंक्ति बनाई जाएगी। यह मानव-रोधी सुरंगें आरडीएक्स के मिश्रण से तैयार की जा रही हैं। थल सेनाध्यक्ष एमएम नरवणे ने मंगलवार को बताया कि इनकी तरह ही भारत में बनीं विभव और विशाल एंटी-टैंक बारूदी सुरंगों का परीक्षण भी एडवांस स्टेज पर किया जा रहा है जो सीमा पर लगाई जा सकती हैं।

भारत द्वारा बनाए कवचयुक्त इंजीनियर निगरानी वाहन के 53 में से पहले बैच के 14 वाहनों को सेना में शामिल करने के मौके पर सेनाध्यक्ष ने बताया कि सेना में नई शामिल होने जा रही बारूदी सुरंगें डीआरडीओ द्वारा प्राइवेट सेक्टर की कंपनियों के साथ विकसित की गई हैं। इन्हें सेना की जरूरतें पूरी करने के योग्य पाया गया तो आने वाले समय में शामिल कर लिया जाएगा।

तीन और सुरंगें भी होंगी शामिल

सूत्रों ने बताया कि निपुन, विभव और विशाल के अलावा तीन से अधिक नई बारूदी सुरंगें सेना में निकट भविष्य में शामिल की जा सकती हैं। इनमें प्रचंड, उल्का और पार्थ प्रमुख हैं।

<https://www.amarujala.com/india-news/india-made-seven-lakh-landmines-for-china-and-pakistan-borders>



थल सेना अध्यक्ष जनरल एमएम नरवणे -  
फोटो : एएनआई

## ब्यूरो: डीआरडीओ प्रतिवर्ष पांच हजार इंजीनियरिंग छात्रों को इंटरनशिप कराएगा

By मदन जैड़ा

- इसका उद्देश्य युवा इंजीनियरों को रिसर्च के लिए प्रोत्साहित करना है
- इंजीनियरिंग के छात्रों को इससे करियर बनाने में बेहतर मौके मिलेंगे

नई दिल्ली: रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) युवा इंजीनियरों में शोध को बढ़ावा देने के लिए प्रतिवर्ष पांच हजार इंटरनशिप प्रदान करेगा। जबकि एक हजार इंजीनियरिंग स्नातकों को प्रतिवर्ष कृत्रिम बुद्धिमत्ता (एआई) में सर्टिफिकेट कोर्स कराएगा। इसके पीछे युवा इंजीनियरों को रिसर्च के लिए प्रोत्साहित करना तो है ही, साथ ही रक्षा क्षेत्र में अनुसंधान के लिए प्रेरित करना भी है।

रक्षा मंत्रालय की संसदीय समिति के समक्ष सरकार की तरफ से दी गई जानकारी में यह बात कही गई है। इसमें कहा गया है कि डीआरडीओ की देश भर में स्थित प्रयोगशालाओं में इंजीनियरिंग छात्रों को बड़े पैमाने पर इंटरनशिप कराने का निर्णय लिया गया है। अभी यह सीमित संख्या में हैं। लेकिन आने वाले दिनों में प्रतिवर्ष पांच हजार इंटरनशिप कराई जाएगी। आमतौर पर इंटरनशिप की अवधि एक से छह महीने तक की होती है तथा यह साल में दो बार कराई जाती है। डीआरडीओ की देश भर में प्रयोगशालाएं हैं तथा निकटवर्ती इंजीनियरिंग कालेजों के छात्रों को इनमें इंटरनशिप करने का मौका मिलेगा।

इंजीनियरिंग की पढ़ाई के दौरान इंटरनशिप अनिवार्य की जा चुकी है। चूंकि डीआरडीओ की प्रयोगशालाएं उच्च स्तर की हैं तथा उनमें योग्य वैज्ञानिक भी हैं, इसलिए इंजीनियरिंग के छात्रों को इससे करियर बनाने में बेहतर मौके मिलेंगे। उन्हें रक्षा क्षेत्र में सेवा व अनुसंधान करने की प्रेरणा भी मिलेगी। सरकार आत्मनिर्भर भारत अभियान के तहत अधिक से अधिक रक्षा उत्पादन देश में करना चाहती है। यह नई तकनीकों से ही संभव हो पाएगा।

### कृत्रिम बुद्धिमत्ता के प्रशिक्षितों की मांग तेजी से बढ़ रही

इसी प्रकार कृत्रिम बुद्धिमत्ता (एआई) के प्रशिक्षितों की मांग तेजी से बढ़ रही है जबकि देश में एआई पर कार्य कर रही प्रयोगशालाओं की संख्या सीमित है। डीआरडीओ लंबे समय से कृत्रिम बुद्धिमत्ता पर भी कार्य कर रहा है। उसकी अनेक प्रयोगशालाओं में एआई पर कार्य हो रहा है। इसी को ध्यान में रखते हुए वह प्रतिवर्ष एक हजार इंजीनियरिंग स्नातकों को सर्टिफिकेट कोर्स कराएगा। यह करीब तीन महीने का ऑनलाइन कोर्स है तथा इसकी शुरुआत हो चुकी है।

