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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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Wed, 03 March 2021

# Sindhu Netra satellite deployed successfully in space, Know all about it!

*The Sindhu Netra satellite will boost India's surveillance capabilities to monitor activities of both military warships and merchant shipping in the Indian Ocean Region (IOR)*

*By Sangeeta Nair*

Sindhu Netra satellite, developed by the Defence Research and Development Organisation (DRDO), was successfully deployed in space on February 28, 2021.

The satellite will boost India's surveillance capabilities to monitor activities of both military warships and merchant shipping in the Indian Ocean Region (IOR).

The satellite was launched aboard Indian Space Research Organisation's (ISRO) PSLV-C51, which took off on February 28, 2021 from the Satish Dhawan Space Centre in Sriharikota in Andhra Pradesh.



Sindhu Netra satellite Deployed in satellite

### About Sindhu Netra satellite

- The Sindhu Netra satellite was developed by young DRDO scientists and it is capable of automatically identifying the warships and merchant ships operating in the IOR.
- It will also help in carrying out surveillance in specific areas such as the South China Sea or near the Gulf of Aden and the African coast.
- The satellite has already started communicating with the ground systems.

### Significance

Sindhu Netra is one of the first in the series of satellites that will help India in enhancing its surveillance capabilities on land in areas including the Ladakh region and the border areas with Pakistan.

### Background

The Indian security agencies feel there is a requirement of 4-6 dedicated satellites that will help them keep a check on the adversary's moves. The centre is also setting up of the Defence Space Agency.

The government has also created a defence space research organisation to look after the ability to protect space assets from being attacked by adversaries there. The space arm of the defence forces would also be bolstered significantly in near future.

<https://www.jagranjosh.com/current-affairs/sindhu-netra-satellite-deployed-successfully-in-space-know-all-about-it-1614677107-1>

## India deploys 'Sindhu Netra' Satellite to identify 'all warships' in the Indian Ocean Region

*By Aakriti Sharma*

In a big boost to India's maritime surveillance, the country has successfully launched the Sindhu Netra satellite, aimed at tracking and identifying warships and merchant ships in the Indian Ocean Region.

It will also help India keep an eye on the South China Sea, the Gulf of Aden, and the African coast.

Launched using the Indian Space Research Organisation's (ISRO) PSLV-C51 rocket from the Satish Dhawan Space Centre in Sriharikota in Andhra Pradesh on Sunday, the Sindhu Netra satellite has been developed by a team of young scientists from the Defence Research and Development Organisation (DRDO).

According to reports, the satellite will also monitor movements on land areas such as the Ladakh region which had witnessed a nine-month-long standoff between Indian and Chinese troops before disengagement was announced last month. It is the first in the series of such satellites which would enhance India's surveillance capabilities.

The Indian security agencies had been stressing the need for at least four to six dedicated satellites to keep a closer eye on the activities of the Chinese military both near the Indian territory as well as in its depth areas all along the 4,000 kilometer Line of Actual Control (LAC).

Besides, India wants to closely monitor the activities in the Indian Ocean, where China has been making relentless attempts to increase its influence. Since India claims to be a net security provider in the region, experts opine that such satellites will serve as strategic assets for India.

In the 2020-21 financial year, ISRO had aimed at launching 10 Earth observation satellites including three communication satellites and two navigation satellites.

In 2019, India had launched RISAT (Radar Imaging Satellite) – 2BR1, which marked the stationing of a quartet of satellites in space to ensure its borders are protected.

The RISAT satellite was augmented after the 26/11 Mumbai terror attack. Currently, ISRO's Cartosat satellites, which are optical earth observation satellites, have been deployed for resource management, defense services, and monitoring.

The RISAT is a part of a series of radar imaging reconnaissance satellites built by ISRO aimed at providing all-weather surveillance using synthetic aperture radars (SARs). It can capture high-quality images than the optical sensor radars incorporated into an earlier generation of satellites.

<https://eurasianimes.com/china-india-deploys-satellite-to-identify-warships-in-the-indian-ocean-region/>

## DRDO के 'सिंधु नेत्र' सर्विलांस सैटेलाइट की अंतरिक्ष में तैनाती, जानें विस्तार से

इस सैटेलाइट के स्थापित होने से हिंद महासागर क्षेत्र में सैन्य युद्धपोत और मर्चेट शिपिंग दोनों की गतिविधियों की निगरानी के साथ ही देश की निगरानी क्षमताओं को मदद मिलेगी।

By Vikash Tiwari

भारतीय अंतरिक्ष अनुसंधान संगठन (ISRO) ने 28 फरवरी 2021 को हिंद महासागर क्षेत्र में सैन्य और मर्चेट नेवी के जहाजों की गतिविधियों की निगरानी के लिए डीआरडीओ (DRDO) द्वारा विकसित एक उपग्रह 'सिंधु नेत्र' प्रक्षेपित किया।

इस सैटेलाइट के स्थापित होने से हिंद महासागर क्षेत्र में सैन्य युद्धपोत और मर्चेट शिपिंग दोनों की गतिविधियों की निगरानी के साथ ही देश की निगरानी क्षमताओं को मदद मिलेगी। उपग्रह को इसरो के



पीएसएलवी (ध्रुवीय उपग्रह प्रक्षेपण यान)-सी 51 (PSLV C51) का उपयोग करके लॉन्च किया गया।

### डीआरडीओ द्वारा विकसित एक उपग्रह

सिंधु नेत्र को बेंगलुरु स्थित पीईएस विश्वविद्यालय के छात्रों द्वारा विकसित किया गया है। इसे रक्षा अनुसंधान और विकास संगठन (DRDO) के हिस्से, रिसर्च सेंटर इमरत द्वारा 2.2 करोड़ रुपये का ठेका दिया गया था।

### इस सैटेलाइट की खासियत

डीआरडीओ द्वारा यह परियोजना उपग्रह इमेजिंग के माध्यम से संदिग्ध जहाजों की पहचान करने में मदद करेगी। डीआरडीओ का सिंधु नेत्र सैटेलाइट भारतीय समुद्री क्षेत्र में आने वाले हर तरह के मालवाहक, युद्धपोत, व्यापारिक जहाजों को ऑटोमेटिक पहचान लेगा। इस सैटेलाइट की मदद से 4000 किलोमीटर लाइन ऑफ एक्चुअल कंट्रोल पर भी नजर रखी जा सकती है।

इस सैटेलाइट ने 28 फरवरी को हुई लॉन्चिंग के बाद ग्राउंड से अपना संपर्क बना लिया है। साथ ही इसने अपना काम करना भी शुरू कर दिया है। सिंधु नेत्र सैटेलाइट की मदद से भारतीय सेनाएं लद्दाख समेत चीन से लगी सीमाओं और पाकिस्तान की सीमा पर नजर रख सकते हैं।

### पृष्ठभूमि

इसरो ने 28 फरवरी 2021 को PSLV-C51 रॉकेट से ब्राजील के Amazonia-1 सैटेलाइट के साथ 18 अन्य सैटेलाइट्स भी अंतरिक्ष में भेजे हैं। इस लॉन्च की सबसे बड़ी खासियत ये है कि इस साल की ये पहली सफल लॉन्चिंग है।

[https://www.jagranjosh.com/current-affairs/drdo-sindhu-netra-surveillance-satellite-all-you-need-to-know-in-hindi-1614669735-2?ref=list\\_ca](https://www.jagranjosh.com/current-affairs/drdo-sindhu-netra-surveillance-satellite-all-you-need-to-know-in-hindi-1614669735-2?ref=list_ca)

## India to export defence equipment to Philippines, expands reach in the Pacific

By Dipanjan Roy Chaudhury

### Synopsis

**The Philippines will be the first country to receive BrahMos missiles jointly developed by India and Russia. Earlier, New Delhi had extended a \$100 million defence-related line of credit to Manila. The Philippines, a key US ally for decades, has been keen to diversify sources for defence hardware, sources familiar with the country's defence sector told ET**

Expanding its defence footprint in the Indo-Pacific, India has reached an understanding with the Philippines for exporting military equipment to the nation which has been at the receiving end of China's expansionist plans in the South China Sea.

The deal which was concluded in Manila would enable a wider defence interface between India and the Philippines, ET has learnt.

The Philippines will be the first country to receive BrahMos missiles jointly developed by India and Russia. Earlier, New Delhi had extended a \$100 million defence-related line of credit to Manila. The Philippines, a key US ally for decades, has been keen to diversify sources for defence hardware, sources familiar with the country's defence sector told ET.



[BrahMos weapon system at Rajpath on January 23,](#)

The Philippines had recently expressed concerns over China's new coast guard law. It's also a claimant in the South China Sea region and is the only country to approach the UN tribunal on the issue.

The arrangement was concluded following a foreign ministers-level meeting last November. At the meet, both sides aimed to implement the arrangement through "military training and education, capacity building, regular goodwill visits and procurement of defence equipment". The two countries had also identified counter-terrorism as an area for security cooperation.

It may be recalled that New Delhi had donated \$500,000 for rehabilitating Marawi city in Mindanao, which was under terrorists' siege in 2017.

Defence ties between New Delhi and Manila have been growing steadily. In 2018, a bilateral Memorandum of Understanding (MOU) on Defence and Logistics was signed. An MOU on Sharing of White Shipping Information—nonmilitary/non-government shipping vessel information—was inked last year.

In 2018, Defence Secretary Deln Lorenzana met his then Indian counterpart Sitharaman, and visited the Indian Western Naval Command headquarters in Mumbai.

Later in 2019, the Philippine Navy joined its counterparts from India, the United States, and Japan for a group sail in the South China Sea. In February 2020, Indian Coast Guard Ship Shaunak made a port visit to Manila, and Indian naval vessels—guided missile frigate INS Sahyadri and anti-submarine corvette INS Kiltan—visited in October.

Last May, India assisted the Philippine Navy ship BRP Alcaraz after it caught re. Early this year, the third meeting of the bilateral Joint Defence Cooperation Committee was held in Manila to discuss defence procurement, ET has learnt.



The Philippines, which plans to purchase Scorpene submarines from France, may also gather familiarity from the Indian Navy on Scorpenes. (Originally published on Mar 02, 2021)

<https://economictimes.indiatimes.com/news/defence/india-to-export-defence-equipment-to-philippines-expands-reach-in-the-pacific/articleshow/81297651.cms?from=mdr>

INQUIRER.NET

Wed, 03 March 2021

## PH eyes deal with India for world's fastest supersonic missiles

*By Frances Mangosing*

Manila, Philippines: The Philippines and India signed an agreement for a potential supply of BrahMos cruise missiles, a product of collaboration by India and Russia, which the Philippine government hoped would boost coastal defense.

