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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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*Fri, 12 March 2021 5:17PM*

### **DRDO launches Aazadi Ka Amrut Mahotsav to commemorate 75 years of India's independence**

#### **Activities focusing on nation building and achieving self-reliance to be organised in next 75 weeks**

Secretary Department of Defence R&D & Chairman Defence Research and Development Organisation (DRDO) Dr G Satheesh Reddy launched Aazadi Ka Amrut Mahotsav at DRDO Bhawan on March 12, 2021. Directors General, DRDO Scientists and other officers attended the event virtually from all major centres including Bengaluru, Hyderabad, Pune, Tejpur and Visakhapatnam.

Aazadi Ka Amrut Mahotsav has been organised to commemorate 75 years of India's independence and will be celebrated for 75 weeks starting from March 12, 2021 with various themes. Efforts of DRDO will primarily focus on the theme 'AatmaNirbhar Bharat' and the announcements made will be in the direction of realizing that vision. DRDO will celebrate the Mahotsav throughout the 75 weeks by conducting various activities in the direction of nation building, achieving self reliance, encouraging scientific innovations, developing human resources and host of other related topics.

During the Mahotsav, DRDO will work with renewed energy to accomplish the goals set by Secretary Department of Defence R&D & Chairman DRDO under the vision of the Prime Minister. Chairman DRDO called upon DRDO fraternity to put special efforts to further support the industry and academia. DRDO will work along with them to achieve the goals of Mahotsav in various ways.

DRDO plans to enhance handholding of startups through incubation centres for technology development. Technology proposals from various industries will be processed under the Technology Development Fund (TDF) scheme in larger numbers. Number of Licensing Agreements for Transfer of Technologies (LAToTs) will be increased to greater than 100. ToT to local industry for potable water in North Eastern Regions, Interactions/visits by DRDO scientists to various industries, filing of patents and reaching out to foreign countries to promote export of DRDO products have also been planned in a bigger way over the entire duration of the Mahotsav.

In order to promote greater collaboration with the academia, wide variety of activities have been planned such as providing new challenges to academic institutes, increasing internship to students and providing apprenticeships to students in DRDO laboratories/centres. Besides, PhD students will be enrolled in DRDO laboratories on various defence related topics. More importance will be given to publication of scientific research papers and defence related articles in regional languages. Organising of courses and seminars on defence related areas in Universities/Institutions has also been planned on a larger scale. For encouraging skill development, many Certificate

courses have been planned for students in advanced futuristic technologies like Artificial Intelligence and Cyber Security.

In addition to these, special activities like exhibitions, short films, documentaries, carrying out plantations on a large scale, have been planned.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1704382>



**पत्र सूचना कार्यालय**

**भारत सरकार**

**रक्षा मंत्रालय**

*Fri, 12 March 2021 5:17PM*

## **डीआरडीओ ने भारत की स्वतंत्रता के 75 वर्ष पूरे होने के उपलक्ष्य में आजादी का अमृत महोत्सव की शुरुआत की**

**अगले 75 हफ्तों में राष्ट्रीय निर्माण और आत्मनिर्भरता**

**पर केंद्रित गतिविधियों को आयोजित किया जाएगा**

रक्षा अनुसंधान एवं विकास (आरएंडडी) विभाग के सचिव और रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) के अध्यक्ष डॉ. जी सतीश रेड्डी ने 12 मार्च, 2021 को डीआरडीओ भवन में आजादी का अमृत महोत्सव की शुरुआत की। इस कार्यक्रम में डीआरडीओ के महानिदेशक और बेंगलुरु, हैदराबाद, पुणे, तेजपुर एवं विशाखापत्तनम सहित सभी बड़े केंद्रों के वैज्ञानिक एवं अन्य अधिकारी वर्चुअल माध्यम से उपस्थित हुए।

आजादी का अमृत महोत्सव भारत की स्वतंत्रता के 75 साल पूरे होने के उपलक्ष्य में आयोजित किया गया है। 12 मार्च, 2021 को शुरू हो रहे इस महोत्सव को विभिन्न विषय वस्तुओं के साथ मनाया जाएगा। डीआरडीओ का प्रयास इस महोत्सव को 'आत्मनिर्भर भारत' विषय वस्तु पर प्राथमिक रूप से केंद्रित करने का रहेगा और इस विजन को साकार करने की दिशा में घोषणाएं की जाएंगी। डीआरडीओ 75 हफ्तों तक इस महोत्सव का मनाएगा। इस दौरान राष्ट्र निर्माण, आत्मनिर्भरता प्राप्त करने, वैज्ञानिक नवाचारों को प्रोत्साहित करने, मानव संसाधनों का विकास करने की दिशा में विभिन्न गतिविधियों के आयोजन सहित अन्य संबंधित विषयों की मेजबानी करेगा।

इस महोत्सव के दौरान डीआरडीओ प्रधानमंत्री के विजन के अनुरूप रक्षा अनुसंधान एवं विकास विभाग के सचिव और डीआरडीओ के अध्यक्ष द्वारा निर्धारित लक्ष्यों को पूरा करने के लिए नई ऊर्जा के साथ काम करेगा। डीआरडीओ के अध्यक्ष ने डीआरडीओ के लोगों से उद्योग और अकादमिक क्षेत्र को आगे बढ़ाने के लिए विशेष प्रयास करने का आहवाहन किया। डीआरडीओ विभिन्न तरीकों से महोत्सव के लक्ष्यों को प्राप्त करने के लिए उनके साथ काम करेगा।

डीआरडीओ की योजना प्रौद्योगिकी विकास के लिए ऊष्मायन केंद्रों के माध्यम से स्टार्टअप्स की हैंड होल्डिंग बढ़ाने की है। विभिन्न उद्योगों की तकनीकी प्रस्तावों को बड़ी संख्या में प्रौद्योगिकी विकास निधि (टीडीएफ) योजना के तहत प्रक्रिया में लाया जाएगा। वहीं, तकनीकों के हस्तांतरण के लिए लाइसेंसिंग समझौतों की संख्या (एलएटीओटीएस) बढ़ाकर 100 से अधिक की जाएगी। इस महोत्सव की पूरी अवधि के दौरान उत्तर पूर्वी क्षेत्रों में पीने योग्य पानी के लिए स्थानीय उद्योगी को टीओटी, डीआरडीओ के वैज्ञानिकों द्वारा विभिन्न उद्योगों में सहभागिता/यात्रा, डीआरडीओ के उत्पादों के निर्यात को बढ़ावा देने के

लिए पेटेंट दर्ज करना और इनकी विदेशों तक पहुंच बनाने को लेकर भी बड़े पैमाने पर योजना बनाई गई है।

अकादमिक क्षेत्र को साथ अधिक सहयोग को बढ़ावा देने के लिए विभिन्न तरह की गतिविधियों की योजना बनाई गई है। इनमें अकादमिक संस्थानों को नई चुनौतियां प्रदान करना, छात्रों के लिए इंटरनेशिप बढ़ाना और डीआरडीओ प्रयोगशालाओं/केंद्रों में छात्रों को प्रशिक्षुता प्रदान करना शामिल हैं। इसके अलावा रक्षा संबंधी विभिन्न विषयों पर पीएचडी छात्रों का डीआरडीओ प्रयोगशालाओं में नामांकन किया जाएगा। वहीं, क्षेत्रीय भाषाओं में वैज्ञानिक शोध पत्रों और रक्षा संबंधी लेखों के प्रकाशन को भी अधिक महत्व दिया जाएगा। विश्वविद्यालयों/संस्थानों में रक्षा संबंधित क्षेत्रों पर पाठ्यक्रमों और सेमिनारों का बड़े पैमाने पर आयोजन करने की योजना बनाई गई है। इसके अलावा कौशल विकास को प्रोत्साहित करने को लेकर कृत्रिम बुद्धिमत्ता और साइबर सुरक्षा जैसी भविष्य की उन्नत तकनीकों में छात्रों के लिए कई प्रमाणपत्र पाठ्यक्रमों की भी योजना बनाई गई है।

इसके अतिरिक्त, बड़े पैमाने पर विशेष गतिविधियां जैसे; प्रदर्शनियां, लघु फिल्में, वृत्त चित्रों, वृक्षारोपण को करने की भी योजना बनाई गई है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1704477>



Sat, 13 March 2021

## DRDO launches Aazadi Ka Amrut Mahotsav

By Aksheev Thakur

### Highlights

**Aazadi Ka Amrut Mahotsav was launched on March 12 by Secretary DDR&D & Chairman, Defence Research Development Organisation (DRDO) Dr G Satheesh Reddy at DRDO Bhawan in the national capital.**

Aazadi Ka Amrut Mahotsav was launched on March 12 by Secretary DDR&D & Chairman, Defence Research Development Organisation (DRDO) Dr G Satheesh Reddy at DRDO Bhawan in the national capital. Director Generals, DRDO scientists and other officers attended the event virtually from all major centres including Bengaluru, Hyderabad, Pune, Tezpur, Visakhapatnam among others.