<https://www.livehindustan.com/ncr/new-delhi/story-bureau-drdo-will-conduct-internship-to-five-thousand-engineering-students-every-year-5381875.html>



## DRDO scientist Atul Dinkar Rane is the new DG for BrahMos Aerospace

*Rane who took charge of the Indo-Russian Joint Venture of BrahMos Aerospace on Monday has been associated with the project right from the beginning. This JV entity is known to produce the world-class BrahMos supersonic cruise missile system.*

The most outstanding scientist of Defence Research and Development Organisation (DRDO) Atul Dinkar Rane is the new Director General of BrahMos Aerospace.

Rane who took charge of the Indo-Russian Joint Venture of BrahMos Aerospace on Monday has been associated with the project right from the beginning. This JV entity is known to produce the world-class BrahMos supersonic cruise missile system.

### More about the new DG

The new DG through his R&D has made huge contributions in the indigenous design & development of mission critical Onboard computers (OBC); avionics technologies for defence applications; hardware in loop simulation studies; and systems analysis, development of mission software.

His contributions and techno-managerial leadership has played an important role in the successful development and induction of the formidable BrahMos weapon system into the Indian Armed Forces.

According to an official statement from the BrahMos Aerospace, the new DG had joined the DRDO in 1987 and had started his career at Defence Research and Development Laboratory (DRDL) as System Manager. During his stint there he had carried out not only simulation studies but also established modular real-time simulation test mechanisms which were meant for the indigenously designed and developed surface-to-air Akash missile system.



**His contributions and techno-managerial leadership has played an important role in the successful development and induction of the formidable BrahMos weapon system into the Indian Armed Forces.**

When he was at Research Centre Imarat (RCI) as part of the Onboard Computers Division, Mr Rane had led the development of Onboard Mission Software for Agni-I missiles. For seamless test and evaluation of Onboard Systems for various missile projects, he played an important role in establishing a unique integrated test bed facility.

### Part of BrahMos Core Team

He has contributed as Programme Manager, Avionics & System Integration for the programme. He has been a part of the feasibility studies, development and planning, testing and integration, and certification of DRDO Onboard systems. All this then culminated in successful demonstration, induction and subsequent productionisation of BrahMos. This missile system has further strengthened the missile power of the Indian Armed Forces.

The new DG of BrahMos Aerospace has also been a Counsellor (Defence Technology), posted in the Embassy of India, Moscow. During his tenure Indo-Russian technical collaborations progressed well. Later, as Director, International Cooperation, he played an important role in the further strengthening of the joint developments, and Defence R&D collaborations.

He has also represented India during several inter-governmental cooperation and his expertise in defence technology management and international S&T outreach efforts has helped in bridging the technology gaps. While pushing the DRDO developed products for exports, Mr Rane has also helped in identifying futuristic areas for joint research.

When at Systems Analysis and Modeling Centre as a director, he was responsible for playing a key role in System Analysis. And for further development of advanced weapons systems, he has carried out extensive feasibility studies.

#### **Where was before this new appointment?**

At the DRDO Headquarters in New Delhi, as a Director of one of the facilities, he led various activities which are of national importance. He has played an important role in the indigenisation of critical missile technologies and boosted manufacturing of defence platforms in India.

#### **Awards**

The prestigious DRDO Path Breaking Research/ Outstanding Technology Development Award and DRDO Performance Excellence Award has been awarded to him.

He is also an active member of several professional societies like Society of Aerospace Quality and Reliability; Computer Society of India; Aeronautical Society of India; Systems Society of India.

He has graduated in Electronics and Communication Engineering and received his post graduate degree in Guided Missiles from the University of Poona.

<https://www.financialexpress.com/defence/drdo-scientist-atul-dinkar-rane-is-the-new-dg-for-brahmos-aerospace/2385862/>

## **Business Standard**

*Wed, 22 Dec 2021*

### **RailTel Corp rises after order win**

RailTel Corporation of India gained 1.76% to Rs 115.80 after the company said that it received work order from Defence Research and Development Organisation (DRDO) worth Rs 68.31 crore.

The project involves expansion and enhancement of the network capacity of Central Internet Access Gateway (CIAG). The entire work is to be completed in a period of seven months.

RailTel, a "Mini Ratna (Category-I)" Central Public Sector Enterprise is an information and communications technology (ICT) provider and one of the largest neutral telecom infrastructure providers in the country owning a pan-India optic fiber network on exclusive Right of Way (ROW) along Railway track. The Optical Fibre Cable (OFC) network covers important towns & cities of the country and several rural areas. The Government of India held 72.84% stake in the company.