Philippine Defense Undersecretary Raymund Elefante and Indian Ambassador Shambu Kumaran signed an implementing agreement on Tuesday (March 2) at Camp Aguinaldo, headquarters of the Armed Forces of the Philippines (AFP), according to the Philippine Department of National Defense (DND) on Facebook.

The agreement involved the procurement of defense material and equipment by the Philippines from India, an emerging superpower rival of China in Asia.

“We are buying the BrahMos missiles,” said Philippine Defense Secretary Delfin Lorenzana, who witnessed the signing ceremony. He did not provide details of the procurement plan yet.

BrahMos are medium-range supersonic (faster than the speed of sound) missiles that can be launched from submarines, ships, planes or land. It is considered to be the fastest supersonic missile in the world.

Lorenzana said the agreement served as guide for the Philippines and India on “policies and procedures in the defense procurement.” It also served as a “legal framework for the procurement under the government-to-government modality,” Lorenzana added.

The missile system, which can be used for coastal defense and ground attack, would boost Philippine military firepower in the face of threats to its maritime territory, coming mainly from Chinese aggression in the South China Sea.

Plans to procure the system stalled last year due to budgetary constraints caused by the pandemic.

Hindustan Times reported in 2020 that India has offered a \$100 million line of credit to the Philippines for the weapons system purchase, but a government source privy to the deal said it could be more.

In separate occasions last January, Kumaran and BrahMos Aerospace CEO and Managing Director Dr. Sudhir Mishra visited the Philippine Army and Philippine Marines, the potential users of the BrahMos missiles.

<https://globalnation.inquirer.net/194117/ph-eyes-deal-with-india-for-worlds-fastest-supersonic-missiles>

Wed, 03 March 2021

## **BDL received order of Rs 372.98 crore to supply MRSAM Missile**

***Shares of Bharat Dynamics Ltd was the last trading in BSE at Rs.367 as compared to the previous close of Rs. 350.8. and the total number of shares traded during the day was 134548 in over 3547 trades***

New Delhi: Bharat Dynamics Limited (BDL), India's manufacturers of ammunitions and missile systems received order amounting to Rs. 372.98 Crore towards the supply of MRSAM Missile Rear Sections for Indian Air Force deliverables.

It is mentioned that the order has to be executed on or before November 30, 2023, in lots. Under the administrative control of the Ministry of Defence (MoD), it's manufacturing with a pool of engineers drawn from Indian Ordnance Factories, DRDO, and aerospace industries, BDL began by producing a first-generation anti-tank guided missile - the French SS11B1.



**Representational Image (PSU Connect)**

Further, the shares of Bharat Dynamics Ltd was the last trading in BSE at Rs.367 as compared to the previous close of Rs. 350.8. and the total number of shares traded during the day was 134548 in over 3547 trades.

Keeping pace with the modernisation of the Indian Armed Forces, BDL is poised to enter new avenues of manufacturing covering a wide range of weapon systems such as Surface to Air Missiles, Air Defence Systems, Heavy Weight Torpedoes, Air to Air Missiles, making it a defence equipment manufacturer. BDL has also entered into the arena of the refurbishment of old missiles.

The Medium-Range Surface-to-Air Missile (MRSAM) is being developed by India's Defence Research and Development Organisation (DRDO) in collaboration with Israel Aerospace Industries (IAI). The missile is designed to provide the armed forces with air defence capability against a variety of aerial threats at medium ranges.

<https://www.psuconnect.in/news/BDL-received-order-of-Rs-372.98-crore-to-supply-MRSAM-Missile/26851/>



## US media calls India's LCA Tejas 'much more reliable' than Chinese fighter jets

*India's homegrown fourth-generation Tejas MK1A fighter jets are believed to be more reliable than Chinese combat aircraft, according to a report by US Magazine*

*By Mansij Asthana*

Developed by the state-owned Hindustan Aeronautics Limited (HAL), Tejas is a single-engine, fourth-generation, multirole light combat aircraft.

The fighter has been designed by the Aeronautical Development Agency (ADA) in collaboration with HAL's Aircraft Research and Design Centre (ARDC) for the primary use of the Indian Air Force and the Navy under the Light Combat Aircraft (LCA) program.

While the Tejas is being showcased as a flagship project under the Modi government's 'Make in India' initiative in the defense sector, the fighter jet has had its share of controversies since its maiden flight in 2001.

Long delays in its development and inadequacies in performance were cited as big drawbacks in the Tejas program in the past. However, of late, the government has given utmost importance to the Tejas in a bid to project it as the future aircraft of the Indian Air Force.

When compared to China's fifth-generation J-20 stealth fighter, the Tejas Mark 1A lacks many features. However, with further improvements, it can beat the more advanced fighters of its class possessed by China and Pakistan.

The fighter jet could see upgrades including, active electronic scanned array (AESA) radar, air-to-air refueling, long-range BVR missiles, advanced electronic warfare to jam enemy radars and missiles, and multi-tasking abilities.

According to *Foreign Policy* magazine, the fighter is a shining example of international cooperation. The F404 engine powering the Tejas was supplied by US company GE and the fighter's radar and electronic warfare equipment came from Israel Aerospace Industries (IAI).

According to *Foreign Policy* columnist Salvatore Babones, India not only possesses one of the world's largest military procurement budgets and a large pool of talented engineers but it also boasts a strong tradition of rule of law to protect intellectual property.

In contrast, China has a history of copying foreign designs and technology and turning them into 'made-in China' features. From fighters to submarines to even cars, China has been notorious for resorting to reverse-engineering western products, something which has now come back to haunt the communist nation.

The biggest plus point for the Tejas, according to Babones, is that the fighter is widely perceived to be a more reliable, higher-performance aircraft than anything offered by Beijing.

China's most advanced fighter, the Chengdu J-20 is widely believed to be modeled on the stolen technology from Lockheed Martin's F-35 fighter jet, considered the most advanced fighter on the planet.

### **Rough Takeoff, Perfect Landing?**

Despite some initial hiccups with respect to the indigenous 'Kaveri' engines, the Tejas program seems to be on the right track now.



LCA Tejas of the Indian Air Force

Developed by the Defence Research and Development Organisation (DRDO), the Kaveri was a low bypass twin-spool turbofan jet engine slated to provide an 80 KN power pack and adequate 'thrust to weight' ratio for the Tejas.

However, it was deemed insufficient for the requirements of the Tejas, with the fighter now being powered by the US-made GE F404 engine. On the other hand, China continues to rely on older Russian engines.

The Tejas fighter also features a modern sensor suite and electronics imported from Israel, while possessing Russian missiles, making it a good ensemble of modern products.

Tejas MK-1A variant is cheaper than the US F-16, though it was more expensive than Chinese fighters. However, its superior quality would definitely work in its favor, analysts opine.

<https://eurasianimes.com/indias-homegrown-lca-tejas-is-a-high-quality-product-compared-to-chinese-fighter-jets/>

## Defence News

## Defence Strategic: National/International



Press Information Bureau

Government of India

Ministry of Defence

*Tue, 02 March 2021 5:36PM*

### IAF Participation in EX Desert FLAG VI

Ex Desert Flag is an annual multi-national large force employment warfare exercise hosted by the United Arab Emirates Air Force. The Indian Air Force is participating for the first time in Exercise Desert Flag-VI along with air forces of United Arab Emirates, United States of America, France, Saudi Arabia, South Korea and Bahrain. The exercise is scheduled from 03 Mar 21 to 27 Mar 21 at Al-Dhafra airbase, UAE.

The IAF is participating with six Su-30 MKI, two C-17 and one IL-78 tanker aircraft. C-17 Globemaster will provide support for induction/ de-induction of the IAF contingent. Su-30 MKI aircraft will undertake long range ferry, routing direct from India to the exercise area with aerial refueling support from IL-78 tanker aircraft. The aim of the exercise is to provide operational exposure to the participating forces while training them to undertake simulated air combat operations in a controlled environment. The participating forces will get an opportunity to enhance their operational capabilities along with mutual exchange of best practices.

The large-scale exercise involving diverse fighter aircraft from across the globe will provide the participating forces, including IAF, a unique opportunity to exchange knowledge, experience, enhance operational capabilities and interoperability. Exercising and interaction with the participating nations in a dynamic and realistic warfare environment will also contribute to strengthen international relations.

Over the last decade, IAF has regularly hosted and participated in multi-national operational exercises, wherein collaborative engagements are undertaken amongst the best air forces of the world.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1701975>



पत्र सूचना कार्यालय  
भारत सरकार  
रक्षा मंत्रालय

Tue, 02 March 2021 5:36PM

## युद्धाभ्यास डेजर्ट फ्लैग VI में भारतीय वायुसेना की भागीदारी

डेजर्ट फ्लैग युद्धाभ्यास संयुक्त अरब अमीरात वायु सेना कीमेजबानी में आयोजित एक वार्षिक बहुराष्ट्रीय बड़ा युद्ध अभ्यास है। भारतीयवायु सेना, संयुक्त अरब अमीरात, संयुक्त राज्य अमेरिका, फ्रांस, सऊदी अरब, दक्षिण कोरिया और बहरीन की वायु सेनाओं के साथ अभ्यास डेजर्ट फ्लैग-VI मेंपहली बार भाग ले रही है। यह अभ्यास संयुक्त अरब अमीरात के अल-दाफरा एयरबेसपर दिनांक 03 मार्च 21 से 27 मार्च तक निर्धारित है।

भारतीय वायुसेना छह सुखोई-30 एमकेआई, दो सी-17 और एक आईएल-78 टैंकर विमानके साथ इस युद्धाभ्यास में भाग ले रही है । सी-17 ग्लोबमास्टर भारतीयवायुसेना के दल को लाने ले जाने के लिए सहायता प्रदान करेगा। सुखोई-30 एमकेआई विमान लंबी दूरी की उड़ान भरेगा जो भारत से सीधे अभ्यास क्षेत्र मेंजाएगा और इस दौरान रास्ते में आईएल-78 टैंकर विमानों से उसमें ईंधन भराजाएगा। इस अभ्यास का उद्देश्य प्रतिभागी सैन्य बलों को नियंत्रित वातावरणमें हवाई युद्ध अभियान की परिस्थितियां बनाकर प्रशिक्षण देते हुए सामरिकएक्सपोजर प्रदान करना है। भाग लेने वाली सेनाओं को युद्ध की सर्वश्रेष्ठप्रथाओं का पारस्परिक आदान-प्रदान करने के साथ-साथ अपनी सामरिक क्षमताओं कोबढ़ाने का अवसर मिलेगा।