DRDO has made elaborate plans to celebrate the Mahotsav throughout the 75 weeks by conducting various activities in the direction of nation building, achieving self reliance, encouraging scientific innovations, developing human resources and host of other related topics.

Aazadi Ka Amrut Mahotsav is being organised to commemorate the 75 years of India's independence and will be celebrated for 75 weeks starting from March 12 with various themes. DRDO efforts will be primarily focused on Aatm Nirbhar Bharat theme and the announcements made will be in the direction of realizing that vision.



DRDO launches Aazadi Ka Amrut Mahotsav

During the mahotsava, DRDO plans to enhance handholding of startups through incubation centres for technology development. Technology proposals from various industries will be processed under the Technology Development Fund (TDF) scheme in larger numbers. Number of

Licensing Agreements for Transfer of Technologies (LAToTs) will be increased to greater than 100.

Transfer of Technology (ToT) to local industry for potable water in North Eastern Regions, Interactions/visits by DRDO scientists to various industries, filing of patents and reaching out to foreign countries to promote export of DRDO products have also been planned in a bigger way over the entire duration of the Mahotsav.

In order to promote greater collaboration with academia, a wide variety of activities have been planned such as providing new challenges to academic institutes, increasing internships to students and providing apprenticeships to students in DRDO laboratories/centres . Besides, PhD students will be enrolled in DRDO laboratories on various defence related topics. More importance will be given to publication of scientific research papers and defence related articles in regional languages. Organizing courses and seminars on defence related areas in Universities/ Institutions has also been planned on a larger scale.

To encourage skill development, many Certificate courses have been planned for students in advanced futuristic technologies like Artificial Intelligence and Cyber Security. In addition to these, special activities like exhibitions, short films, documentaries, carrying out plantations on a large scale etc., have also been planned.

#### **IAF carries out a unique flying display**

As a part of Amrit Mahotsav, the Surya Kiran aerobatic team of the IAF carried out a unique flying display in the skies of Coimbatore today. The team created magic in the air by flying in a formation depicting the numeral "75" with seventeen Aircrafts. The team led by Group Captain Anoop Singh was in the air for more than half an hour covering the length and breadth of the town.

The air display was a part of yearlong "Amrit Mahotsav" being celebrated by the nation in tune with Hon"ble Prime Minister's clarion call to all public representatives to participate in the nationwide activities at 75 locations for the coming 75 weeks. The display showcased a spirit of adventure and exhibited the diverse flying skills of the men in Blue.

<https://www.thehansindia.com/karnataka/drdo-launches-aazadi-ka-amrut-mahotsav-676619?infinitescroll=1>



## **DRDO Chairman Dr G Satheesh Reddy visits DRL Tezpur**

*Dr G Satheesh Reddy, Secretary, Department of Defense, R & D and Chairman, Defense Research and Development Organization (DRDO), visited Defense Research Laboratory (DRL), Tezpur*

Tezpur: Dr G Satheesh Reddy, Secretary, Department of Defense, R & D and chairman, Defense Research and Development Organization (DRDO), visited Defense Research Laboratory (DRL), Tezpur and DRL R & D Centre at Tawang, Arunachal Pradesh on March 13 and March 14. He was accompanied by Dr A K Singh, DG (Life Science), and K S Varaprasad, DG (HR) and other high-ranking officials from DRDO HQ, New Delhi.

On March 13, Dr Reddy attended review of ongoing DRL R & D activities and guided DRL scientists towards future course of research. Several issues pertaining to development, successful deployment and induction of different DRL products like Long Lasting Insecticidal Net (LLIN), Iron Removal Unit (IRU) and Bio-Toilet in the armed forces and paramilitary were also discussed at length. The unique operational features of each of the products like no-power requirement of IRU, complete degradation of human faecal matter by Bio-toilet and multiple wash ability of LLIN were highlighted by the chairman. Dr Reddy entered into close discussions with the state and military authorities of both Assam and Arunachal Pradesh to envisage scope of further successful interactions with both the stakeholders.

The chairman applauded the contribution made by DRL in mitigating the corona challenge in this part of the State by conducting PCR based sample testing and large scale sanitation drives. The Chairman also addressed all ranks of DRL in an open forum and assured to strengthen the only DRDO lab in the Northeast by providing more manpower and funds.

On March 14, the Chairman visited DRL R & D Centre at Tawang and took stock of the progress on ground. Then he visited Tawang War Memorial and adjoining places of interest before leaving for Delhi.

<https://www.sentinelassam.com/north-east-india-news/assam-news/drdo-chairman-dr-g-satheesh-reddy-visits-drl-tezpur-528501?infinite-scroll=1>

# Why did India reject Eurojet Engine in favor of GE F404 to propel its Tejas Fighter Jets?

By Mansij Asthana

As India is commissioning indigenous Tejas fighter jets in the air force, experts analyze why the Indian DRDO opted for General Electric's GE F404 instead of Eurojet engines that also powers Eurofighter Typhoons and many others.

Developed by the state-owned Hindustan Aeronautics Limited (HAL), Tejas is a single-engine, fourth-generation, multirole light combat aircraft (LCA). Given its capabilities, experts see Tejas as the future aircraft for the Indian Air Force.

The development of the HAL Tejas fighter is considered a flagship project under Prime Minister Narendra Modi's 'Make in India' initiative.

India had for long relied on the Kaveri engines developed by the Defence Research and Development Organisation (DRDO). The home-grown low bypass twin-spool turbofan Kaveri jet engine was slated to provide an 80 KN power pack and adequate 'thrust to weight' ratio for the Tejas fighter.

However, it was deemed insufficient for the requirements of the fighter jet.

To meet India's need to field a modern fighter jet, it had to find a new engine that is of international standards. It shortlisted two engines for the Tejas: the Eurojet EJ200 engine and General Electric's GE F404 engine.

## The EJ200 Engine

The Eurojet EJ200 is a military low-bypass turbofan engine that has been developed by the Munich-headquartered EuroJet Turbo GmbH.

The engine powers the Eurofighter Typhoon multi-role fighter jet. It is largely based on the Rolls-Royce XG-40 technology demonstrator that was developed in the 1980s.

The EJ200 engine has also been used in the Bloodhound LSR supersonic land speed record attempting car.

Despite the fighter jet engine being smaller and simpler in layout than its contemporaries, according to Rolls Royce, the EJ200 still delivers an unprecedented power-to-weight ratio for a fighter jet.

The engine possesses next-generation technology, power for multi-role capability, and a high thrust-to-weight ratio, making it ideal for the most demanding military aircraft applications

## The GE Engine

Produced by GE Aviation, the GE F404 is a family of afterburning turbofan engines falling in the 10,500–19,000 lbf (47–85 kN) class (static thrust).





The engine provides a maximum thrust of 11,000 lbf (48.9 kN) and a thrust of 17,700 lbf (78.7 kN) with an afterburner. The overall pressure ratio of the engine stays at 26:1, the Bypass ratio is 0.34:1, with the Thrust-to-weight ratio being 4.8 (dry), 7.8 (afterburning).

### **Why India Chose GE Engine**

As per reports, when India looked at the possibility of procuring the EJ-200 engines for the Tejas fighters, they had the Eurofighter Typhoons in mind as well.

If the engines were built within India for the Tejas fighter, the Eurofighter would benefit from a fully amortized engine line while also being entitled to offset credits for the 'made-in-India' Eurofighter EJ200 engines.

This would in turn reduce the price of the Typhoons to India, which could have been a big advantage for a fighter jet that was considered advanced but expensive.

On the other hand, with the GE F404 engines, India's Tejas fighters would get engines that possessed the much-needed stability and reliability to the Tejas fighter jet at a time when New Delhi's rivals Beijing were having engine troubles with the Chengdu J-20 stealth fighters.

According to General Electric itself, the F404 is one of the most versatile engines in its class, making it a compelling option for applications around the world.

The engine powers fighter jets like the Boeing T-7 Red Hawk advanced jet trainer, the South Korean KAI T-50 Golden Eagle light combat aircraft, the Northrop F-20 Tigershark, the Lockheed Martin F-117 Nighthawk, and the McDonnell Douglas F/A-18 Hornet.

With the history of powering such incredible aircraft, it was no doubt that the American engines truly had a very high caliber and met all international standards.

The F404 engine provides higher power, improved fuel efficiency, and increased mission capability for the combat-proven Boeing F/A-18C/D Hornet. It seems India wanted to go for the best when it came to Tejas fighter jets.

Earlier, the engine has already been praised by former Indian Air Force Air Chief Marshal Birender Singh Dhanoa, who said that the American-made engines had excellent fuel efficiency and that he had rarely seen that among the contemporary fighter jets that he had flown during his career.