The company's consolidated net profit rose 130.85% to Rs 67.50 crore on 26.69% rise in net sales to Rs 358.49 crore in Q2 FY22 over Q2 FY21.

[https://www.business-standard.com/article/news-cm/railtel-corp-rises-after-order-win-121122100258\\_1.html](https://www.business-standard.com/article/news-cm/railtel-corp-rises-after-order-win-121122100258_1.html)

# DRDO on Twitter

**A. Bharat Bhushan Babu** @SpokespersonMoD

The first set of indigenously developed next-generation Armoured Engineer Reconnaissance Vehicle, designed by @DRDO\_India & manufactured by Ordnance Factory Medak & Bharat Electronics Limited, Pune inducted into the Corps of Engineers of #IndianArmy, today [pib.gov.in/PressReleasePa...](http://pib.gov.in/PressReleasePa...)




7:34 PM · Dec 21, 2021 · Twitter Web App

**ANI** @ANI · Dec 21, 2021

Replying to @ANI

The requirement of AERV was long felt especially for our armoured formations, strike cores, who are mainly operating on the Western border...This platform will speed up the process of reconnaissance which used to be done manually: Army chief General Manoj Mukund Naravane



**ANI** @ANI

Pune | Indian Army Chief General Manoj Mukund Naravane flags off and inducts the first set of indigenously developed next-generation Armoured Engineer Reconnaissance Vehicle and other equipment into the Corps of Engineers, at Bombay Engineering Group (BEG)



4:51 PM · Dec 21, 2021

**ANI** @ANI

This development has been in partnership with DRDO and our engineers. This is a very good example of cooperation between the user & the industry. This is an ideal example of how we can go in for 'Make in India' solutions: Army Chief on AERVs



5:59 PM · Dec 21, 2021



Wed, 22 Dec 2021

## **Future Ready: Defence forces eye modernisation through indigenisation, CDS Appointment in 2022**

*Amidst China standoff and tension in northeast, the government is pushing for self-reliance in defence. Big acquisitions, which will add to defence capabilities, will be delivered in 2022.*

*By Amrita Nayak Dutta*

The year 2021 was a mixed bag for the Indian defence establishment and clearly, quite challenging for the Indian Armed Forces, in terms of operational matters, even as there was a significant progress on key acquisitions and modernisation of defence forces.

If one has to touch upon a few of the key operational challenges the Indian defence forces faced this year, the continuing impasse at the Line of Actual Control (LAC) with China remains right at the top of the list.

Then, there was no headway in about a month-long anti-terror operation near the Line of Control (LoC) in Poonch, after nine Indian soldiers were killed in firing exchanges with terrorists in October.

There were troubles in the northeast too. In November, the commanding officer of 46 Assam Rifles, his family and four other soldiers were killed by insurgents in an ambush in Manipur.

The botched operation by the Army's special forces in Nagaland killed 14, including 13 civilians earlier this month. A Court of Inquiry and a special investigation team are looking into the incident even as locals protest across the state over the repeal of Armed Forces Special Powers Act (AFSPA).

As the year was drawing to a close, India's first Chief of Defence Staff General Bipin Rawat was killed in a tragic helicopter crash on December 8 along with his wife, and 12 Army and Indian Air Force personnel, leaving the country in shock.

The Narendra Modi government has begun the process of narrowing down on the next CDS of the country who will take forward the agenda of creating theatre commands and bringing jointness within the defence services.

Modernisation of Armed Forces, however, saw some progress with a few major acquisitions carried out under the emergency powers and some deliveries of the defence platforms for which the contracts were signed in the previous years.

For instance, 33 French Rafale fighters of the 36 earlier bought have already been delivered to India and has been inducted into the IAF.

Similarly, Russia has also begun deliveries of the S-400 air defence system. The long-pending deal of jointly manufacturing AK 203 assault rifles in Amethi was also signed with Russia earlier this month when President Vladimir Putin visited India.

Last month, the Navy commissioned Visakhapatnam, the first of the P 15B destroyers. The service has also commissioned four of the six boats of the indigenous Scorpene class submarines—

the third boat, Karanj, was commissioned in March, and the fourth boat, Vela, in November. The fifth boat, Vagir, has also been launched.

Moreover, in the backdrop of the military standoff with China, the services have procured significant quantities of ammunition and spares.

Under the emergency powers, the defence ministry has also initiated a few critical capital procurements—ranging from anti-drone systems to additional numbers of HAMMER air-to-ground precision-guided weapon systems for its Rafale fighter jets.

Armour-piercing fin-stabilised discarding sabot (APFSDS) ammunition fired by the T-72 and T-90 main battle tanks, more number of Heron drones, Man Portable Air Defence System (MANPADS) as well as loitering munitions, Spice Bombs, were some of the other procurements.