दुनिया भर से विविध लड़ाकू विमानों को शामिल करते हुए बड़ेपैमाने पर आयोजित यह अभ्यास भारतीय वायु सेना सहित प्रतिभागी ताकतों कोज्ञान, अनुभव, सामरिक क्षमताओं को बढ़ाने और अंतरसंचालनीयता को बढ़ाने काएक अनूठा अवसर प्रदान करेगा। एक गतिशील और वास्तविक युद्ध वातावरण में भागलेने वाले राष्ट्रों के साथ युद्धाभ्यास और बातचीत भी अंतरराष्ट्रीयसंबंधों को मजबूत करने में योगदान देगी।

पिछले दशक में भारतीय वायु सेना ने नियमित रूप सेबहुराष्ट्रीय सामरिक युद्ध अभ्यासों की मेजबानी की है एवं इनमें भाग लियाहै, जिनमें दुनिया की सर्वश्रेष्ठ वायु सेनाओं के बीच सहयोग किया जाता है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1702037>



Wed, 03 March 2021

## Commander of Pacific Air Forces calls on IAF Chief, discusses ways to strengthen bilateral ties

*General Kenneth Wilsbach, commander of Pacific Air Forces, on Tuesday called on Indian Air Force (IAF) Chief RKS Bhadauria along with his delegation at Air Force Headquarters and discussed ways to further strengthen bilateral ties*

New Delhi: General Kenneth Wilsbach, commander of Pacific Air Forces, on Tuesday called on Indian Air Force (IAF) Chief RKS Bhadauria along with his delegation at Air Force Headquarters and discussed ways to further strengthen bilateral ties. According to the IAF, the Comprehensive discussions were held between the two sides on issues pertaining to Air Force level cooperation and ways to further strengthen the IAF and the United States Air Force (USAF) bilateral ties.

"Gen Kenneth Wilsbach, Cdr @PACAF called on Air Chief Mshl RKS Bhadauria at Air HQ today along with his delegation. Comprehensive discussions were held between the two sides on issues pertaining to Air Force level cooperation and ways to further strengthen IAF-USAF bilateral ties," the IAF tweeted. Meanwhile, the IAF is going to participate in the annual multinational exercise 'Desert Flag' hosted by the United Arab Emirates (UAE), informed the Ministry of Defence.

The IAF is participating with six Su-30 MKI, two C-17 and one IL-78 tanker aircraft, the Ministry said. According to the IAF officials, 10 countries including the US, France and Saudi Arabia are scheduled to take part in the exercise. (ANI)



(This story has not been edited by Devdiscourse staff and is auto-generated from a syndicated feed.)

<https://www.devdiscourse.com/article/international/1480070-commander-of-pacific-air-forces-calls-on-iaf-chief-discusses-ways-to-strengthen-bilateral-ties>



Wed, 03 March 2021

## जानें, भारतीय वायु सेना के कौन से युद्धक विमानों पर होगी चीन और पाकिस्तान की नजर, क्या हैं उसकी खूबियां

भारतीय वायुसेना के छह एसयू-30 एमकेआइ और सी-17 की गर्जना की गूंज चीन और पाकिस्तान तक पहुंचेगी। आइए जानते हैं भारतीय वायु सेना के इन दोनों विमानों के बारे में। क्या है सी-17 और एसयू-30 एमकेआइ की खूबियां। इन विमानों पर क्यों है चीन और पाकिस्तान की नजर।

By Ramesh Mishra

अबू धाबी: भारत से बैर रखने वाले पड़ोसी मुल्क पाकिस्तान और चीन भारतीय वायु क्षमता को एक बार ऽफिर देखेंगे। भारतीय वायुसेना के छह एसयू-30 एमकेआइ और सी-17 की गर्जना की गूंज चीन और पाकिस्तान तक पहुंचेगी। दरअसल, तीन मार्च से भारतीय वायु सेना के दोनों विमान संयुक्त अरब अमीरात में डेजर्ट फ्लैग में हिस्सा ले रहे हैं। इस युद्धाभ्यास में अमेरिका, फ्रांस और सऊदी अरब के साथ 10 देश हिस्सा ले रहे हैं। आइए जानते हैं भारतीय वायु सेना के इन दोनों विमानों के बारे में। क्या है सी-17 और एसयू-30 एमकेआइ की खूबियां। इन विमानों पर क्यों है चीन और पाकिस्तान की नजर।



### विमान सी-17 ग्लोबमास्टर की खूबियां

- लद्दाख में भारत-चीन के तनाव के मध्य भारतीय वायुसेना के बेड़े में शामिल सबसे शक्तिशाली और विश्व के बड़े मालवाहक जहाजों में से सुमार सी-17 ग्लोबमास्टर ने देहरादून के जौलीग्रंट हवाई अड्डे पर लैंडिंग की थी। भारत-चीन सीमा के मौजूदा हालात और तनाव को देखते हुए इस भीमकाय विमान की लैंडिंग को सामरिक दृष्टि से भी अहम माना जा रहा है। भारत-चीन तनाव के बीच जौलीग्रंट एयरपोर्ट पर भारतीय सेना के सबसे शक्तिशाली सी-17 ग्लोबमास्टर विमान की लैंडिंग ने एक बार सबको चौंका कर रख दिया था।

- 174 फीट लंबे, 170 फीट चौड़े और करीब 55 फीट ऊंचे इस विमान की खास बात यह है कि यह 3500 फीट लंबी हवाई पट्टी पर भी आसानी से उतर सकता है। यही नहीं यह विमान 1500 फीट की हवाई पट्टी पर भी आपातकाल में लैंडिंग करने में सक्षम है। सी-17 ग्लोबमास्टर विश्व के बड़े मालवाहक जहाजों में से एक माना जाता है।
- अब तक के इतिहास में सी-17 ग्लोबमास्टर कारगिल, लद्दाख, उत्तरी और पूर्वी सीमाओं के विषम भौगोलिक क्षेत्रों में लैंडिंग कर चुका है। यह विमान अपने साथ 70 टन वजन ले जाने में सक्षम है। यह एक बार में 42 हजार किलोमीटर की उड़ान भर सकता है और डेढ़ सौ से अधिक जवानों को एक साथ ले जाने में सक्षम है। इस विमान में एक साथ तीन हेलीकॉप्टर या दो ट्रकों को एयरलिफ्ट किया जा सकता है।

### **सुखोई-30 एमकेआइ की क्या हैं खूबियां**

देश में निर्मित SU-30MKI (सुखोई-30 एमकेआइ) लड़ाकू विमान रूस के सुखोई-30 विमान से अलग खूबियां रखते हैं। सुखोई-30 एमकेआइ में भारतीय वायु सेना की जरूरत के मुताबिक कई बदलाव किए गए हैं। वायुसेना में 31 लड़ाकू स्क्वाड्रन कार्यरत है। नए नाम टाइगर शार्क वाला यह फाइटर एयरक्राफ्ट अपने साथ 2.5 टन के वजन वाला सुपरसोनिक ब्रहमोस क्रूज मिसाइल को अपने साथ रखने में सक्षम है। चौथी पीढ़ी का यह सुखोई 12वां स्क्वाड्रन है।

- तंजावुर एयरबेस पर सुखोई का फाइटर एयरक्राफ्ट SU-30 MKI तैनात किया गया है। यह दक्षिण भारत में पहला एसयू -30 एमकेआई लड़ाकू विमान स्क्वाड्रन है जो समुद्र में भी अहम भूमिका निभाएगा। SU-30 MKI में ब्रहमोस सुपर सोनिक मिसाइलों को भी लगाया गया जो 300 किमी दूरी तक निशाना साध सकता है।
- तंजावुर एयरबेस दक्षिणी वायु कमान का हिस्सा होगा। इससे मुख्य रूप से समुद्री क्षेत्र में हमारी शक्ति में इजाफा होगा। इसके अलावा विमानों द्वारा किए जाने वाले तमाम अन्य आक्रामक और रक्षात्मक भूमिकाएं होंगी।
- ब्रहमोस मिसाइल के एयर लॉन्च वर्जन को SU-30MKI फाइटर एयरक्राफ्ट में ब्रहमोस एयरोस्पेस, HAL और वायुसेना द्वारा लगाया गया है। तंजावुर के लोकेशन को देखते हुए यहां Su-30 MKI की तैनाती सुनिश्चित की गई। SU-30 MKI को विशेष हथियार ब्रहमोस सुपर सोनिक मिसाइलों से लैस कर दिया गया है।

<https://www.jagran.com/world/middle-east-know-which-planes-of-the-indian-air-force-will-be-eyeing-china-and-pakistan-what-is-the-merits-of-them-jagran-special-21420571.html>



## India launches real-time vessel tracking and seafarers' help system

*PM Modi inaugurates 'Maritime India Summit 2021', launches e-book of maritime vision 2030 aimed at making the industry at par with the top global benchmark*

India launched a real-time vessel tracking system that can help seafarers and fishermen in the times of need. Apart from tracking Indian vessels globally, it can also track foreign vessels within 1,000-km of India's coastline.

To be operated by DG Shipping, the system is termed Sagar-Manthan: Mercantile Marine Domain Awareness Centre (MMDAC) and can organise help in case of emergency. India is sharing this system with Sri Lanka and the Maldives, said Anil Devli, CEO, Indian National Shipowners Association.



The MMDAC facility also has elements of security, for which DG Shipping collaborates with the Indian Navy, said Amitabh Kumar, DG-Shipping.

This was launched by the Prime Minister Narendra Modi at the inauguration of Maritime India Summit. "Mega ports with world-class infrastructure are being developed at VadHAVAN, Paradip and Deendayal Port in Kandla...Domestic waterways are found to be a cost effective and environment friendly way of transporting freight. We aim to operationalise 23 waterways by 2030," said Modi.

"The Eastern Waterways Connectivity Transport Grid for regional connectivity with Bangladesh, Nepal, Bhutan and Myanmar will be strengthened for effective regional trade and cooperation," said Prime Minister Modi.

Addressing another session, Shipping Minister Mansukhlal Mandaviya said that India is looking to develop water-based connectivity with Nepal, Bhutan and Myanmar, on the lines of what it has done with Bangladesh.

### **RO-RO projects**

To boost ease of living, Ro-Ro (Roll-on/Roll-off), and passenger ferry projects and 16 water-dromes to enable sea-plane operations are being developed. Steps are also being taken to introduce urban water transport systems in key States and cities such as Kochi, Mumbai, Gujarat and Goa.