<https://eurasianimes.com/why-india-dumped-eurojet-engine-in-favor-of-ge-f404-tejas-fighter/>



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Ministry of Defence

*Fri, 12 March 2021 5:44PM*

### **Mobile Integrated Network Terminal (MINT) for Indian Army under Aatmanirbhar Bharat Abhiyaan**

1. Robust communication support has always been a key enabler of combat potential of the field army. Advancements in communication technologies have facilitated solutions which can be adapted and customised as per operational requirements to give a distinctive winning edge.
2. To this end, the Indian Army is in the process of procuring Mobile Integrated Network Terminal (MINT) systems under Make II Category of DAP 2020. The system is envisaged as a lightweight, portable, state of art integrated communication solution with satellite backhaul and wireless access system to support voice, video and data. Post evaluation of response submitted by the Indian Industry, a total of 11 (eleven) firms have been issued with the Project Sanction Order on 12 March 2021 for development of prototype. The Contract will subsequently be placed with one of the firms on successful development of prototype as per provisions of Buy (Indian-IDDM) of DAP 2020.
3. Development of MINT systems will enhance the operational communication capability of the field army in consonance to the self-reliance vision of “Aatmanirbhar Bharat” for Defence production.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1704393>



पत्र सूचना कार्यालय  
भारत सरकार  
रक्षा मंत्रालय

*Fri, 12 March 2021 5:44PM*

## आत्मनिर्भर भारत अभियान के अंतर्गत भारतीय सेना के लिए मोबाइल इंटीग्रेटेड नेटवर्क टर्मिनल (मिंट)

मजबूत संचार प्रणाली हमेशा से ही मैदान पर सेना की युद्ध क्षमता का एक प्रमुख घटक रही है। संचार प्रौद्योगिकियों में हुई प्रगति ने अपनाए जाने वाले ऐसे समाधान प्रस्तुत करने की प्रक्रिया को सुगम बनाया है जिन्हें सामरिक आवश्यकताओं के अनुरूप ढाला जा सकता है।

इसके लिए भारतीय सेना डीएपी 2020 की मेक II श्रेणी के अंतर्गत मोबाइल इंटीग्रेटेड नेटवर्क टर्मिनल (मिंट) सिस्टम खरीदने की प्रक्रिया में है। इस प्रणाली की परिकल्पना वॉयस, वीडियो और डेटा का साथ देने वाली ऐसी प्रणाली के तौर पर की जा रही है जो वजन में हल्की, एक से दूसरे स्थान पर ले जाने में आसान है तथा जिसमें सैटेलाइट बैकहॉल एवं वायरलेस एक्सेस प्रणाली समेत अत्याधुनिक एकीकृत संचार समाधान हैं। भारतीय उद्योग द्वारा प्रस्तुत प्रतिक्रिया के मूल्यांकन के बाद प्रोटोटाइप के विकास के लिए दिनांक 12 मार्च 2021 को परियोजना स्वीकृति आदेश के साथ कुल 11 (ग्यारह) फर्मों को जारी किया गया है।

इसके बाद डीएपी 2020 के बाय (इंडियन-आईडीडीएम) के प्रावधानों के अनुसार प्रोटोटाइप के सफल विकास पर एक फर्म के साथ अनुबंध प्रदान किया जाएगा।

मोबाइल इंटीग्रेटेड नेटवर्क टर्मिनल (मिंट) सिस्टम्स का विकास फील्ड आर्मी की सामरिक संचार क्षमता में बढ़ोतरी करेगा जो कि रक्षा उत्पादन के क्षेत्र में "आत्मनिर्भर भारत" के आत्म-निर्भरता दृष्टिकोण के अनुरूप है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1704457>

# New-age wars of the 21st century and Indian Navy's tryst with unmanned systems

*The Indian Navy aims to achieve complete Unmanned Solutions with fusing all the data collected by various unmanned systems deployed*

*By Huma Siddiqui*

The Indian Navy aims to achieve complete Unmanned Solutions with fusing all the data collected by various unmanned systems deployed. Some platforms in the pipeline including 10 drones from the US based General Atomics; 10 Naval Shipborne Unmanned Aerial System (NSUS); minesweepers are expected to be part of the Indian Navy soon.

“The world has changed and there are new enemies and new wars to fight in the 21st century, and for this purpose new war machines with the state of the art technologies are needed,” explained a service veteran.

In India the three services are in the midst of massive shift in priorities for defence expenditure, and the focus has slowly shifted from combating terrorism towards fighting off the aggressions of — China and Pakistan.

Top sources confirmed to Financial Express Online, “Due to budgetary constraints, there is a push towards fleet rationalization. And have reached a point where in place of manned platforms the focus has shifted to unmanned platforms. For instance, there is a requirement for 12 minesweepers. So, the navy is looking for unmanned minesweepers, additional P-8Is, NSUS, and more UUVs.” Adding, “The Indian Navy has always the latest technology whether it is an eye in the sky or Sonar and UUVs to deal with threats underwater.”



The Indian Navy has been pushing for High Altitude Long Endurance (HALE) drones to beef up surveillance to keep an eye on the huge Ocean space as well as increasing its profile in the Indian Ocean Region (IOR). (Image: boeing.co.in/)

“The data gathered that is gathered through AI based software is for better and faster analysis for seamless flow of information and helps the navy in its operations.”

## What is Indian Navy getting?

The Indian Navy has been pushing for High Altitude Long Endurance (HALE) drones to beef up surveillance to keep an eye on the huge Ocean space as well as increasing its profile in the Indian Ocean Region (IOR).

As has been reported by Financial Express Online earlier, a deal with the US based General Atomics is expected to be inked soon. The Indian Navy is going to acquire 10 Predator (MQ-9) series UAVs.

The Predator (MQ-9) UAV from the US is perhaps the most iconic aircraft of the war on terror. Over two decades the people across the globe have grown familiar with the Drones.

## How did the Predators get the name Sea Guardian?

General Atomics defines Sea Guardians as highly modular and easily configurable High altitude Long Endurance Remotely Piloted Vehicles/Aircraft (RPV/RPA). This allows the customer selected combination of payloads to be fitted onboard, thus making it specialized for specific needs. According to sources, “Indian Navy, which is the lead service for the procurement of HALE, exploited this ability and selected some of the latest most versatile sensors and payloads to make it better than the aircraft being operated by the customer themselves.”

A team of its best unmanned crew went globetrotting for selection of the airframe and sensors package. And through their journey, the Indian Navy team got an opportunity to interact with USAF, and RAF officers to understand the operational performance of their sensor packages. “To understand real world ranges in the Maritime Domain, the protector programme in particular was helpful. And through this dedicated and tedious process India’s Sea Guardian was conceived. The UAVs presently on lease are just a shade of cross domain capable aircraft yet to come,” explained a source.

Being a technological intensive and network centric service, Indian Navy has already commenced defining various Letters Of Intent (LoIs) towards the MUM-T (Manned and Unmanned Team). This would give the commander at sea, increased flexibility and reduced sensor shooter timeline. Sea Guardian is fully capable to interact and share information with P-8I multirole maritime ASW aircraft.

Negotiations are going on with the US based Boeing company for a contract of 10 Naval Ship borne Unmanned Aerial Systems. In fact when the US Defense Secretary visits India next week this will be topping the agenda for discussions.

### **Induction of NSUS is expected soon**

These are ship launched tactical unmanned aircraft, that would provide cover to ships on Mission Based Deployment or Picket ships which are operating away from shore based air support ability to build MDA without any electronic emissions emanating from the mother ship. The stealth and surprise both can be maintained whilst continuing tracking the vessel of interest.

### **How will these help the Indian Navy?**

All these new unmanned inductions are very critical as there has been a spurt in UUVs incidents across the globe. And in the case of the Indian Navy’s air ASW platform, the arrival of MH-60 R is still awaited and the Dunking Sonar has aged.

During this period, it becomes very important for the Navy to induct both HALE and NSUS at the earliest. The interesting fact about the Quad (India, the US, Japan and Australia) meeting is that all the four members have great interest in the Sea Guardian and are operating P8-I and MH-60R.

### **Interoperability**

Once the HALE drones are inducted in the navy they can be used for surveillance, and the P-8Is will be for Anti-Submarine Warfare (ASW) roles. The Sea Guardian can fly in sync with its P-8Is.

Since both India and the US have inked the Communications Compatibility and Security Agreement (COMCASA) in 2018, the US origin platforms will get encrypted systems which are expected to further improve their capabilities.

This takes the interoperability between the two to the next level. And will be of great help when the navies of the Quad go in for the next Malabar exercise.

### **Unmanned Minesweepers?**

The navy is keen to get the unmanned minesweepers. The US Navy and the Royal Navy already have these in service. These minesweepers are used for triggering modern naval mines without endangering manned vessels or crew.

<https://www.financialexpress.com/defence/new-age-wars-of-the-21st-century-and-indian-navys-tryst-with-unmanned-systems/2211827/>

## At least 50% of required Sig Sauer rifles received by Indian Army infantry battalions: Officials

*India has been training Uzbekistan soldiers in handling the new rifles*

The Uzbekistan Army has been learning to handle Sig Sauer assault rifles from the Indian Army during the joint exercise that is happening currently in Chaubatia of Ranikhet district, said senior military officials on Friday.

Moreover, all infantry battalions of the Indian Army have got at least 50 per cent of the required Sig Sauer rifles, said its spokesperson Colonel Aman Anand.