Both 2020 and 2021 saw major progress in the border infrastructure front, particularly in the northeastern states and close to the LAC in eastern Ladakh.

In October, the defence ministry announced the launch of five major road projects in Ladakh to be carried out by the Border Roads Organisation (BRO). Earlier this year, defence minister Rajnath Singh inaugurated 10 roads in Arunachal Pradesh, and one each in the Union Territories of Ladakh and Jammu and Kashmir. Eleven bridges were also inaugurated in Ladakh this year.

Among higher defence reforms, Gen Rawat had aggressively begun pursuing the exercise of integration in the armed forces by initiating multiple studies on forming the theatre commands and their structures.

Much of the work was also centered around improving defence procurements—both for faster purchases and providing a push to the government’s ‘Atmanirbhar Bharat’ plans.

For instance, the revised Delegation of Financial Powers to Defence Services (DFPDS-2021) was unveiled by Rajnath Singh in September this year, which gave out details of financial powers allotted to the three defence services.

Similarly, the defence ministry came out with a second positive indigenisation list of 108 items to push for the ‘Atmanirbhar Bharat’ campaign. The first list of 101 items was notified in August 2020.

### **Modernisation of Indian Military in 2022**

The defence establishment is looking forward to the appointment of the next CDS who will carry forward the agenda of modernising the Indian military and establishing theatre commands. The process of shortlisting the officer is also underway in the government.

Some of the major acquisitions of the Armed Forces, which will add to India’s defence capabilities, will be finally delivered in 2022. This includes a variety of drones—such as four Israeli Heron TPs—which were bought last year.

The deliveries of the remaining three Rafale jets, their armaments, such as the HAMMER weapon systems, are expected to be delivered by 2022.

A large number of spares for the weapon systems currently in use as well as ammunition, bought under emergency powers, are also likely to be delivered by 2022.

It remains to be seen if there would be any further progress on some of the major capital purchases from foreign countries which were on cards—such as the Kamov 226-T helicopters and the Iгла-S Very Short Range Air Defence (VSHORAD) systems from Russia, as well as the naval utility helicopters planned to be bought under the strategic partnership route and the 30 predator drones that India is seeking to buy from the United States.

State-owned Hindustan Aeronautics Ltd (HAL) will manufacture four light utility helicopters (LUHs) under limited series production by 2022-23, with the defence ministry approving the procurement of 12 LUH from the PSU for around Rs 1,500 crore in November this year.

HAL has also started deliveries for the Light Combat Helicopters but it is yet to sign a contract with the defence ministry for production. There is also likely to be some decision on the procurement of the Advanced Towed Artillery Gun System (ATAGS) being developed by DRDO.

News18.com has learnt that there will be an added push on 'Atmanirbhar Bharat' in defence in 2022.

There is likely to be a third positive indigenisation list, and a higher share of capital procurement budget in 2022, up from the 64%, that was earmarked for the current financial year.

Additionally, a defence procurement manual is also likely to be drafted that will lay down rules for all defence revenue procurements.

<https://www.news18.com/news/india/future-ready-defence-forces-eye-modernisation-through-indigenisation-cds-appointment-in-2022-4576862.html>

## THE TIMES OF INDIA

Wed, 22 Dec 2021

### 'Def manufacturing holds key to future'

Lucknow: While the upcoming Defence Corridor is set to become UP's pride, it is already the envy of neighbouring states, said Sunil Kumar Misra, principal advisor of Confederation of Indian Industry (CII). He was speaking at The Times of India Destination Uttar Pradesh Conclave on Monday.

He is the director general of society of Indian Defence manufacturers (SIDM), which includes 514 private defence manufactures members such as Adani defence system, Tata advance system, Mahindra & Mahindra, Lucknow-based PTC industries which manufactures metal components for critical and super-critical applications for advance world's fastest supersonic cruise missile Brahmos and also ISRO rockets.

"There was opportunity knocking at the door for manufacturing of defence equipment, which was not encouraged in yesteryears for private sectors. UP is very lucky to have defence corridor along with Tamil Nadu. UP has historically industrial eco-system and mindset, therefore it has skilled manpower and academicians for research who would provide technical expertise and feed defence manufacturing industries," he said.

Speaking to TOI, he said, "Since 209 items identified by government of India for defence services cannot be imported, six nodes of UP defence corridor such as Aligarh and Lucknow which traditionally have expertise in metallurgy and forging will act as ancillary and feeder industries to make metal components for critical and super-critical applications of missile system and aerospace."

"Similarly, Agra and Kanpur have industries for leather, parachute, bullet proof jackets while Jhansi and Chitrakoot would be used for development and testing of ammunition and other equipment because it has a large open area," he said.