To ensure that work relating to the maritime sector does not happen in silos, PM said that the Ministry of Shipping's ambit was widened and it will strive for excellence in maritime shipping and navigation, education and training for the mercantile marine, ship-building and ship-repair industry, ship-breaking, fishing vessels industry and floating craft industry.

The Ministry of Port Shipping and Waterways has created a list of 400 investable projects, said the PM adding that these projects have an investment potential of ₹2.25-lakh crore.

Anne H Stevensen, DG and CEO, Danish Shipping, a trade body of Denmark, wondered how seafarers could be prioritised for Covid-19 vaccination so that they are safe. The biggest challenge as Covid-19 hit was not falling cargo volumes or low trade but the inability to take care of key assets — sea-farers, she added.

<https://www.thehindubusinessline.com/economy/logistics/india-launches-real-time-vessel-tracking-and-seafarers-help-system/article33970821.ece>



## Why F-15EX is a better option than F-35 Stealth Jets for the Indian Air Force?

*As the US is offering F-15EX jets to the Indian Air Force, many experts have suggested that the Boeing F-15EX jets could be better for the IAF since the Lockheed Martin F-35 stealth jets have been plagued with numerous issues*

*By Mansij Asthana*

The F-35 Lightning II fighter is considered the most advanced fighter in the world due to its advanced avionics, armament, stealth technology, and state-of-the-art features.

It's already in service with nine countries, and more clients, including the UAE, are looking to procure the most sought-after flying machine.

However, the fact that the entire F-35 Joint Strike Fighter program has been plagued with problems is seen as a major drawback for the advanced fighter jet.

Factors such as engine troubles, premature part failures, problems in the software development, pilot blackouts, and even structural cracks have raised a big question mark on its performance and reputation.

The situation is such that even the US Air Force chief of staff, General Charles Q. Brown, has admitted finally that the \$1-trillion project has failed to achieve the goals that were set for the stealthy fighter jets.

While emphasizing the need for an NGAD (Next Generation Air Dominance) fighter, a sixth-generation aircraft, and a new "5th-generation minus / 4.5th-generation aircraft", Brown said that the only solution to dealing with F-35's issues would be to fly it less often.

"I want to moderate how much we're using those aircraft. You don't drive your Ferrari to work every day, you only drive it on Sundays. This is our high end, we want to make sure we don't use it all for the low-end fight... We don't want to burn up capability now and wish we had it later," said Brown. According to reports, the US Air Force is already moving from the F-35 fighters to the 'much more reliable' F-15EX jets.

Developed by American aerospace giant Boeing, the F-15EX is the most advanced variant of the F-15 Eagle twin-engine, all-weather tactical fighter jet.

The new fighter, which uses the frame of the classic F-15 and bears a resemblance to the Su-30 MKI in terms of its size, can fulfill a host of missions that include homeland and airbase defense, no-fly zone enforcement against limited or no air defense systems, and deploying standoff munitions.

It is reported that multiple partner nations of the US that had promised to buy the F-35s, are now shifting their orders to the F-15EX fighter jets and there is no reason to believe why India should not follow suit by purchasing the F-15EXs instead of the F-35s.

### **F-15EX Is Cheaper**

The cost of flying the F-15EX fighter is estimated at \$20,000 per hour, which is half the cost of flying the advanced F-35 fighter, which costs around \$44,000 per hour.

While Lockheed had promised to cut down the costs to \$25,000, it has not happened yet, making the F-15EXs a much better option for India.

### **F-15EX Offers Better Performance**



F-15EX (Image courtesy: Boeing)

The F-15EX can fulfill a variety of roles including air superiority, interceptor, deep penetration strikes against enemy infrastructure, strategic bombing, and ground attack.

According to reports, the new F-15EX has a combat range of 1,100 miles against F-35's 670 miles. The Boeing fighter is also much faster and boasts a speed of Mach 2.5 as compared to F-35's speed of Mach 1.6, while also being able to accommodate heavy radars.

The F-35, due to its smaller stature in comparison to the heavyweight F-15EX, cannot accommodate heavy radars and fuel.

### **F-15EX Better Suited Against Pakistan, China**

Amid threats from China and Pakistan, New Delhi needs its modern fighters to have substantial fuel tanks to fly for longer hours, so that they do not have to return to base for refueling.

The F-15EX fulfills this requirement; it can also strike deep into the territories of western neighbors Pakistan. The F-35 might offer its unique stealth abilities, but India doesn't need stealth when it comes to its neighborhood and instead needs an air dominance jet that can dominate the Asian skies.

Another advantage is that the F-15EX fighter's heavy engine capacities would make it more suitable to operate in the high altitude regions of Ladakh, something India requires to counter both Pakistan and China in the Himalayas.

### **F-15EX Has Already Been Offered To India**

Last but not the least, unlike the F-35 fighters, the F-15EX fighters have already been offered by Boeing to India. This ensures that the transition process of the fighter or a potential deal between the US and Indian governments would be a lot smoother than that of the F-35 fighter.

It's worth mentioning that Lockheed Martin's Vice President for business development, JR McDonald, had indicated in September 2020 that countries like India were not yet ready for the F-35. "Not every country in the world is ready today for an F-35. And, that can be either because they from a policy perspective haven't become that level of partner with the United States yet, or maybe just the maturity of their military: it's hard to jump from a MiG-21 directly into an F-35," he said.

Given this uncertainty and proven combat capabilities of F-15EX jets, India would do well to opt for Boeing fighters and strengthen its fighter fleet on a priority basis.

<https://eurasianimes.com/f-15ex-is-a-better-option-for-india-than-the-f-35-stealth-jet/>



*Wed, 03 March 2021*

## **How India is stepping up its outreach in the Indian Ocean**

*India needs to step up its game in the Indian Ocean. India aspires to play the role of a 'net security provider' in the region and has consistently assisted Indian Ocean states in their time of need*

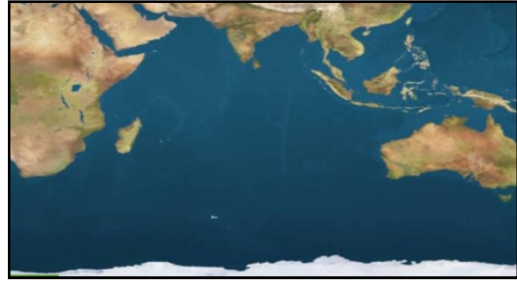
*By Sankalp Gurjar*

From February 20 to 23 India's External Affairs Minister S Jaishankar visited the Maldives and Mauritius. The visit was marked by the signing of important agreements to boost defence, economic and developmental co-operation between India and these two Indian Ocean island nations. These two countries are at the receiving end of the geopolitical rivalries being played out in the Indian Ocean, and hence India's engagement with these countries matters.

Since 2018, the Maldives has been following an 'India First' policy and the two countries have built a strong partnership. Building on it, India and the Maldives signed an agreement to 'develop, support and maintain' a coast guard harbour at Sifvaru. It is expected to enhance the capability of

the Maldivian defence forces to patrol and monitor the exclusive economic zone (EEZ) as well as other islands of this tiny nation. India also extended a \$50 million line of credit (LOC) to the Maldives for defence projects.

In Mauritius, an agreement was signed for a \$100 million LOC for the purchase of defence assets from India. India also offered a Dornier aircraft and an Advanced Light Helicopter for two years. It is expected to strengthen the capabilities of Mauritius to monitor its maritime domain effectively. In his press statement, Jaishankar said that the “security of Mauritius is the security of India”. Framing Mauritian security with India’s own security underscores the key role of Mauritius for India in the Indian Ocean.



India signed a Comprehensive Economic Co-operation and Partnership Agreement (CECPA) with Mauritius. For India, it is the first such agreement with an African country. As per the CECPA, India will provide preferential trade access to a bulk of Mauritian products, including sugar. Mauritius is considered as a gateway for Africa and through this partnership, Indian investors will be able to ‘use Mauritius as a launch-pad for business expansion into continental Africa’. Additionally, owing to its bilingual prowess, Mauritius can also help Indian companies to enter francophone Africa.

This visit is crucial in the context of India’s evolving maritime strategy towards the Indian Ocean. India enjoys primacy in the Indian Ocean and seeks to ensure a favourable balance of power in the region. However, growing engagement by China with Indian Ocean states is presenting a difficult challenge for India. For example, in January, China’s Free Trade Agreement (FTA) with Mauritius came into effect. With bilateral trade of \$192 billion between China and Africa (in 2019), it is already the largest trading partner of Africa. The FTA with Mauritius is expected to boost China’s trade ties with Africa even further.

China also enjoys considerable influence in Sri Lanka. Despite the professed policy of ‘India First’, Sri Lanka cannot shake off Chinese influence. In the last 15 years, China has made deep inroads into Sri Lanka including the control of a Hambantota port. China is a major economic as well as a defence partner of strategically located countries such as the Seychelles and Madagascar. China’s growing influence and engagement in the Indian Ocean is supported by its military base at Djibouti and regular naval patrols in the Gulf of Aden.

In this context, India needs to step up its game in the Indian Ocean. India aspires to play the role of a ‘net security provider’ in the region and has consistently assisted Indian Ocean states in their time of need. In 2020, at the height of COVID-19, Indian naval ships had sent medical assistance to several smaller states in the Indian Ocean. India has taken lead in supplying COVID-19 vaccines to these countries as well. However, these actions need to be backed by a strong defence and economic partnership between these countries and India. Jaishankar’s visit assumes significance in this context.

India is developing military infrastructure on the Agalega island of Mauritius and seeks to develop naval infrastructure on the Assumption island of Seychelles. With the naval infrastructure in the Maldives and growing defence ties with Mauritius, the Indian Navy’s operational capabilities would be enhanced. Mauritius and the Maldives are part of India’s security perimeter and greater outreach to these Indian Ocean states is vital from the perspective of India’s security interests. Robust trade and economic relationship with Indian Ocean states are in India’s interest and the CECPA is a step in that direction.

In the context of these steps and counter steps between India and China, it will be interesting to watch how the geopolitics of the Indian Ocean evolves.