The frontline infantry battalions (posted along the Line of Control or the Line of Actual Control) have got Sig Sauer rifles in a much larger number while other battalions have got at least 50 per cent, he added.

The military exercise called Dustlik-2 between India and Uzbekistan started on March 10 and it will end on March 19.

Col Amit Malik, who heads the 13th battalion of the Kumaon Regiment, said, "We will be training them (Uzbekistan Army personnel) because they would be using it for the first time."

Around 45 personnel of the 13th battalion are conducting a joint exercise with around 45 personnel of the Uzbekistan Army. The focus of this military exercise has been counterterrorist operations.

The mainstay of the Indian Army's infantry has been the indigenously-built Insas 5.56 mm rifle, which has a firing range of around 400 metres. However, the Army has recently been shifting to the American Sig Sauer 7.62 mm rifle, which has a firing range of 600 metres.

The defence ministry had in September last year approved the procurement of 72,000 Sig Sauer rifles for the Indian Army.

<https://www.theweek.in/news/india/2021/03/13/at-least-50-of-indian-army-infantry-battalions-received-sig-sauer-rifles-officials.html>



An Indian Army soldier with the newly acquired Sig Sauer 716 | ADGPI Twitter

## UAE के आसमान में भारत के सुखोई SU-30MKI

### ने लगाई दहाड़, पाकिस्तान के क्यों छूटे पसीने?

भारत और यूएई के बीच बढ़ते आपसी संबंधों के बीच दोनों देश इस समय साझा युद्धाभ्यास कर रहे हैं। 'डेजर्ट फ्लैग' नाम के इस युद्धाभ्यास में भारतीय वायुसेना के छह सुखोई एसयू-30एमकेआई, एक आईएल-78 एयर रिफ्यूइलिंग एयरक्राफ्ट और दो सी-17 ग्लोबमास्टर ट्रांसपोर्ट एयरक्राफ्ट शामिल हैं।

By Priyesh Mishra

भारत और यूएई के बीच बढ़ते आपसी संबंधों के बीच दोनों देश इस समय साझा युद्धाभ्यास कर रहे हैं। 'डेजर्ट फ्लैग' नाम के इस युद्धाभ्यास में भारतीय वायुसेना के छह सुखोई एसयू-30एमकेआई, एक आईएल-78 एयर रिफ्यूइलिंग एयरक्राफ्ट और दो सी-17 ग्लोबमास्टर ट्रांसपोर्ट एयरक्राफ्ट शामिल हैं। यूएई के आसमान में उड़ान भर रहे भारत के इन लड़ाकू विमानों की गूंज वहां से करीब 1700 किलोमीटर दूर पाकिस्तान में सुनाई दे रही है। इस युद्धाभ्यास में भारत और यूएई के अलावा फ्रांस, अमेरिका, सऊदी अरब, दक्षिण कोरिया और बहरीन की सेना हिस्सा ले रही है। यह पहला मौका है जब भारत की वायुसेना यूएई में आयोजित किसी युद्धाभ्यास में एक्टिव पार्टिसिपेट कर रही है। इसमें तुर्की के कट्टर दुश्मन ग्रीस को भी ऑब्जर्वर की भूमिका में शामिल किया गया है, जिसे सीधे तौर पर मध्यपूर्व में बदलते रणनीतिक हालात से जोड़कर देखा जा रहा है।

#### कई देशों के साथ गरज रहे भारत के लड़ाकू विमान

तीन से 27 मार्च तक होने वाले युद्धाभ्यास 'डेजर्ट फ्लैग' में भारत के लड़ाकू विमान अलग-अलग देशों के साथ उड़ान भर रहे हैं। इस युद्धाभ्यास को यूएई के अल धाफ्रा एयरबेस पर आयोजित किया जा रहा है। यह वही एयरबेस है, जहां फ्रांस से भारत आते समय राफेल विमानों की पहली खेप ने थोड़े समय तक आराम किया था। ऐसे में सामरिक रूप से बेहद अहम अदन की खाड़ी के नजदीक स्थित इस एयरबेस से ऑपरेट करने से भारत की सामरिक ताकत और सभी सहयोगी देशों के साथ दोस्ती भी मजबूत हो रही है। इस अभ्यास में ग्रीस, जॉर्डन, कुवैत और मिस्र को पर्यवेक्षक राष्ट्र का दर्जा दिया गया है। जिससे पाकिस्तान और मुस्लिम जगत का खलीफा बनने की चाहत रखने वाले तुर्की की टेंशन बढ़ना तय है।

#### नरवणे के दौर से युद्धाभ्यास की लिखी गई पटकथा

पिछले साल के अंतिम महीने में भारतीय सेना प्रमुख जनरल एमएम नरवणे संयुक्त अरब अमीरात (यूएई) और सऊदी अरब के ऐतिहासिक दौर पर पहुंचे थे। यह भारत के किसी भी सेना प्रमुख का सऊदी अरब और यूएई का पहला दौरा था। इस दौरान उन्होंने न केवल दोनों देशों के सेना प्रमुखों से मुलाकात की, बल्कि यहां के बड़े स्तर के कई नेताओं के साथ भी बैठकें भी की थी। यही कारण है कि संयुक्त अरब अमीरात और सऊदी अरब ने भारत के साथ युद्धाभ्यास करने का निर्णय लिया। ये दोनों देश अब भारत के साथ रक्षा सहयोग बढ़ाने पर तेजी से काम कर रहे हैं। यही कारण है कि सऊदी और यूएई अब भारत के साथ कंधे से कंधा मिलाकर चलने को तैयार हैं।

#### पाकिस्तान के लिए कैसे है यह तगड़ा झटका

सऊदी अरब का भारत के साथ सैन्य संबंध बढ़ाना सीधे तौर पर पाकिस्तान के लिए तगड़ा झटका है। अबतक पाकिस्तान अपनी सेना का लालच देकर ही यूएई और सऊदी अरब से खैरात पाता था। लेकिन, पिछले साल कश्मीर को



UAE के आसमान में भारत के सुखोई SU-30MKI ने लगाई दहाड़, पाकिस्तान के क्यों छूटे पसीने?

लेकर प्रिंस सलमान की आलोचना करने के कारण पाकिस्तान और सऊदी अरब के संबंध सबसे खराब दौर से गुजर रहे हैं। सऊदी को मनाने पहुंचे पाकिस्तान के सेना प्रमुख जनरल कमर जावेद बाजवा को भी बिना प्रिंस से मिले खाली हाथ वापस लौटना पड़ा था। वहीं यूएई ने एक दिन पहले ही कंगाल पाकिस्तान से एक अरब डॉलर की दी गई राशि को वापस मांगा है। ये रकम स्टेट बैंक ऑफ पाकिस्तान में जमा है। इसे लौटाने की लास्ट डेट 12 मार्च है। यूएई ने यह रकम इसलिए वापस मांगी है कि उसकी मैच्योरिटी हो गई है। ऐसे में अगर पाकिस्तान यह पैसा वापस कर देता है तो उसके फॉरेन रिजर्व में बहुत बड़ी गिरावट होगी।

### **भारत के साथ संबंध बढ़ा रहे सऊदी अरब और यूएई**

अब तक अरब देशों में पाकिस्तान सेना की अच्छी पकड़ रही है। यमन में सऊदी अरब की सेना का नेतृत्व पाकिस्तान के पूर्व सेना प्रमुख जनरल राहिल शरीफ कर रहे हैं। अब सऊदी अरब और उसका घनिष्ठ दोस्त यूएई दोनों ही भारत के साथ रक्षा संबंध बढ़ा रहे हैं। भारत ने 20-25 फरवरी के बीच अबू धाबी में हुई दो नेवल डिफेंस एग्जिबिशन में INS प्रलय को भेजा था। पिछले साल दिसंबर में सेना प्रमुख जनरल मनोज मुकुंद नरवणे ने सऊदी अरब और UAE की यात्रा की थी। यही नहीं जब राफेल लड़ाकू विमान फ्रांस से भारत आ रहे थे तो उन्हें UAE के एयरफोर्स टैंकर्स ने मिड एयर रिफ्यूइलिंग सपोर्ट दिया था। भारतीय वायुसेना ने भी हाल ही में अपने राफेल जेट्स के साथ जोधपुर में फ्रांस के साथ युद्धाभ्यास किया था।

### **सऊदी अरब के साथ भी युद्धाभ्यास करेगा भारत**

सऊदी अरब और भारत जल्द ही द्विपक्षीय सैन्य अभ्यास करने जा रहे हैं। यह अब तक के इतिहास में इन दोनों देशों के बीच पहला युद्धाभ्यास होगा। यह युद्धाभ्यास सऊदी अरब में आयोजित किया जाएगा। इसके लिए भारतीय सेना का एक दल कुछ महीने में सऊदी अरब के दौरे पर जा सकता है। इस युद्धाभ्यास से न केवस सऊदी अरब की सेना की ताकत में इजाफा होगा, बल्कि खाड़ी के देशों में रणनीतिक हालात में भी बड़ा बदलाव होगा।

### **पाकिस्तान के साथ सऊदी का सैन्य संबंध होगा खत्म**

पाकिस्तान अबतक सऊदी अरब की सेना को ट्रेनिंग और हथियार मुहैया कराता था। इतना ही नहीं, इस्लाम के सबसे पवित्र स्थलों में शामिल मक्का और मदीना की सुरक्षा में भी सऊदी अरब पाकिस्तान का सहयोग लेता है। अब भारत की एंट्री से पाकिस्तान के लिए राह और मुश्किल हो जाएगी। सऊदी को यह पता है कि भारत के साथ संबंध बढ़ाना पाकिस्तान की तुलना में अधिक लाभदायक है। इसलिए, अब पाकिस्तान फिर से कौड़ियों का मोहताज होने वाला है।

<https://navbharattimes.indiatimes.com/world/uae/indian-air-force-sukhoi-su-30mki-in-exercise-desert-flag-vi-with-uae-air-force-effect-on-pakistan-imran-khan/articleshow/81470499.cms?story=4>



## Four reasons why the Indian Air Force ‘Could Overlook’ US Fighter Jets like F-21, F-15EX

By Prakash Nanda

As India and the US are expected to discuss major defense deals, including that of fighter jets, this week, analysts point out the difficulties that New Delhi will face in procuring them.