<https://timesofindia.indiatimes.com/city/lucknow/def-manufacturing-holds-key-to-future/articleshow/88420702.cms>



vocal for local: Principal advisor, CII, SK Misra

## **Explained: India deploys first of its S-400s, here's all about advanced aerial defence system**

*Seen as being one of the most advanced aerial defence systems in the world, the S-400 packs an ability to take on everything from drones to ballistic missiles.*

The first of the S-400 Triumf advanced missile systems acquired from Russia has been deployed in the Punjab sector by the Indian Air Force with reports saying that the batteries of the first squadron can counter aerial threats from both Pakistan and China. Seen as being one of the most advanced aerial defence systems in the world, the S-400 packs an ability to take on everything from drones to ballistic missiles. Here's all you need to know about the system, for which India has shelled out USD 5.5 billion amid objections from the US.

### **What Is The S-400 Triumf Air Defence System?**

The S-400 Triumf, which has the Nato designation of SA-21 Growler, is a mobile, surface-to-air missile system that is "capable of engaging aircraft, UAVs, cruise missiles, and has a terminal ballistic missile defence capability", according to the Washington-based Centre for Strategic and International Studies (CSIS).

Development of this advanced missile system is said to have been taken up in 1993, almost in the immediate aftermath of the collapse of the Soviet Union, and borrows heavily from the earlier S-300 missile defence system, including on aspects like missile storage containers, launchers, and radars. Testing of the S-400 is said to have begun in late 1999 or early 2000 and the first of the weapons became operational in 2007.

Russia has deployed S-400s in a variety of areas, including for the defence of Moscow. Russia had also deployed the S-400 to Syria in 2015 with some units also placed in Crimea after it was annexed by Moscow.

### **What Are The Capabilities Of The System?**

Made by the Moscow-based Almaz Central Design Bureau, the S-400, says army-technology.com, comes with a "multifunction radar, autonomous detection and targeting systems, anti-aircraft missile systems, launchers, and command and control centre".

The missile system is capable of taking on practically any aerial target within a range of 400km and can "simultaneously engage 36 targets". It can be activated within five minutes, is "twice as effective as the previous Russian air defence systems" and has the flexibility to be "integrated into the existing and future air defence units of the air force, army and navy".

To engage a multiplicity of targets, the S-400 uses four kinds of missiles along with the missiles of the earlier S-300 variant. So, first there is the 48N6DM missile, which can hit airborne targets within a range of 250km while the 40N6 missile has a range of 400km and "uses active radar homing to intercept air targets at great distances".

The S-400 also comes with improved electronic counter-countermeasures to thwart attempts at jamming while its radars are capable of detecting low-signature targets.

Then there are the 9M96E and 9M96E2 medium range ground-to-air missiles that can strike "fast moving targets such as fighter aircraft with a high hit probability". The range of the 9M96 missiles is 120km. CSIS adds that another missile, the 77N6, is currently in testing, which comes a hit-to-kill capability "designed specifically to destroy ballistic missile warheads". 'Hit-to-kill' implies the capability to take down a target through the use of kinetic power. That is, these weapons rely on destroying a target by hitting it at high velocity instead of packing an explosive warhead.

### **How Does It Compare With Its Competitors?**

A report on [globalsecurity.org](http://globalsecurity.org) said that the S-400 would likely serve as "the cornerstone of Russia's theatre air and missile defences... and it is possible that Triumf will become the only system being developed, providing defence both in the close-range and mid-range as well long-range zones". It notes that Russia claims that the S-400 "has no parallels across the globe in terms of combat capabilities".

The report says that in comparison, the US-made Terminal High Altitude Area Defence, or THAAD, "has shorter range and is incapable of hitting targets beyond the horizon" while also being just an anti-ballistic missile system that cannot engage other aerial targets. Another much-touted capability of the S-400 is its "fire-and-forget capability" with missiles fitted with a homing device that locks on a target and destroys it.

Russian military experts are reported to have held that the S-400 is superior to the US system in terms of both the range and altitude at which it can operate. While it can launch missiles at targets 400km away, it can also thwart threats at a height of 27km. "In terms of maximum target destruction range, the S-400 surpasses its counterparts by almost two times... (and is) capable of destroying a cruise missile or any enemy aircraft at an altitude of 10 meters".

"Nothing flies below. The closest competitors lag behind our system in this indicator by two-and-a-half times," [globalsecurity.org](http://globalsecurity.org) quoted a Russian expert as saying.

An Observer Research Foundation (ORF) report notes that when it comes to India's needs, "there is no alternative system capable of serving its long-range air defence requirements, from the standpoint of either capability or cost". It says that the abilities of the S-400 are "unmatched by typical Western systems offered up as analogues", comparable western systems "are primarily oriented towards missile defence with less focus on the pure anti-aircraft role".

Further, ORF points out that the typical S-400 configurations cost around half of their western equivalents.