<https://www.moneycontrol.com/news/opinion/how-india-is-stepping-up-its-outreach-in-the-indian-ocean-6594411.html>

# Infosys-Backed ideaForge Bags Funding After Clinching \$20 Mn Indian Army Drone Order

By Kritti Bhalla

- *ideaForge has bagged a \$20 Mn order from the Indian army for its 'SWITCH' drone*
- *Last month, early investor Infosys had infused an additional \$1 Mn into the company*
- *ideaforge's drones have been widely deployed by the Indian armed forces for surveillance, rescue operations*

Mumbai-based ideaForge has raised about \$2 Mn (INR 15 Cr) from venture debt firm Blacksoil after the drone manufacturer recently bagged a \$20 Mn order from the Indian army for its 'Switch' UAVs (unmanned aerial vehicles).

Switch is a vertical takeoff and landing (VTOL) drone with advanced capabilities of operating at high altitudes and difficult climatic conditions for day and night surveillance. The company plans to use this funding to meet the working capital needs to service its larger order book.

Last month, ideaForge raised \$1 Mn (about INR 7.2 Cr) debt funding from existing investor Infosys, which had previously invested \$1.5 Mn in the drone manufacturer's Series A round in 2016. The \$10 Mn Series A round was led by WRV Capital and IndusAge Partners.

While announcing the latest investment, Infosys in its regulatory filings said, "ideaForge's UAV systems are increasingly being used across a wide spectrum of organisations. Several customers of Infosys have also embraced UAV systems as they digitalise rapidly. The investment is intended to be utilised on R&D, sales, marketing, business development and working capital needs at ideaForge."

ideaForge was founded in 2008 by five IIT Bombay graduates — Ankit Mehta, Ashish Bhat, Rahul Singh, Vipul Joshi, and Amardeep Singh. With more than 15 years of research and development (R&D) and 20+ patents in the Indian and international market, the company has created a product pipeline of fully autonomous UAVs and drones. It claims to have deployed more than 1,000 drones since its inception.

The company's drones have been widely deployed by Indian armed forces for surveillance, crowd monitoring and rescue operations, and offer a compelling solution for commercial applications in verticals such as energy, utilities, telecom, and agriculture.

According to global market intelligence and advisory firm BIS Research, the Indian UAV market will reach \$885.7 Mn by 2021, while the global market size will touch \$21.47 Bn. Meanwhile, a PWC report added that the Indian UAV market is poised to grow at the compound annual growth rate (CAGR) of 18% between 2017 to 2023 in terms of revenue.

<https://inc42.com/buzz/infosys-backed-ideaforge-bags-2-mn-after-clinching-indian-army-drone-order/>





Wed, 03 March 2021

## **Exclusive: Night-time satellite images show Chinese buildup in Depsang**

*Night-time satellite images have revealed the Chinese buildup in the Depsang region near the Line of Actual Control*

*By Ankit Kumar, Abhishek Bhalla*

New Delhi: Synthetic Aperture Radar (SAR) images of a permanent Chinese post, generated by illuminating radio waves during the night, provide glimpses of the Chinese buildup near the Line of Actual Control (LAC).



Overview of Tianwendian post on 25 February 2021. SAR image Capella Space

Situated at a distance of about 24 km opposite India's highest airstrip Daulet Beg Oldie (DBO) in Ladakh, PLA's Tianwendian post is an all-season post in Aksai Chin.

The post was established after the 1962 war and has seen consistent upgrades over the past few years.

The latest imagery suggests that its main building has seen additional auxiliary structures, camps, vehicles and fencing since August 2020.

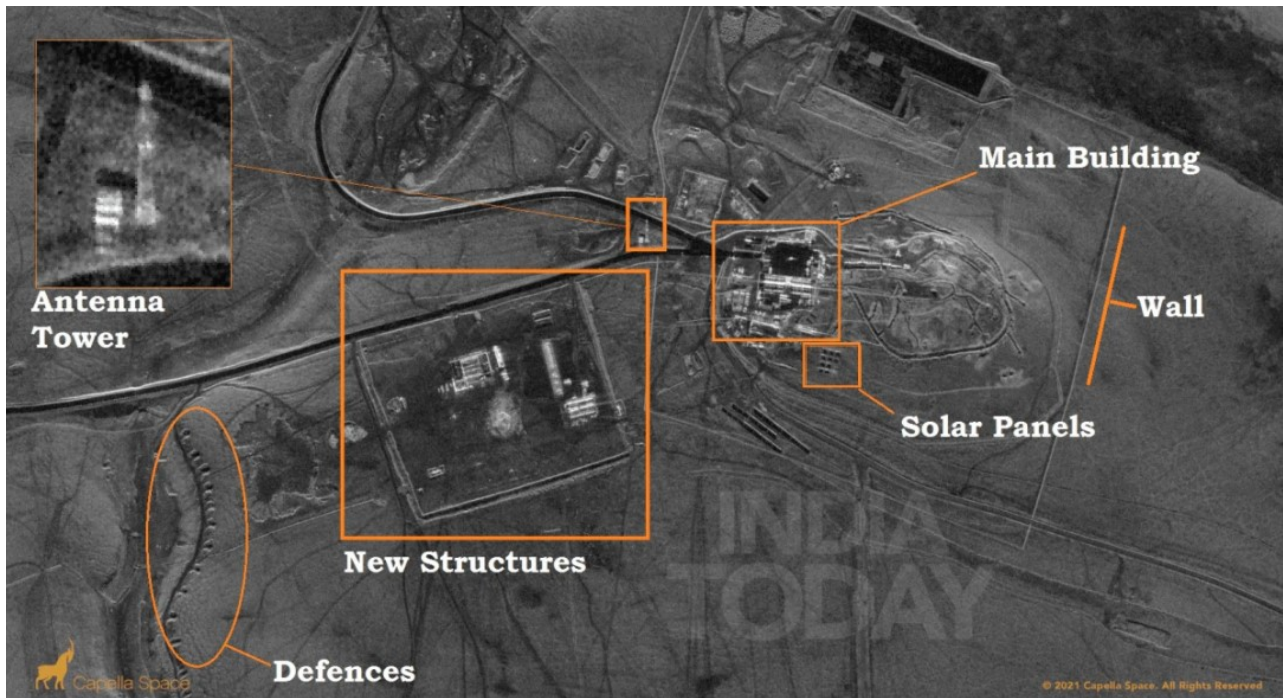
Indian and Chinese troops have implemented stepwise disengagement in eastern Ladakh's Galwan and Pangong Tso area, ending the long standoff between the two ground forces.

However, the longstanding standoff persists at more than one location in the Depsang region of Ladakh.

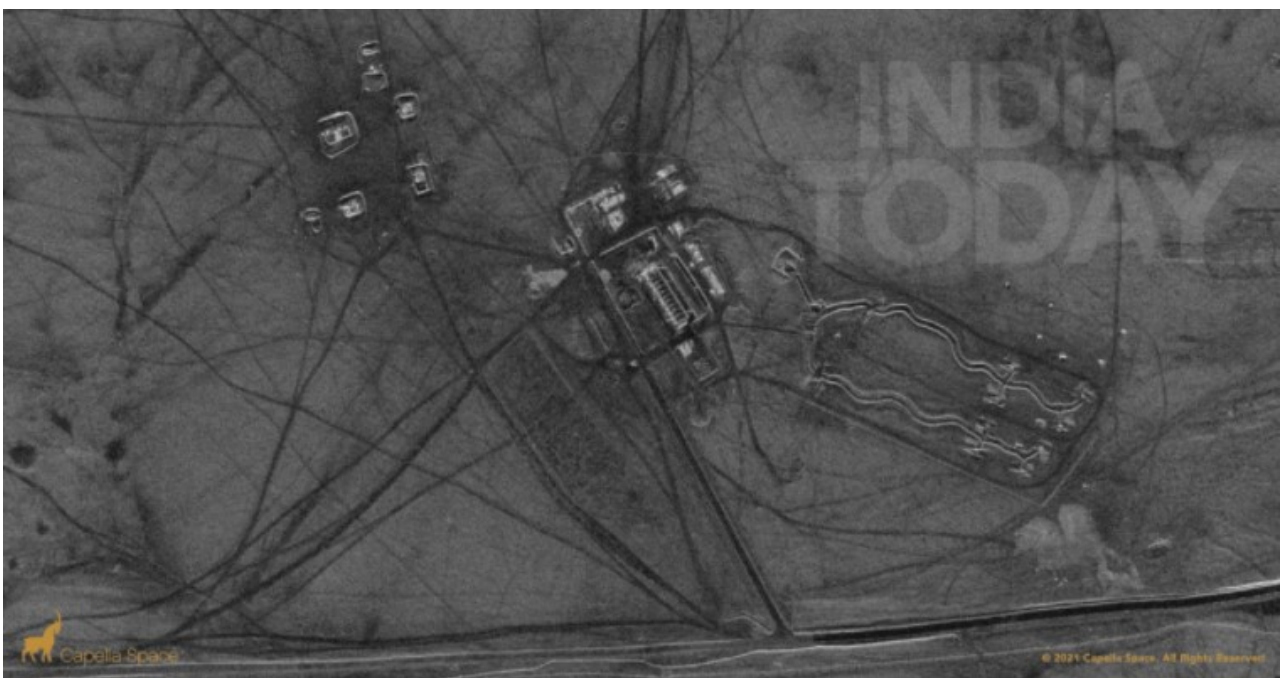
The latest high-resolution imagery has been captured on the night of 25 February by the SAR commercial satellites of the US-based space firm, Capella Space.

During the current standoff, Chinese troops have brought in their tanks and troops close to Indian positions.

The Tianwendian post with its air defence systems, storages, additional shelters and vehicles for the reinforcements serves as the core of the PLA operations in the region.