Soon after US President Joe Biden’s maiden multinational summit with the QUAD heads of the government, his Defence Secretary Lloyd Austin will undertake his maiden foreign visit to three countries – South Korea, Japan, and India – this week. Significantly, two of them – Japan and India — also happen to be America’s QUAD partners.

In his talks with Indian Defense Minister Rajnath Singh in New Delhi, Austin will “discuss operationalizing the major defense partnership that we have with India, including through enhanced information sharing, regional security cooperation, defense trade, and cooperation in new domains”, Acting Assistant Defence Secretary for Indo-Pacific, David F Helvey said on Friday (12 March) after the QUAD summit.



F-15EX (Image courtesy: Boeing)

When it comes to “defense trade”, among other American arms, ammunition, and platforms for India, the most important happens to be Lockheed’s F-16 (or the improved variant F-21), and Boeing’s F-15EX and F/A-18E/F fighters that are bidding for India’s Medium Multi-Role Combat Aircraft (MMRCA) 2 tender of worth about \$20 billion.

MMRCA-2 promotes the Make-in-India initiative, under which the country pursues to jointly manufacture 114 fighter aircraft and assist its Air Force expansion plans. Boeing now seems to be keen on F-15 Ex for the IAF and the F/A-18 Super Hornet Block III for the Indian Navy.

However, despite India’s weapons procurement from the United States jumping from a meager \$6.2 million to a whopping \$3.4-billion in the final year of the Donald Trump administration, and that too at a time when the sale of American weapons to other countries has dipped to \$50.8 billion in 2020 from \$55.7 billion 2019, the chances of either the Lockheed or Boeing succeeding in the MMRCA bid appear remote, according to knowledgeable sources.

This likelihood, however, is not reflective of the otherwise upswing in the Indo-US defense ties. All told, India has already bought American weaponry worth over \$18 billion over the past decade – C-130J Super Hercules transport aircraft, 10 Boeing P-8I long-range maritime patrol aircraft for the Indian Navy, Boeing C-17 Globemaster III heavy-lift military aircraft, Boeing Apache Longbow attack helicopters, 24 anti-submarine warfare Sikorsky MH-60R Seahawks and ammunitions like Raytheon/ Kongsberg National Advanced Surface to Air Missile System-II (NASAMS-II) and 145 M777 howitzers, among others.

But, when it comes to US fighter planes, analysts point out the difficulties that India will face in procuring them.

### Political Hurdle

First, there will be a political problem for India to opt for Lockheed Martin’s F-16 or F-21 (which the company is saying to be made especially for India). It will be difficult to ignore adverse public opinion to buy an aircraft that Pakistan uses, even though it is one of the cheapest fighters available in the international market with a proven record of accuracy and efficiency.

Changing the name from F-16 to F-21 will not remove the stigma attached to the airplane and the negative images it produces in the minds of the Indian public. One may recall here the Bofors scam, for which there was a heavy political price, notwithstanding the gun's superb quality.

Besides, there is an added political factor linked to the incumbent Minister of External Affairs S. Jaishankar. After he retired as the foreign secretary, he was allowed by the Modi government to take up a job as president, global corporate affairs, in Tata Sons in April 2018 by overlooking the mandatory cooling-off period of one year for retired government officials to join any private sector.

And his corporate position was widely seen as a follow-up of the agreement that the Tata Group had signed with Lockheed Martin for the joint production of the F-16 fighter aircraft in India. And from this high-profile corporate position, he was catapulted by Prime Minister Modi as the country's foreign minister in 2019.

Given this background, buying or joint-manufacturing F-16(F-21) will be literally a political bomb for the Modi government.

### **A Costly Proposition?**

Secondly, compared to F-16, going for Boeing's F-15EX will be much more expensive not only to procure but also to fly and maintain. Experts have noted the estimates made by the Air Force Association (an independent, nonprofit, civilian education US organization that is meant to promote dominant U.S. Air & Space Forces, and support for Airmen and Space Professionals) that flying the F-15EX will cost \$27,000 an hour.

As Indian-American military expert Amit Gupta says, for a cash-strapped India, this financial consideration cannot be overlooked because the French Rafale's reported flight cost is \$14,000 an hour.

"Fighter jets, while loved by air forces, have prohibitive costs, are expensive to maintain, and the smart weaponry that makes such systems into lethal platforms cost an arm and a leg", he adds.

### **Too Many Aircraft Types**

Thirdly, India is one of those rare countries whose Air Force flies a mix of French, Russian, and British combat aircraft, a situation that already is a logical and maintenance nightmare. If one adds now a modern American fighter, that will further add to the complexity and expense of the maintenance and operations process.

### **The Nuke Factor**

Fourthly, and this is most important, fighter jets are the third leg of India's nuclear triad. India's 'triad' is a mix of Agni missiles fired from land, maritime strike capability from the INS Arihant under the sea, and dropping from the air through Sukhoi Su-30MKIs, Mirage 2000s, Rafales, and Jaguars.

Combat aircraft are also invaluable in the successful pursuit of the country's nuclear doctrine, which stresses the prevention of both accidental and unauthorized launches because they can be recalled in the event of official authorization not being given or due to an accidental launch.

It may be noted here that one of the unstated but understandable reasons for buying the Rafale was that the French were permitting India to use the aircraft as a nuclear delivery system. This was vital to the mission planning of the IAF which sees combat aircraft as an integral part of its nuclear delivery systems.

Given its domestic laws, the US usually does not permit nations to use or buying its sophisticated weapons to use in combat situations. Their use needs Washington's prior clearance. This being the case, will the US allow India to deliver nuclear weapons through its fighters and bombers?

In other words, India would have to negotiate with the US on whether it had complete autonomy in using American aircraft or whether they would be limited to non-nuclear missions.

If the latter conditionality was imposed it would compromise India's strategic autonomy, which no government in Delhi will allow.

Let alone nuclear weapons, the US special permission will also be needed if the American platforms that India will buy or co-produce are to be fitted with like ammunitions from other countries such as the Israeli and French missiles.

Viewed this, it will be worth watching whether the Singh-Austin meeting will provide some answers.

<https://eurasianimes.com/four-reasons-why-it-will-be-difficult-for-india-to-procure-us-fighter-jets/>



Sun, 14 March 2021

## US Def Sec Austin and Singh to discuss ways to operationalise major defence partnership: Pentagon

*US Defence Secretary Lloyd Austin and Indian Defence Minister Rajnath Singh will discuss ways to operationalise the major defence partnership that the two countries have, according to a top Pentagon official*

*By Lalit K Jha*

US Defence Secretary Lloyd Austin will meet his Indian counterpart Rajnath Singh next week in India and discuss ways to operationalise the major defence partnership that the two countries have, according to a top Pentagon official.

The Indo-US defence ties have been on an upswing in the last few years and in June 2016, the US had designated India a “Major Defence Partner”.

The two countries have also inked key defence and security pacts over the past few years, including the Logistics Exchange Memorandum of Agreement (LEMOA) in 2016 that allows their militaries use each other’s bases for repair and replenishment of supplies as well as provides for deeper cooperation.

Austin will be in India next week, after his stops in Japan and South Korea.

This is for the first time that a US defence secretary is travelling to India on his maiden overseas trip. It will also be the first in-person visit by a top official of the Biden administration to India.

“In India, he’ll meet with Minister Rajnath Singh and others to discuss operationalising the major defence partnership that we have with India, including through enhanced information sharing, regional security cooperation, defence trade, and cooperation in new domains,” Acting Assistant Secretary of Defence for Indo-Pacific Security Affairs David F Helvey told reporters during a conference call.

In New Delhi, the Ministry of Defence said US Secretary of Defence Austin will visit India from March 19 to 21.

India, he said, is an important strategic partnership that involves cooperation with like minded nations committed to protecting the rules-based international order.