### **Which Countries Have S-400s?**

According to [army-technology.com](http://army-technology.com), Russian military was operating more than 20 battalions of the S-400 Triumf by 2015 and there were plans to take that up to above 50 by 2020.

Some of the first countries to get the missile systems were Algeria in 2015 and close Russian ally Belarus in 2016. China acquired two systems reportedly starting in 2018 while Turkey received its first battalion in 2019. China and Turkey which, incidentally, is a member of the US-led NATO, were slapped with sanctions by the US for their acquisition of the advanced missile system.

India had in 2018 signed a deal for the purchase of five S-400 Triumf systems at a cost of close to USD 5.5 billion, which makes it one of the biggest defence acquisitions made by New Delhi with US, which has come to enjoy deepening defence ties with India, having threatened sanctions in reaction to the deal. However, in October, top Republican Senator Ted Cruz introduced a bill which, if passed, would effectively prevent the US President Joe Biden from imposing any S-400-related sanctions on India.

<https://www.moneycontrol.com/news/india/explained-india-deploys-first-of-its-s-400s-heres-all-about-advanced-aerial-defence-system-7851741.html>



## S-400 missile system: 7 highlights of India's latest defence mechanism

*The S-400 air defence system was contracted for by India in a deal worth around Rs 35,000 crore.*

In a major boost to the country's air defence capabilities, the Indian Air Force (IAF) is deploying the first squadron of the S-400 air defence missile system in the Punjab sector.

"The first squadron is being deployed in the Punjab sector. The batteries of the first squadron would be capable of taking care of aerial threats from both Pakistan and China," government sources told ANI.

Here are some key points to know about S-400:

- The S-400 air defence system was contracted for by India in a deal worth around Rs 35,000 crore.
- 5 squadrons would be provided to India for tackling air threats from up to 400 km. The first squadron deliveries are expected to be complete by the end of this year.
- The equipment is being brought to India through both sea and air routes.
- The Air Force would start focusing on the Eastern borders along with providing resources for training of personnel within the country after the first squadron is deployed.
- Indian Air Force officers and personnel have trained in Russia on the system.
- The air defence system would give India an edge in South Asian skies as they would be able to take out enemy aircraft and cruise missiles from a 400 km distance.
- The S-400 missile defence system is equipped with four different missiles which can engage enemy aircraft, ballistic missiles, and AWACS planes at 400 km, 250 km, the medium-range 120 km and the short-range 40 km.



ANI Photo

<https://zeenews.india.com/india/s-400-missile-system-7-highlights-of-india-s-latest-defence-mechanism-2421217.html>

## India to get S-500 missile system from Russia? Here's what we know

*As has been reported in Financial Express Online earlier, the long awaited S-400 has started arriving in India, for the Indian Air Force (IAF).*

*By Huma Siddiqui*

Even as India gets ready to deploy the first regiment of the S-400 Air Defence System, Russia has already indicated that the newer version S-500 'Prometei' anti-aircraft missile system is ready to be offered to India. According to media reports quoting Russian Deputy Prime Minister Yury Borisov have indicated that India could be the first buyer of the S-500 air defence system. The comments of the Russian Deputy Prime Minister come at a time when India has already started

receiving the S-400 'Triumpf' from that country and the US has expressed its concern over the system.

As has been reported in Financial Express Online earlier, the long awaited S-400 has started arriving in India, for the Indian Air Force (IAF). This will be followed by a team of Russian specialists, arriving in India next month (January 2022) for transferring the equipment to the sites and helping the Indian team who have been trained in Moscow to start the operation process. The deliveries of various parts of the system started in November this year.

### **What about the S-500?**

A top officer who wished to remain anonymous explained to Financial Express Online, "It is too early to discuss this as the first regiment of S-400 is in the process of being delivered to India. The delivery will be completed by 2023. And only then a decision will be taken."



The second regiment of the S-400 is expected to reach in mid-summer of 2022.

### **When was the contract for S-400 inked?**

It was inked in 2018 when the Russian President Vladimir was in India for the annual Indo-Russia annual summit.

### **Payment Mode**

And, the first tranche of payment for the S-400 Air Defence System was made by India in 2019 equivalent to USD 800 million. In fact in 2019, the two countries had agreed that the payment mode will be in Indian rupees. At a media interaction at that time, the embassy officials in New Delhi had explained that the main bank in India will transfer the payment in Rupees to the state-owned Russian Sberbank. And then, the Russian Bank's branch will transfer the money to its Moscow based Headquarters in rouble.

### **S-400 Vs S-500**

Based on the information available in public domain the air defence system that India is receiving now has an operational range of 400 Km and the new version S-500 has the capability to target ballistic missiles from a distance of around 600 km.