Upgraded PLA Post, Tianwendian. SAR image Capella Space



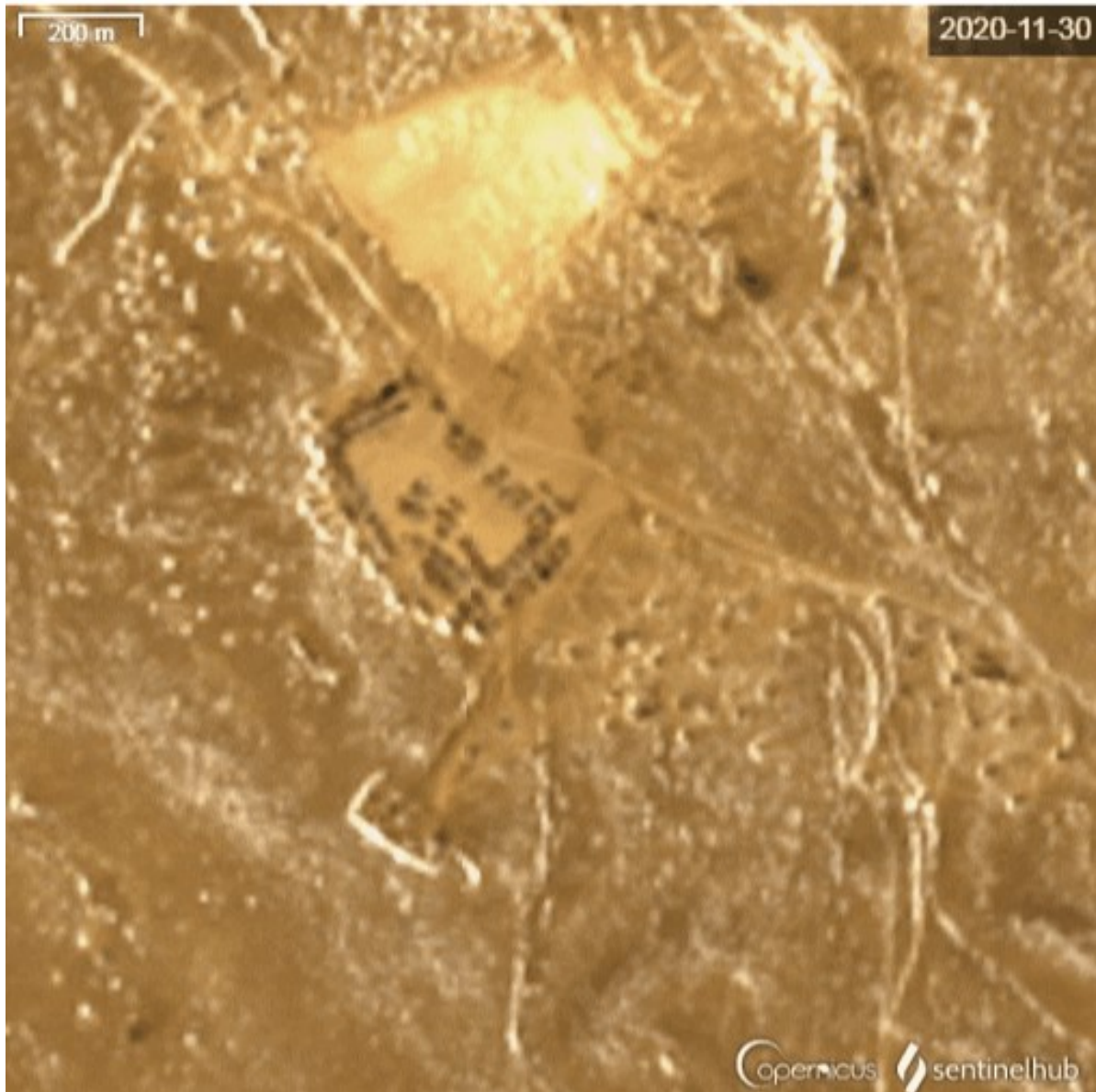
Additional structures near Tianwendian post. SAR image Capella Space

The additional buildup of new camps and shelters were first seen in July last year after the brutal hand-to-hand combat between Indian and Chinese troops in the Galwan river valley.

The main double-storey building at the post is now surrounded by several temporary camps and shelters. New support buildings, observation posts and towers can also be seen in the latest images.

The post initially had three large buildings possibly for accommodating a large number of troops; however, the facility seems to have been expanded to house additional PLA troops during the standoff period. Temporary shelters with defensive walls as well as observation posts are also visible in the new imagery.





Time-lapse of the PLA post showing buildup of the PLA troops/ Credit: European Space Agency

After initial breakthrough in Pangong, the focus of the negotiation is on Depsang plains where China has come in around 18 km since 2013.

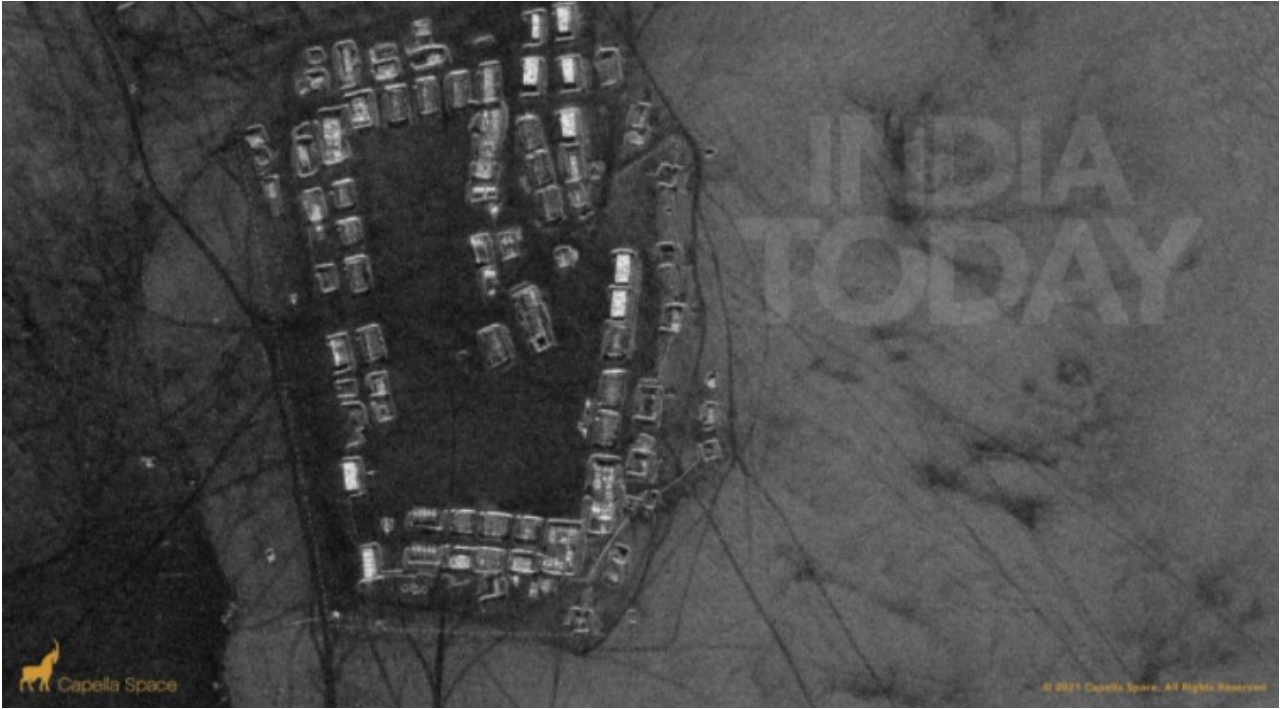
DBO is barely 20 km away from the Karkoram Pass.

Depsang plains are also close to China's western highway G219. Depsang at 16,000 feet north of Shyok River is strategically important as it provides India, the Daulet Beg Oldie airstrip and Karakoram Pass further north.

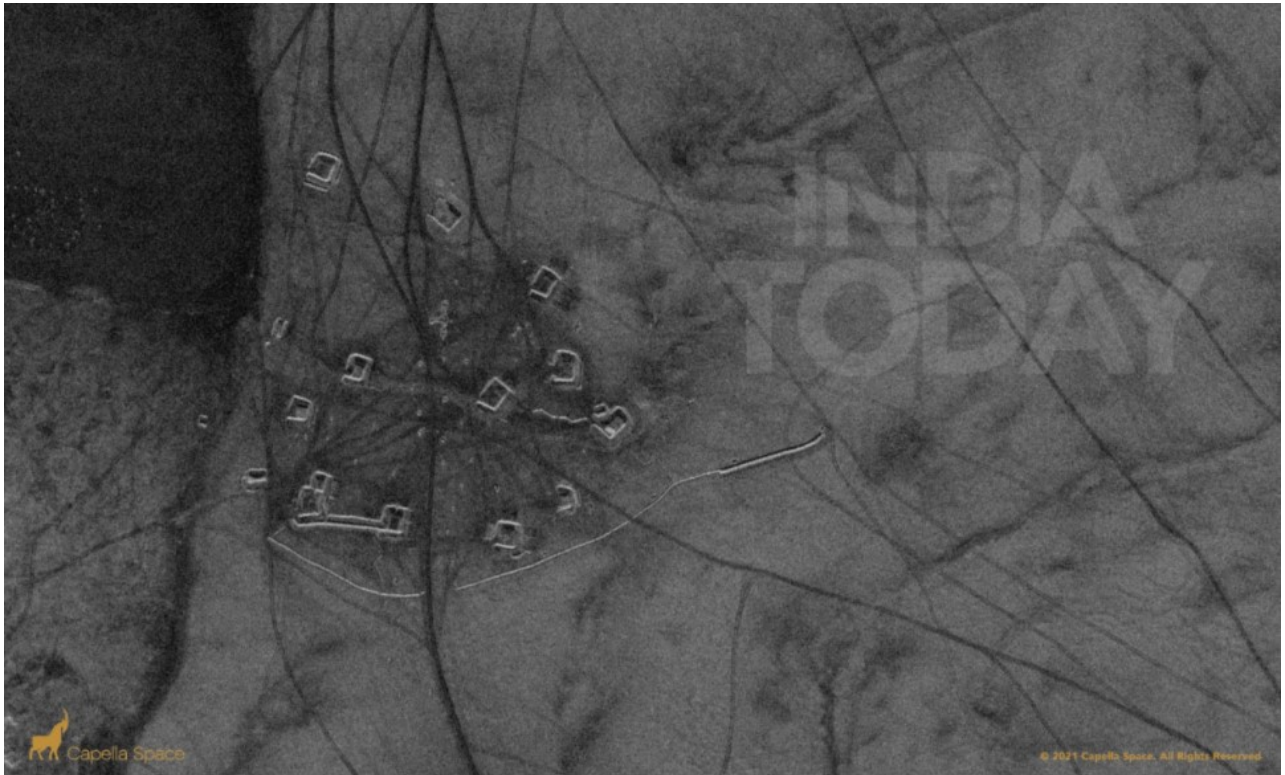
On its west is the Siachen Glacier under Indian control. Indian patrols have been blocked here by PLA in the Y junction area as the Chinese have intruded 18 km inside since 2013.

Regular patrols to patrol points 10,11, 11A, 12 and 13 have been blocked due to the impasse.

India has been asserting that not just Pangong but all friction points across Eastern Ladakh including Depsang and areas around Demchok where Indian grazers have been obstructed should be dealt with.