Helvey said that the travel to India, will provide an opportunity for exchange of views early on with key allies and partners about how they can work together and expand cooperation to support a rules-based international order, and continue developments of these critical relationships which enable them to do that.



Defence Minister Rajnath Singh will meet US Defence Secretary Lloyd Austin in India next week. (PTI photo)

Austin's visit to India will take place a week after the maiden virtual Quad summit between US President Joe Biden, Prime Minister Narendra Modi, Australian Prime Minister Scott Morrison and Japanese Prime Minister Yoshihide Suga.

The four leaders in a joint statement on Friday said that they brought diverse perspectives and were united in a shared vision for the free and open Indo-Pacific. "We strive for a region that is free, open, inclusive, healthy, anchored by democratic values, and unconstrained by coercion," the statement said.

The Biden administration has made clear the criticality that attaches to promoting peace, security, and prosperity in the Indo-Pacific region and beyond through engaging with and investing in alliances and partnerships; and strengthening our foundation at home to maintain our innovation edge and to rebuild the industrial base, Helvey said.

India, the US and several other world powers have been talking about the need to ensure a free, open and thriving Indo-Pacific in the backdrop of China's rising military manoeuvring in the region. The Chinese military is also actively eyeing the strategic Indian Ocean region to step up Beijing influence.

China claims nearly all of the disputed South China Sea, though Taiwan, the Philippines, Brunei, Malaysia and Vietnam all claim parts of it. Beijing has built artificial islands and military installations in the South China Sea.

In 2017, India, Australia, Japan and the US gave shape to the long-pending proposal of setting up the 'Quad' or the Quadrilateral coalition to counter China's aggressive behaviour in the Indo-Pacific region.

"The upcoming trips by the Secretaries of State and Defence signal the importance of our alliance and partner relationships, which are a real force multiplier in advancing our shared interests in the United States commitment to a rules-based international order, an order that places all nations on a level playing field and holds them responsible for preserving the principles that underpin it," he said.

The Department of Defence, he said, is committed to upholding a free and open Indo-Pacific region where all nations, large and small, are secure in their sovereignty and pursue economic opportunity, resolve disputes without coercion, and have the freedom to navigate and fly consistent with international rules and norms.

"At a time when the region is facing mounting pressure from People's Republic of China and the continued threat from North Korean nuclear weapons and ballistic missile programmes, this trip sends an important signal of resolve to work with allies, partners, and like-minded to promote a peaceful, stable, and resilient order that benefits us all," he said.

Austin will be joining Secretary Tony Blinken for the Security Consultative Committee meeting, or 2+2, in Japan, the highest platform for alliance management that we have with Japan.

"Our alliance is the cornerstone for peace and prosperity in the Indo-Pacific. In addition to the 2+2, Secretary Austin will meet with Minister Kishi and other officials to discuss the continued transformation of this critical alliance and deepen our interoperability," he said.

"Austin, likewise, will join Secretary Blinken for a 2+2 meeting in the Republic of Korea. Our alliance with South Korea is the linchpin of peace and stability not only on the Korean Peninsula but across the region," Helvey told reporters.

<https://www.indiatoday.in/india/story/us-def-sec-austin-and-singh-to-discuss-ways-to-operationalise-major-defence-partnership-pentagon-1778867-2021-03-13>

## Does China have an answer to India's Arihant Missile Submarine?

Because of nuclear propulsion, Arihant can do twelve to fifteen knots on the floor and twenty-four knots underwater. Most diving depth is unknown, and possibly a carefully held secret, however the Akula class is thought to dive to 6 hundred meters. The submarine is manned by a crew of ninety-five to 1 hundred.

A brand new submarine guarantees to provide the world's most populous democratic nation a strong second-strike nuclear functionality. The INS Arihant, India's first nuclear ballistic-missile submarine, will lastly give the nation nuclear weapons that would survive a shock first strike and go on to deal a crushing retaliatory blow to the enemy. The brand new sub will full India's triad of air, land and sea nuclear forces.



India examined its first weapon, an eight-kiloton gadget nicknamed Smiling Buddha, in 1974. Though small in yield, the gadget was an exceptional technological achievement that thrust the younger nation into the unique, so-called “nuclear membership” that had till then consisted of America, Soviet Union, United Kingdom, France and China.

India is believed to have 520 kilograms of plutonium—sufficient for, in response to the Arms Management Affiliation, “100 to 130 warheads.” New Delhi describes this a “credible minimal deterrent” towards neighbouring nuclear powers China and Pakistan. India has a agency No First Use coverage with regard to nuclear weapons, vowing to by no means be the primary to make use of them in any battle and solely use them to retaliate in type.

Nuclear-armed submarines are an excellent basing answer for a rustic equivalent to India. Whereas much less correct than land-based missiles and fewer versatile than air-launched weapons, ballistic-missile submarines are essentially the most tough to destroy in a primary strike. Hiding within the vastness of the oceans, a nuclear-armed submarine is almost invulnerable. And, within the logic of nuclear deterrence technique, an invulnerable nuclear arsenal makes for an invulnerable nation.

The Arihant program goes again greater than three a long time, to the vaguely named Superior Expertise Vessel. Begun in 1974, ATV was broadly conceived as a venture to analysis nuclear propulsion and, down the street, discipline an indigenously developed and constructed nuclear-powered submarine. This system was a collaboration between the Bhabha Atomic Analysis Centre, the Indian Navy and the Indian authorities's Defence Analysis Improvement Centre.

By 1995, ship-sized reactor trials had been underway on the Bhabha Centre in Mumbai. In line with *Fight Ships of the World*, the reactor had been beneath improvement since 1985, weighed 600 tons and was “solely unsuccessful.” By 1989, Russian nuclear scientists and engineers joined the venture, and but this system nonetheless didn't yield a viable reactor. In 1998, the Indian authorities threw within the towel and bought a reactor design outright from Russia, and by 2004, a working eighty-megawatt prototype reactor had been constructed, examined and achieved criticality.

Hull started building in 1998 at Visakhapatnam, however couldn't be accomplished because of the lack of a working reactor. The hull itself is variously reported as based mostly on the Russian Akula/Challenge 971-class nuclear assault submarine or the ex-Soviet Charlie II class. *Fight Fleets of the World* claims it's based mostly on the Akula, and lengthened a further thirty ft to accommodate a missile compartment. Different sources declare it's based mostly on the Charlie II

class, one among which was leased to India from 1988 to 1991 and served as INS Chakra. At both ends, the submarine is estimated to be 330 to 360 ft lengthy, with submerged displacement of 6,500 tons. It's the smallest ballistic-missile submarine on this planet, with the potential exception of the North Korean Gorae class.

Because of nuclear propulsion, Arihant can do twelve to fifteen knots on the surface and twenty-four knots underwater. Most diving depth is unknown, and possibly a carefully held secret, however the Akula class is thought to dive to 6 hundred meters. The submarine is manned by a crew of ninety-five to 1 hundred.

Arihant was formally launched in 2009. The onboard reactor reached criticality in 2013, and the ship started sea trials in late 2014. It was formally commissioned into service in August 2016. In line with Naval Expertise, the entire price ticket was \$2.9 billion.

Arihant's identify actually interprets to "Slayer of Enemies," and the ship's armament makes it the best focus of firepower in Indian historical past. The submarine was constructed with 4 missile tubes mounted in a hump behind the conning tower. The 4 can carry twelve Ok-15 Sagarika ("Oceanic") short-range ballistic missiles. Ok-15 has a most vary of simply 434 miles, making it able to hitting simply the southern half of Pakistan.

Alternately, the sub can carry 4 Ok-Four medium-range ballistic missiles with a 2,174-mile vary, able to hitting targets as far-off as Beijing. Each the Ok-Four and the Ok-15 are nuclear successful, however the warhead yield is unknown. India has but to grasp a number of independently targetable re-entry car (MIRV) know-how, so regardless of the yield of the warhead, Ok-Four and Ok-15 carry simply one among them.

With a purpose to be credible, a seagoing nuclear deterrent will need to have at the very least one submarine on patrol always. The second ship in school, Aridhaman, is beneath building in Visakhapatnam, and India plans to have as many as 4 boomers by 2020—the identical quantity as the UK and France. With the 4 nuclear-armed boats accomplished, India could lastly obtain its aim of strategic invulnerability.

<https://www.defencenews.in/article/Does-China-Have-An-Answer-To-India%e2%80%99s-Arihant-Missile-Submarine-1034059>



*Sat, 13 March 2021*

## **Why Russia's best nuclear submarines are sailing for India**

Here's What You Need to Remember: Though its primary purpose is likely as a testbed to facilitate India's plans to indigenously produce six nuclear attack submarines, it remains to be seen if the Chakra III will become embroiled in the ongoing Sino-Indian tensions in the Indian Ocean and the South China Sea.

In the latest instance of long-standing military cooperation between Moscow and New Delhi, India is set to rent additional Russian nuclear-powered attack submarines as a stepping stone on its path to acquiring an indigenous nuclear submarine force.