Reports in public domain state that the S-500 has the capability of targeting hypersonic missiles, thus giving it an edge over S-400. The Defence Research and Development Organisation (DRDO) is working on hypersonic missiles and by 2024, will have them ready. The S-500 also has the capability to target American fighters including B-2, F-35 stealth aircraft and F-22.

### **S-400 compared to American systems?**

What India is getting is considered to be the best in the world – S-400 air defence system. The system that India is in the process of receiving has the capability of targeting fighter jets, drone attacks, rockets and missiles. India has placed order for five regiments – this means that each regiment has eight launchers, which have four missiles and combined – when needed this system can fire 32 missiles at a time.

According to reports, by 2024 the Russian Army is getting ready to replace the S-400 which has been operational since 2007 with the S-500.

### **Deployment of S-400 in India**

As has been reported earlier by Financial Express Online, the system India is getting will be deployed in the northern part of the country. Why? Because from this location any kind of air attack from either Pakistan or China can be prevented.

The second regiment of the S-400 is expected to reach in mid-summer of 2022 and are likely to be deployed in the region to protect Arunachal Pradesh and Ladakh and also along the Mumbai-Baroda Industrial Corridor.

<https://www.financialexpress.com/defence/india-to-get-s-500-missile-system-from-russia-heres-what-we-know/2385673/>

## Pakistan test fires home-grown cruise missile with enhanced range

*The indigenously developed Babur cruise missile has a range of more than 900 kilometres, twice the distance of an earlier version.*

Pakistan has "successfully" test-fired a version of its indigenously developed Babur cruise missile 1B with enhanced range.

It has a range of more than 900 kilometers, twice the distance of an earlier missile of the same model, a statement said on Tuesday.

An earlier version had a limited capacity to travel just 450 kilometres.

The missile's extended range further enhances nuclear-armed Pakistan's military capability.

The ordinance is capable of striking both land and sea targets with "high accuracy," the statement said.

This comes days after longtime rival India tested its own next-generation nuclear-capable ballistic missile, Agni-P.

### 'Strategic deterrence'

Addressing the launch ceremony, Lieutenant General Nadeem Zaki Manj, who heads the Pakistani army's Strategic Plans Division, said the test would further strengthen Pakistan's "strategic deterrence."

President Arif Alvi, Prime Minister Imran Khan, the chairman of the Joint Chiefs of Staff Committee, and three services chiefs also congratulated the scientists and engineers on conduct of "successful launch."

The two arch-rivals, locked in a decades-long arms race, have fought three wars – in 1948, 1965 and 1971 – since they were partitioned in 1947, two of which were fought over the disputed Kashmir valley.

Kashmir, a Muslim-majority Himalayan region, is held by India and Pakistan in parts and claimed by both in full.

A small sliver of Kashmir is also held by China.

<https://www.trtworld.com/asia/pakistan-test-fires-home-grown-cruise-missile-with-enhanced-range-52853>



The test comes days after longtime rival India tested its own next-generation nuclear-capable ballistic missile, Agni-P. ()

## New atomically thin material could improve efficiency of light-based tech

By Melissa Pappas

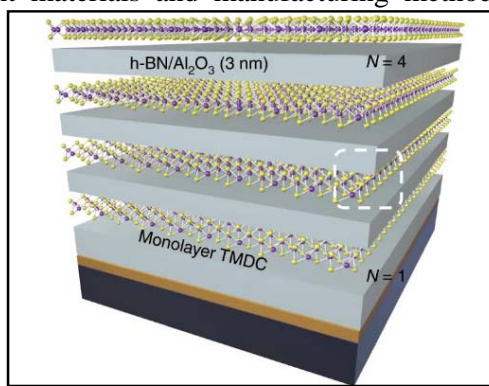
Solar panels, cameras, biosensors and fiber optics are technologies that rely on photodetectors, or sensors that convert light into electricity. Photodetectors are becoming more efficient and affordable, with their component semiconductor chips decreasing in size. However, this miniaturization is pushing against limits set by current materials and manufacturing methods, forcing trade-offs between size and performance.

There are many limitations of the traditional semiconductor chip manufacturing process. The chips are created by growing the semiconductor film over the top of a wafer in a way where the film's crystalline structure is in alignment with that of the substrate wafer. This makes it difficult to transfer the film to other substrate materials, reducing its applicability.

Additionally, the current method of transferring and stacking these films is done through mechanical exfoliation, a process where a piece of tape pulls off the semiconductor film and then transfers it to a new substrate, layer by layer. This process results in multiple non-uniform layers stacked upon one another with each layer's imperfections accumulated in the whole. This process affects the quality of the product as well as limits the reproducibility and scalability of these chips.