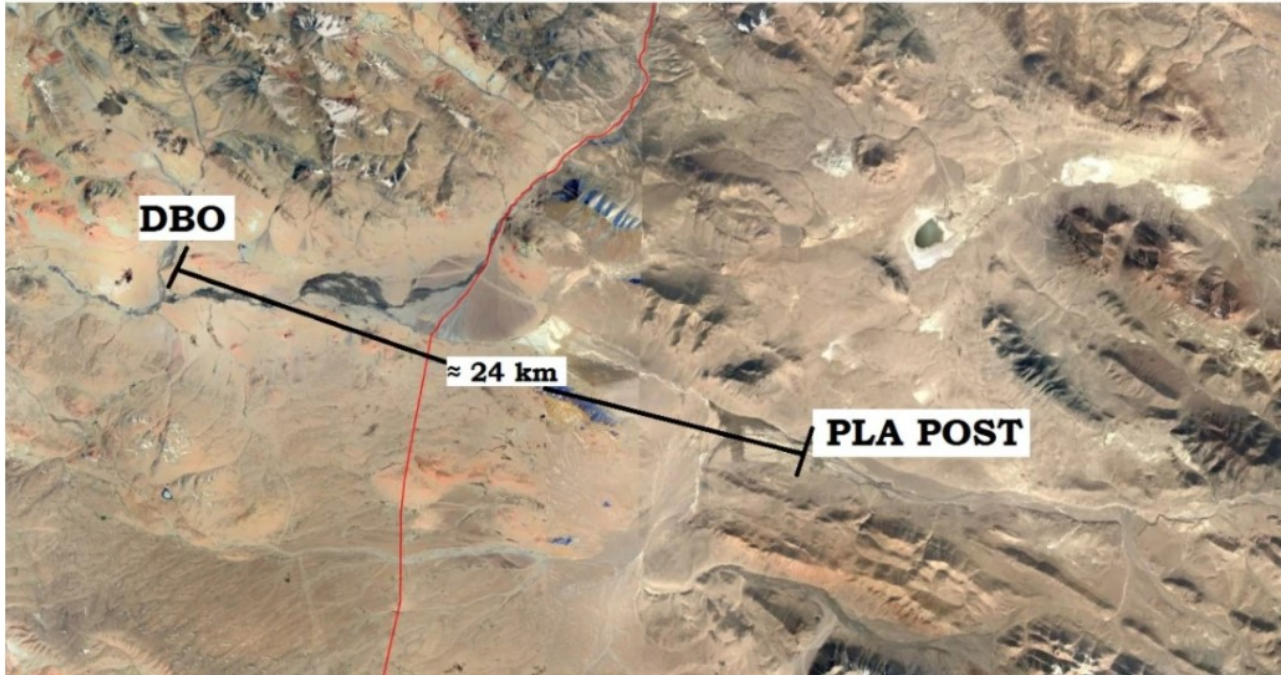
A closer look at the new encampments near Tianwendian post. SAR image Capella Space



New camps and PLA deployments seen near Tianwendian post. SAR image Capella Space



# DBO AIRSTRIP & PLA POST



Overview of DBO Airstrip and Tianwendian post in Depsang

Unlike the usual optical satellites which rely on the sunlight to capture images, the SAR generates a picture emitting microwaves and illuminating its target on the earth. The SAR has an advantage over traditional optical satellites as it can capture images at night as well as during bad weather conditions.

<https://www.indiatoday.in/india/story/exclusive-night-time-satellite-images-show-chinese-buildup-in-depsang-1774474-2021-03-01>

Wed, 03 March 2021

## Flying high: IIT Roorkee opens centre for drone research

*This facility will undertake advanced research on several aspects of drone technology, including development, applications and anti-drone technology*

Like the internet and GPS before them, drones are evolving beyond their military origin to become powerful business tools. They have already made the leap to the consumer market, and now they are being put to work in commercial and civil government applications from firefighting to farming. That's creating a market opportunity that's too large to ignore. A Goldman Sachs Research forecast a \$100 billion market opportunity for drones between 2016-2020 – helped by growing demand from the commercial and civil government sectors.

“The drone segment has witnessed a surge in demand by leaps and bounds and is currently being harnessed by 50-60 academic institutions for developing a variety of applications,” said V K Saraswat, member, NITI Aayog and former director-general DRDO, as he inaugurated a state-of-art Centre for Drone Research at Indian Institute of Technology (IIT) Roorkee. He also stressed upon the significance of indigenisation in the design process of drones and the need for prudent business models to make it commercially viable.

The IIT Roorkee initiative has secured a seed funding of Rs 1 crore from alumni of the 1994 batch on the occasion of their Silver Jubilee Reunion. State-of-the-art and frontier research would be conducted on several aspects of Drone technology, including Drone development, Drone applications and Anti-Drone technology at this centre.

RK Tyagi, IIT Roorkee's distinguished alumnus and former chairman, Hindustan Aeronautics, said: “The starting of drone research is very timely.

The year 2020 has been very disruptive and the drone technology in the last year has impacted every area of activity like transport, medical, pipeline, agriculture and defence. In fact, next to internet and GPS, the drone and anti-drone technology is making a transformative effect and impact on mankind. India will become a drone hub by 2030 and drones and anti-drones will define the core combat capabilities of tomorrow.”

Drones are extensively used by the military in today's world. Drones can be used in rural areas to improve the life of the people, besides monitoring and surveillance of standing crops, crowd management, search and rescue operations and mapping of infrastructure facilities.

<https://www.financialexpress.com/lifestyle/science/flying-high-iit-roorkee-opens-centre-for-drone-research/2205065/>



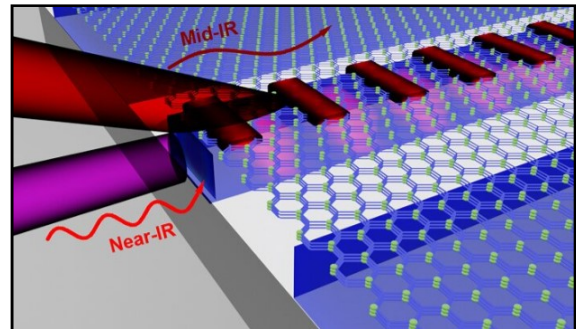
Drones can be used in rural areas to improve the life of the people, besides monitoring and surveillance of standing crops, crowd management, search and rescue operations and mapping of infrastructure facilities.

## Photonics discovery portends dramatic efficiencies in silicon chips

A team led by Vanderbilt engineers has achieved the ability to transmit two different types of optical signals across a single chip at the same time.

The breakthrough heralds a potentially dramatic increase in the volume of data a silicon chip can transmit over any period of time. With this project, the research team moved beyond theoretical models and demonstrated dual-band optical processing, significantly expanding the functionality of silicon as a photonics platform.

Joshua Caldwell, associate professor of mechanical engineering, and Cornelius Vanderbilt Professor Sharon Weiss, professor of electrical engineering, led the team, which also included faculty members from Columbia University, the University of Iowa, and Kansas State University.



Researchers devised a hybrid, hyperbolic-silicon photonic waveguide platform that transmits mid-IR and near-IR light at the same time, on the same chip, demonstrating dual-band optical processing. Credit: Caldwell Lab

Their research, "Guided Mid-IR and Near-IR Light within a Hybrid Hyperbolic-Material/Silicon Waveguide Heterostructure," was published online in *Advanced Materials* on Feb. 1. It is featured on the inside cover of the March 16 print edition of the journal.

The work is an important advance in silicon photonics, which uses light rather than electrical signals to transmit data. The need for faster and expanded processing has all but outstripped the limits of adding more wire to smaller and smaller chips, which requires more power, creates more heat, and risks data integrity. Using patterned silicon to transmit optical signals uses less power without heating up or degrading the signal.

Still, doing more with the same chip has been challenging. Silicon waveguides provide the principle building block of on-chip photonics, confining light and routing it to functional optical components for signal processing. Different forms of light need different waveguides, but linear scaling to accommodate more waveguides would quickly surpass the available space of a silicon chip in the standard form factor.

"It has been difficult to combine near-infrared and mid-infrared transmission in the same device," said Mingze He, a Vanderbilt mechanical engineering Ph.D. student and first author of the paper.

Two innovations—a novel approach and device geometry—allowed disparate frequencies of light to be guided within the same structure. Such frequency multiplexing is not new but the ability to expand the bandwidth within the same available space is.

Leveraging the infrared properties of hexagonal boron nitride, researchers devised a hybrid, hyperbolic-silicon photonic waveguide platform. In the mid-infrared, the structure of the hBN crystal can support a novel type of optical mode called a hyperbolic phonon polariton. These hyperbolic polaritons were demonstrated to guide long, mid-infrared wavelengths of light within nanoscale thickness slabs, with the optical modes following the path of the underlying silicon waveguide.

The approach does not require any additional fabrication of the hBN and can support signal processing and chemical sensing modalities simultaneously, without the need for expanding the device form factor.



"The inclusion of the mid-IR offers promising opportunities for combining signal processing with chemical sensing, or modulation schemes not possible with near-IR signals alone," Caldwell said.

Mid-IR is widely used in the chemical and agricultural industries; applications of near-IR include telecommunications and medical diagnostics.

**More information:** Mingze He et al. Guided Mid-IR and Near-IR Light within a Hybrid Hyperbolic-Material/Silicon Waveguide Heterostructure, *Advanced Materials* (2021). DOI: [10.1002/adma.202004305](https://doi.org/10.1002/adma.202004305)

**Journal information:** [Advanced Materials](https://phys.org/news/2021-03-photonics-discovery-portends-efficiencies-silicon.html)  
<https://phys.org/news/2021-03-photonics-discovery-portends-efficiencies-silicon.html>



Wed, 03 March 2021

## Ultra-fast electron measurement provides important findings for the solar industry

Using a new method, physicists from TU Freiberg, in cooperation with researchers from Berkeley and Hamburg, are for the first time analyzing at the femtosecond scale the processes in a model system for organic solar cells. This can be used to develop high-performance and efficient solar cells. Key to this are ultra-fast flashes of light, with which the team led by Dr. Friedrich Roth works at FLASH in Hamburg, the world's first free-electron laser in the X-ray region.

"We took advantage of the special properties of this X-ray source and expanded them with time-resolved X-ray photoemission spectroscopy (TR-XPS). This method is based on the external photoelectric effect, for the explanation of which Albert Einstein received the Nobel Prize in Physics in 1921. For the first time, we were able to directly analyze the specific charge separation and subsequent processes when light hits a model system such as an organic solar cell. We were also able to determine the efficiency of the charge separation in real-time," explains Dr. Roth from the Institute of Experimental Physics at TU Bergakademie Freiberg.