### **History:**

A somewhat unusual arrangement, India's willingness to lease—rather than procure or import outright—submarine technology from Russia has clear precedent in recent history. In 1986, the Soviet Union became the first state to lease a nuclear submarine. In an attempt to cultivate the Sino-Soviet defence relationship, the Kremlin inked a deal



with New Delhi for the 10-year lease of a Charlie-class nuclear cruise missile submarine. The transfer was accompanied by a myriad of Soviet-imposed restrictions: the K-43 submarine, which entered service in the Indian Navy as the INS Chakra, was subject to frequent Soviet inspections and maintenance sessions, could not be loaded with certain types of weapons, and was severely restricted for purposes of offensive wartime operations. Further still, the contract stipulated that parts of the INS Chakra were to be manned entirely by Soviet crews; Indian servicemen were reportedly denied access to the reactor. Partially due to these restrictions, New Delhi opted to terminate the lease agreement. The INS Chakra was returned to the Soviet Union in 1990 and decommissioned one year later.

The K-43 contract disintegrated, in no small part, because the Soviets' onerous terms ignored the reasons why India was interested in renting the K-43 in the first place. Namely, the INS Chakra was meant to provide the Indian Navy with the crucial experience of maintaining and operating a nuclear submarine as if it were their own. Secondly, the Indian Navy-- which has long planned on making the leap into domestically produced nuclear attack submarine production-- sought access to Soviet nuclear reactor designs. With the former greatly curtailed and the latter denied outright, New Delhi lost all interest.

### **A Partnership Rebooted:**

The Putin administration, in 2008, negotiated the lease of another nuclear attack submarine, this time the K-152 from the Akula-class. Under the \$900 million lease agreement, Indian engineers and sailors travelled to Russia to receive training on how to operate and service the submarine. The K-152, commissioned as the INS Chakra-II, was partly meant to check Chinese expansion in the Indian Ocean. Despite significant operational differences between the submarines (one is an attack sub, and the other a ballistic missile submarine), the Indian navy used Chakra-II to prepare its submarine crews for the introduction of its nuclear-powered Arihant-class submarine line in 2016. New Delhi was apparently much more interested in renting a submarine from Russia's new Yasen cruise missile submarine line, but there were none available-- other than the older Severodvinsk, all of the new Yasen-M submarines remain in various stages of testing and construction.

With the Chakra II lease set to expire in several years, India has rented yet another Akula-class vessel. Dubbed the Chakra III, the Akula submarine will be transferred to India by 2025 as part of a \$3 billion contract. According to an Indian official, the deal includes the refurbishment of the submarine with Indian sensors and communications components. From what little has been publicly revealed, it appears that this latest contract imposes few restrictions on what the Indian navy is allowed to do with the Chakra-III.

Though its primary purpose is likely as a testbed to facilitate India's plans to indigenously produce six nuclear attack submarines, it remains to be seen if the Chakra-III will become embroiled in the ongoing Sino-Indian tensions in the Indian Ocean and the South China Sea.

<https://www.defencenews.in/article/Why-Russia%e2%80%99s-Best-Nuclear-Submarines-are-Sailing-for-India-1034073>

## **A Proactive Indian Navy: Upcoming Naval Exercises**

*The Indian Navy has a bevy of planned engagements  
this spring, including with the UAE and France*

*By Rajeswari Pillai Rajagopalan*

The Indian Navy is preparing for a busy month ahead with exercises planned with the United Arab Emirates (UAE), France, and the Quad countries. According to media reports, the UAE is set to join India and France for a trilateral naval exercise in the strategically vital Persian Gulf and the Gulf of Oman in late April. The exercise under the Varuna banner is to be held on April 25-27. This is the first time that the UAE will be joining India and France for such an exercise. The French Carrier Strike Group led by aircraft carrier Charles de Gaulle and the Indian Kolkata-class destroyer will be part of this exercise.

Earlier, India also sent a warship to Abu Dhabi to take part in two naval defense exhibitions held on February 20-25, another sign of the breadth of military-to-military engagement between India and the UAE. The Indian Navy ship Pralaya participated in the naval defense exhibition, NAVDEX 21, and the international defense exhibition, IDEX 21. INS Pralaya, built by Goa Shipyard, is a Prabal-class missile vessel fitted with a range of weapons and sensors and is considered a versatile platform meant to undertake a number of surface warfare missions. Indian Navy ships also do routine port calls in the UAE, the latest being that of INS Mysore in February 2021, highlighting the closer maritime cooperation between the two sides.



INS Pralaya, built by Goa Shipyard, is a Prabal-class missile vessel fitted with a range of weapons and sensors and is considered a versatile platform meant to undertake a number of surface warfare missions. Indian Navy ships also do routine port calls in the UAE, the latest being that of INS Mysore in February 2021, highlighting the closer maritime cooperation between the two sides.

India and the UAE started a new bilateral naval exercise in March 2018. “Gulf Star 1” was held off the coast of Abu Dhabi from March 17 to 22, 2018, and saw the participation of two major Indian Navy ships, INS Gomati (a guided missile frigate) and INS Kolkata (a guided missile destroyer). The exercise was a follow up to and a further sign of strengthening defense cooperation between India and the UAE. During the exercise, the ships carried out force protection measures drills, maritime interdiction operations, and cross-deck landing exercises during the sea phase of the exercise. In December last year, in a first, the Indian Chief of Army Staff General M.M. Naravane visited the UAE, reflecting yet again the growing facet of military and security collaboration between New Delhi and Abu Dhabi.

France is likely to join another bilateral exercise in the Indo-Pacific, this time with Australia, too. Since the Galwan clash, India has shown an eagerness to expand its security and strategic partnerships with a number of states. France has been a key strategic partner in the Indo-Pacific. Although relatively new, India-Australia bilateral strategic engagement has gained significant momentum in the last few years. The naval exercise, AUSINDEX, has been maturing and now France is keen to join the series. Officials who spoke to media commented that “discussions are under way on how to take it forward.”

There is also another trilateral – India-Australia-Indonesia – under discussion. More trilaterals and minilaterals are likely to shape up in the coming years with much of the Indo-Pacific broiled in tensions with China due to Beijing’s aggressive behavior across the region and beyond. These exercises also indicate India’s own growing comfort and confidence as well as its increasing preference for naval and other military engagements that are aimed at facilitating and strengthening interoperability, and gaining operational experience in different maritime spaces and with multiple partners. India, as with other countries, stands to gain from these energized engagements.



The second major exercise involving the four Quad countries and France, a Quad-Plus naval exercise, is scheduled for April although the dates are still being worked out. France's role and presence in the Indo-Pacific is unambiguous and the planned Quad-Plus naval exercise is a reiteration of the Quad's commitment to ensure a rules-based order in the Indo-Pacific, with a firm commitment to freedom of navigation. The Quad-Plus exercise will also be an opportunity to showcase the enormous naval strength that the five countries can bring to bear in the Indo-Pacific. According to reports, the exercise in the Bay of Bengal may take place around April 4-7 with missile-guided destroyers, frigates, submarines, and surveillance aircraft engaging in complex maneuvers under the La Perouse banner. India's lone aircraft carrier, INS Vikramaditya, will not be part of this exercise as it has gone into maintenance after an extended deployment during the Galwan crisis with China. It is reported that Indian destroyers, P-8I maritime surveillance aircraft, and a submarine will participate in the Quad-plus naval drills. The naval drills will engage in formation sailing, live firing, communications, search, rescue, damage control, and personnel transfers.

While details are still sketchy, the Quad-Plus naval engagement can be the beginning of a series of such engagements between the Quad countries and a number of European countries who have lately shown quite some interest in the Indo-Pacific. France became the first country to post a liaison officer at the Indian Navy's Information Fusion Center for Indian Ocean Region (IFC-IOR), which is one of the critical steps in strengthening maritime domain awareness in the Indian Ocean region. With more European countries releasing Indo-Pacific strategies, including France, Germany, and the Netherlands, it is clear that European countries also now see a clear interest in maintaining a stable and peaceful Indo-Pacific.

<https://thediplomat.com/2021/03/a-proactive-indian-navy-upcoming-naval-exercises/>

### Quantum leap: This tech will boost communication security

*By Swati Bharadwaj & Swati Rathore*

Hyderabad: In October 2019, Google announced that its 54-qubit processor Sycamore, a quantum computer, performed a complex calculation, that would have taken the world's most powerful supercomputer 10,000 years to solve, in a mindboggling 200 seconds.

While this was a quantum leap for computing technology, this also meant that most of the encryption in place to protect data and communication, especially in critical government infrastructure, defence and nuclear facilities, utilities, banks as well as financial institutions, among others, was no longer safe as the quantum computer could crack these easily.

An Indian startup QNu Labs has found the key to this problem in quantum physics. "It's like the classic chor-police situation. One solution was to use higher mathematical algorithms to create encryption but we decided to opt for quantum physics (or mechanics) instead to prepare the encryption keys so that they cannot be cracked even by a quantum computer," explained Srinivasa Rao Aluri, co-founder & chairman, QNu Labs.

QNu Labs has developed a Quantum Key Distribution (QKD) system called Armos comprising hardware (two black boxes) and software that generate random encrypted keys that can be sent from one end to another safely without the threat of hackers stealing them. Armos can even store keys and passwords in a secure vault.