Lastly, certain materials do not function well as extremely thin layers. Silicon remains ubiquitous as the material of choice for semiconductor chips, however, the thinner it gets, the worse it performs as a photonic structure, making it less than ideal in photodetectors. Other materials that perform better than silicon as extremely thin layers still require a certain thickness to interact with light, posing the challenge of identifying optimal photonic materials and their critical thickness to operate in photodetector semiconductor chips. Manufacturing uniform, extremely thin, high quality photonic semiconductor films of material other than silicon would make semiconductor chips more efficient, applicable, and scalable.

Penn Engineers Deep Jariwala, Assistant Professor in Electrical and Systems Engineering, and Pawan Kumar and Jason Lynch, a postdoctoral fellow and a doctoral student in his lab, led a study published in *Nature Nanotechnology* that aimed to do just that. Eric Stach, Professor in Materials Science and Engineering, along with his postdoc Surendra Anantharaman, doctoral student Huiqin Zhang and undergraduate student Francisco Barrera also contributed to this work. The collaborative study also included researchers at Penn State, AIXTRON, UCLA, the Air Force Research Lab and the Brookhaven National Lab, and was primarily funded by the Army Research Lab. Their paper describes a new method of manufacturing atomically thin superlattices, or semiconductor films, that are highly light emissive.



So-called “two-dimensional” materials have unique electrical and photonic properties, but their ultra-thin form factors present practical challenges when incorporated into devices. Penn Engineering researchers have now demonstrated a method for making large-area “superlattices” — layered structures containing 2D lattices of sulfur and tungsten — that can achieve light-matter coupling. Credit: University of Pennsylvania

One-atom-thick materials generally take the form of a lattice, or a layer of geometrically aligned atoms that form a pattern specific to each material. A superlattice is made up of lattices of different materials stacked upon one another. Superlattices have completely new optical, chemical and physical properties that make them adaptable for specific applications such as photo optics and other sensors. The team at Penn Engineering made a superlattice, five atoms thick, of tungsten and sulfur (WS<sub>2</sub>).

"After two years of research using simulations that informed us how the superlattice would interact with the environment, we were ready to experimentally build the superlattice," says Kumar. "Because traditional superlattices are grown on a desired substrate directly, they tend to be millions of atoms thick, and difficult to transfer to other material substrates. We collaborated with industry partners to ensure that our atomically thin superlattices were grown to be scalable and applicable to many different materials."

They grew monolayers of atoms, or lattices, on a two-inch wafer and then dissolved the substrate, which allows the lattice to be transferred to any desired material, in their case, sapphire. Additionally, their lattice was created with repeating units of atoms aligned in one direction to make the superlattice two-dimensional, compact and efficient.

"Our design is scalable as well," says Lynch. "We were able to create a superlattice with a surface area measured in centimeters with our method, which is a major improvement compared to the micron scale of silicon superlattices currently being produced. This scalability is possible due to uniform thickness in our superlattices, which makes the manufacturing process simple and repeatable. Scalability is important to be able to place our superlattices on the industry-standard, four-inch chips." Their superlattice design is not only extremely thin, making it lightweight and cost effective, it can also emit light, not just detect it.

"We are using a new type of structure in our superlattices that involves exciton-polaritons, which are quasi-state particles made of half matter and half light," says Lynch. "Light is very hard to control, but we can control matter, and we found that by manipulating the shape of the superlattice, we could indirectly control light emitted from it. This means our superlattice can be a light source. This technology has the potential to significantly improve lidar systems in self-driving cars, facial recognition and computer vision." Being able to both emit and detect light with the same material opens the door for more complicated applications.

"One current technology that I can see our superlattice being used for is in integrated photonic computer chips which are powered by light," says Lynch. "Light moves faster than electrons, so a chip powered by light will increase computing speed, making the process more efficient, but the challenge has been finding a light source that can power the chip. Our superlattice may be a solution there."

Applications for this new technology are diverse and will likely include high-tech robotics, rockets and lasers. Because of the wide range of applications for these superlattices, the scalability is very important. "Our superlattices are made with a general, non-sophisticated process that does not require multiple steps in a clean room, allowing the process to be repeated easily," says Kumar. "Additionally, the design is applicable to many different types of materials, allowing for adaptability." "In the tech world, there is a constant evolution of things moving toward the nanoscale," he says. "We will definitely be seeing a thinning down of microchips and the structures that make them, and our work in the two-dimensional material is part of this evolution."

"Of course, as we thin things down and make technology smaller and smaller, we start to interact with quantum mechanics and that's when we see interesting and unexpected phenomena occur," says Lynch. "I am very excited to be a part of a team bringing quantum mechanics into high-impact technology."

**More information:** Pawan Kumar et al, Light–matter coupling in large-area van der Waals superlattices, *Nature Nanotechnology* (2021). DOI: [10.1038/s41565-021-01023-x](https://doi.org/10.1038/s41565-021-01023-x)

**Journal information:** *Nature Nanotechnology*  
<https://phys.org/news/2021-12-atomically-thin-material-efficiency-light-based.html>