In the FLASH I experimental hall "Albert Einstein."  
Credit: DESY / Heiner Mueller-Elsner

### With photon science to better solar cells

In contrast to previous methods, the researchers were able to identify a previously unobserved channel for charge separation. "With our measurement method, we can carry out a time-resolved, atom-specific analysis. This gives us a fingerprint that can be assigned to the associated molecule. We can see when the electrons energized by the optical laser arrive at the acceptor molecule, how long they stay and when or how they disappear again," says Prof. Serguei Molodtsov, explaining the measurement method. He heads the research group "Structural Research with X-ray Free Electron Lasers (XFELs) and Synchrotron Radiation" at the Freiberg Institute of Experimental Physics and is a Scientific Director at the European X-ray Free Electron Laser (EuXFEL).

### Analyze weak points and increase quantum efficiency

Real-time analysis and the measurement of internal parameters are important aspects of basic research that the solar industry, in particular, can benefit from. "With our measurements, we draw important conclusions about the interfaces at which free charge carriers are formed or lost and thus



weaken the performance of solar cells," adds Dr. Roth. With the findings of the Freiberg researchers, for example, optimization possibilities at the molecular level or in the field of materials science can be derived and quantum efficiency optimize newly emerging photovoltaic and photocatalytic systems. The quantum efficiency describes the ratio of the incident light to the photon stream (current that is generated). The team published the results in a current specialist publication, the journal *Nature Communications*.

**More information:** Friedrich Roth et al, Direct observation of charge separation in an organic light harvesting system by femtosecond time-resolved XPS, *Nature Communications* (2021). DOI: [10.1038/s41467-021-21454-3](https://doi.org/10.1038/s41467-021-21454-3)

**Journal information:** [Nature Communications](#)

<https://phys.org/news/2021-03-ultra-fast-electron-important-solar-industry.html>

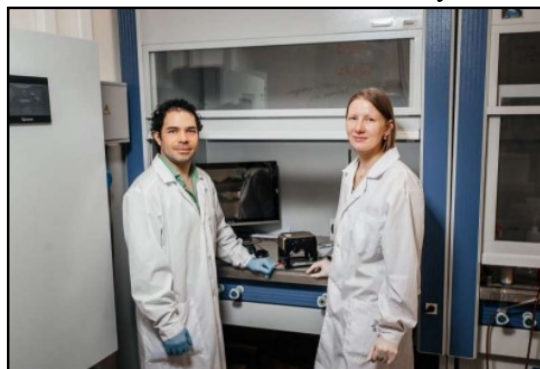


Wed, 03 March 2021

## Scientists develop efficient method to create high-strength materials for flexible electronics

TPU researchers jointly with their colleagues from foreign universities have developed a method that allows for a laser-driven integration of metals into polymers to form electrically conductive composites. The research findings are presented in Ultra-Robust Flexible Electronics by Laser-Driven Polymer-Nanomaterials Integration article "Ultra-Robust Flexible Electronics by Laser-Driven Polymer-Nanomaterials Integration," published in *Advanced Functional Materials*.

"Currently developing breakthrough technologies such as the Internet of Things, flexible electronics, and brain-computer interfaces will have a great impact on society in the next few years. The development of these technologies requires crucially new materials that exhibit superior mechanical, chemical and electric stability, comparatively low cost to produce on a large scale, as well as biocompatibility for certain applications. In this context, polymers and a globally widespread polyethylene terephthalate (PET), in particular, are of special interest. However, conventional methods of polymers modification to add the required functionality, as a rule, change conductivity of the entire polymer volume, which significantly limits their application for complex topologies of 3-manifolds," Raul David Rodriguez Contreras, Professor of the TPU Research School of Chemistry and Applied Biomedical Sciences, says.



TPU researchers Raul David Rodriguez Contreras and Evgeniya Sheremet. Credit: Tomsk Polytechnic University

The scientists offered their method. First, aluminum nanoparticles are deposited on PET substrates and, then, the samples are irradiated by laser pulses. Thus, a conductive composite is locally formed in the irradiated areas. The researchers chose aluminum because it is a cheap and readily available metal. Silver is frequently used as a conductor for flexible electronics. Therefore, the obtained samples with aluminum nanoparticles were compared with a silver conductive paste and graphene-based materials.

"Mechanical stability tests (abrasion, impact and stripping tests) proved that composites based on aluminum nanoparticles surpass other materials. Moreover, the material structure itself turned out to be very interesting. During laser processing, aluminum carbide is formed on sample surfaces. Furthermore, polymers induce the formation of graphene-like carbon structures. We did not expect this effect. Besides, by adjusting laser power, we can control material conductivity. In

practice, using a laser, it is possible to "draw" almost any conductive structure on polymer surface and make it locally conductive," Evgeniya Sheremet, Professor of the TPU Research School of High-Energy Physics, explains.

According to the scientists, the laser integration of metals into polymers was used in flexible electronics for the first time. There are methods based on "metal explosion" by laser and its application into polymers at a high speed, but they are more complicated in terms of technological implementation. The method of the TPU researchers implies two basic technological steps: application of nanoparticles on polymer surface and laser processing. In addition, the method is applicable to a wide variety of materials.

"What can it be used for? First, it can be used for flexible electronics. One of the problems in this field is a low mechanical stability of products. There are many approaches to improve it. However, normally, the obtained materials would not have passed our tests. There is also photocatalysis, flexible sensors for robotics, light-emitting diodes and biomedical products among the potential fields of application," the article authors explain.

Further on, the research team is planning to test the new method on other materials such as silver, copper, carbon tubes and to use various polymers. The scientists from TPU, University of Electronic Science and Technology of China, Leibniz Institute of Polymer Research Dresden and the University of Amsterdam took part in the research work. The project is supported by the TPU Competitiveness Enhancement Program VIU-ISHFVP-198/2020.

**More information:** Raul D. Rodriguez et al, Ultra-Robust Flexible Electronics by Laser-Driven Polymer-Nanomaterials Integration, *Advanced Functional Materials* (2021). DOI: [10.1002/adfm.202008818](https://doi.org/10.1002/adfm.202008818)

**Journal information:** [Advanced Functional Materials](https://phys.org/news/2021-03-scientists-efficient-method-high-strength-materials.html)  
<https://phys.org/news/2021-03-scientists-efficient-method-high-strength-materials.html>

## COVID-19 Research News

**mint**

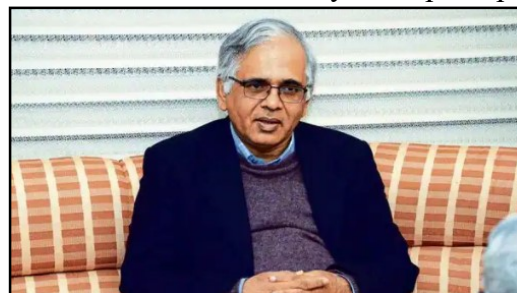
Wed, 03 March 2021

### ‘A killed virus vaccine is likely to offer greater protection’

*By Neetu Chandra Sharma*

While thousands of mutations have been observed in the SARS-CoV-2 virus to date, the so-called UK variant is the first one to have demonstrated increased transmissibility and, perhaps, greater lethality, says Dr Shekhar Mande

India's mass covid-19 vaccination drive, which began on 16 January, entered its second phase on Monday to include senior citizens and those over 45 years with comorbidities. The programme includes two vaccines. Covishield, developed by AstraZeneca-Oxford University, is based on a recombinant chimpanzee adenovirus vector that encodes the spike protein. Covaxin, developed by Bharat Biotech in collaboration with National Institute of Virology, is an "inactivated" vaccine that uses killed SARS-CoV-2 virus, eliciting an immune response targeting more than just the spike protein. In an interview with *Mint*, Dr Shekhar Mande, secretary, department of scientific



**Dr Shekhar Mande, secretary, department of scientific and industrial research.**

and industrial research and director general, Council of Scientific and Industrial Research, spoke on how the antibody response by a killed virus vaccine is likely to offer greater protection against mutated variants of covid-19, than vaccines generating antibodies against spike proteins. Edited excerpts:

**With covid cases on the rise in India, how will the vaccination drive help in controlling the pandemic?**

According to both serological surveys and mathematical model predictions, a substantial portion of India's population has developed immunity against the virus, perhaps because of natural immunity. The evidence is suggestive of long-lasting immune memory, but the immunity afforded by the presence of antibodies might be expected to last for some months and not longer, while T-cell mediated immunity lasts longer. The most reliable long-term protection is, however, provided through vaccination. It has been suggested that vaccination offers much stronger immune response than natural infection and, therefore, is key to controlling the disease. This has not yet been established, but a section of medical researchers say the presence of antibodies (caused by a previous infection) offers less protection against reinfection from a mutation of the virus, compared to vaccination. Hence, it is imperative that the vaccination programme is completed as early as possible.

**The Bharat Biotech vaccine got an emergency-use licence despite not having efficacy data. Prime Minister Narendra Modi was also administered Covaxin. What is your opinion?**

Interestingly, the breadth of antibody response generated by a killed virus vaccine is likely to offer greater protection against mutated viruses, than vaccines that generate antibodies against the spike protein. In the context of the need for nationwide vaccination, we are happy that the regulatory authorities in India have given approval to two vaccines, one (Covishield) unconditionally and the other (Covaxin) under the clinical trial mode. Both vaccines have satisfied the expert committees about their safety and immunogenic requirements. We wait for the Phase III data on Covaxin to become available so that its efficacy can be assessed. The requirement that any vaccine must have 50% efficacy before it can be approved for emergency use comes from the World Health Organization. Even at 40% efficacy, a vaccine gives some protection and at 80% efficacy some vaccine recipients would still be left unprotected. Therefore, we trust the regulatory authorities to take an informed decision and not be bound by this arbitrary guideline. That said, even if everyone in the target population is vaccinated (over 18 years), it is imperative for the public to observe safety protocols.

**India has also found mutant coronavirus strains such as the UK, South African, and Brazilian strains. Will it impact vaccine development and will they be effective?**

While thousands of mutations have been observed in the SARS-CoV-2 virus to date, the so-called UK variant is the first one to have demonstrated increased transmissibility and, perhaps, greater lethality. The world has thus far been fortunate in this regard. However, the longer the virus is allowed to spread among the unprotected population, the greater the opportunities for the virus to mutate into a more virulent form. We must stop the virus from spreading and mutating and for that it is not enough that everyone in India only is vaccinated.

<https://www.livemint.com/science/health/a-killed-virus-vaccine-is-likely-to-offer-greater-protection-11614651116492.html>