The two black boxes on either end, for instance from a bank headquarter to a branch, are connected with the help of an optic fiber cable.

The encrypted quantum keys are generated by one box and transmitted with the help of photons to the box at the other end.

"We can generate quantum encryption keys on both sides with zero probability of anyone breaking or stealing them because if the key is intercepted it will get automatically dropped and will be of no use to the hacker. If the key reaches the other end, it means it was not intercepted and is secure," explained Aluri.

While today the system is able to operate when the two boxes are located at a maximum distance of 100 km from each other, the startup is now working on enhancing this distance to 500 km.

"Today, Armos is the size of a small DVD player and in the future we want to shrink this to the size of a mobile phone and ultimately do it on a chip for which we are working on a project with Intel," he said, adding that the startup is also working on a satellite -based solution so that distance will no longer be a problem.

Prof Indranil Chakrabarty from the Centre for Security, Theory & Algorithms, (CSTAR), IIIT Hyderabad, points out that 'Quantum Secure Communications' will revolutionise the field of security with direct impact on areas such as banking, finance and defence.

He said the security of communication depends on how secure your key is. "The security of the key in an existing communication system depends upon the mathematical complexity of the process of decoding the key. However, if the key is generated using the principle of quantum mechanics, this is no longer a mathematical problem and the laws of 'nature' will enforce security," Chakrabarty added.

## QUOTES

Quantum Computing significantly increases today's computational power many times over. This will help us in obtaining significant advancement in the areas like cybersecurity, drug discovery, financial modelling, traffic optimization, weather forecasting and artificial Intelligence —Prof Indranil Chakrabarty | centre for security, theory & algorithms, (cstar), iiit hyderabad  
We are working on multiple solutions to make networks and systems quantum proof across sectors be it defence, nuclear establishments, railway networks, power plants, pharma companies, telecom networks, banks & financial institutions, healthcare.

—Srinivasa Rao Aluri | co-founder & chairman, qnu labs

### **What is Quantum Cryptography?**

The laws of quantum physics allow the photons or particles to be in a state of superposition, which means they represent 1s and 0s in multiple combinations at the same time. They are called qubits. While in classical cryptography, hackers use the public key to derive a private key to decrypt data, in quantum cryptography the keys are symmetrical and randomly generated in real time, making them un-hackable.

### **What is Quantum Key Distribution?**

QKD is a way to secure the network from code-breaking even by a quantum computer. The encrypted data is sent as classical bits but the keys are generated in real time and sent in quantum state so that anyone trying to hack it will find nothing. It's like two people thinking about the same thing at the same time.

### **QKD in defence**

In December 2020, DRDO conducted trials of QKD technology between two labs, DRDL and RCI, to showcase secure communication. The Quantum-based security solution against eavesdropping was validated at a 12-km range and 10dB (decibels) attenuation over fibre optic channel.

<https://timesofindia.indiatimes.com/city/hyderabad/quantum-leap-this-tech-will-boost-communication-security/articleshow/81501185.cms>

# ISRO aims for 7 more launches from India in 2021

By Chethan Kumar

Bengaluru: With the pandemic having enveloped 2020, Isro is targetting at least seven more launches, including the uncrewed Gaganyaan mission, from India this year, while PSU New Space India Limited (NSIL) plans to launch one satellite through a foreign launch provider.

Of the six other than Gaganyaan to be launched from the spaceport in Sriharikota, three will be earth observation, including one for ocean studies, one remote sensing satellite, a commercial launch, and one navigation satellite (see graphic).

A science satellite to study the Sun (Aditya-L1) that was initially targeted for this year won't happen. And, among the launch vehicles, other than the PSLV, Isro will launch three GSLV missions, including the mark-III as part of the uncrewed Gagnayaan mission. Two more will be SSLV (small satellite launch vehicles) class of rockets.

2021 MISSIONS			
Satellite	Launch Vehicle	Launch *	Type
EOS-3/Gisat-1	GSLV-Mk2 F10	March-April	Earth Observation
EOS-2	SSLV-D1	April	Earth Observation
EOS-4/Risat-1A	PSLV C52	July	Remote Sensing
Commercial Sat	SSLV-D2	July	Commercial
EOS-6/Oceansat 3	PSLV C53	October	Ocean Studies
NVS-01/IRNSS-1J	GSLV-Mk2 F14	November	NaVIC Constellation
Gaganyaan #	GSLV-M3	December	Demonstrator
Source: DoS/Isro   *Tentative   #Uncrewed mission   GSAT-24 To Be Launched Through Ariane			

Aside from this, as reported by TOI earlier, NSIL is planning to launch the GSAT-24, being acquired and launched for a private customer — Tata Sky's DTH business — through Arianespace.

Isro chairman K Sivan said: "If you look at the number, then we consider it to be 14 more missions as each launch is two missions (one launch vehicle and one satellite). We are confident of achieving this target and top priority is for Gaganyaan."

He said Aditya had to be pushed to next year as the next launch window — missions to Moon, Sun and other planets have specific windows during which launches can take place — is only available then.

## 5 Key Desi Techs

Stating that the human rating of GSLV is progressing as planned, Sivan said 2021 will see multiple indigenous technologies tested.

"We will have two SSLV launch vehicles technology demonstration flights, we will be testing the revamped GSLV in terms of rockets. On the satellite technology front, we are looking to test the election propulsion on satellites, use two atomic clocks developed indigenously on the NVS-01 and also a key component called TWTA (Traveling Wave Tube Amplifiers) in a communication satellite," Sivan said.

Isro is hoping to completely stop importing these technologies, in line with the Centre's Atmanirbhar mission, and this year will prove key in deciding how quickly the space agency can shift to indigenous technology. "Apart from giving us the edge technologically, it will also save us a lot of foreign exchange," Sivan said.

<https://timesofindia.indiatimes.com/india/isro-aims-for-7-more-launches-from-india-in-2021/articleshow/81455856.cms>

Mon, 15 March 2021

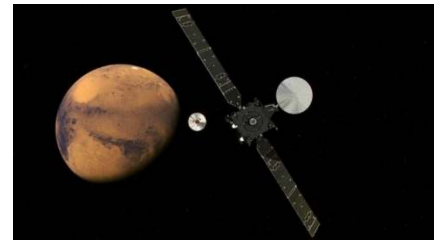
## **Chandrayaan-3 launch by mid 2022, Mangalyaan-2 in definition stage says, ISRO Chairman**

*ISRO is targeting several advanced capabilities including a Heavy-lift launch vehicle that can carry upto 16-ton payloads*

*By Sidharth MP, Edited By Tanweer Azam*

Over the next decade, the Indian Space Research Organization (ISRO) is targeting several advanced capabilities including a Heavy-lift launch vehicle that can carry upto 16-ton payloads to Geostationary Transfer Orbit (which is four times the current lift capability of GSLV Mk3) and also partially, fully reusable launch vehicles, among others, Chairman ISRO and Secretary DoS Dr.K.Sivan said.

In his address to the students and faculty of UPES University, on the “Future of Aerospace and Avionics in India”, he spoke on ISRO’s Chandrayaan-3 (Moon mission 3) and also the ambitious Human Spaceflight programme (Gaganyaan). “We have identified, understood the deficiencies of Chandrayaan-2 and taken corrective measures for the next mission, which we are planning for launch within first half of 2022. Gaganyaan design is in the final stages and project realization has started, all efforts are on for first unmanned mission trial by this year end” he stated.



Representational image

Elaborating on ISRO’s plans for the upcoming year and the near future he said that payload capability to Geosynchronous Transfer Orbit (GTO) will be increased to 5 tons(an increase from the current 4 tons) using a semi-cryogenic engine on the existing GSLV Mk3 rocket. Semi-cryo engines burn rocket-grade kerosene and liquid oxygen, such engines are powerful, environmental friendly and cost-effective.

Sivan also mentioned the need for more powerful booster stages(that power the rocket at lift-off), adding that a more powerful 2000N(Newton) Liquid oxygen and kerosene engine was a work in progress.

The Indian space agency is also making a switch towards environmental-friendly rocket fuels by working on Liquid oxygen-methane and similar green propellants. Engines powered by methane and liquid oxygen (MethaLOX in short) are widely used in reusable rockets as methane is a clean burning fuel that leaves no residue, as opposed to kerosene. Clean burning ensures that the engines can be re-used many times with less or no refurbishment.

“For satellites we are in the final stages of developing a 300mN high-thrust electric propulsion system. This will eliminate use of chemical fuels in satellites and result in lighter satellites by saving on fuel weight” Sivan said.

He added that India’s first test facility for a Semi-cryogenic engine is expected to be ready by later this year and that India had formulated a rocket grade kerosene that they call ISROsene(to fuel the semi-cryo engines), which was formulated using the help of Indian industry. ISRO is also working with industry partners on the long-term production capability of this fuel.

Inviting academia and industry to ideate and provide payloads for India’s second Mars Mission Mangalyaan-2, Sivan said that the second Mars mission project was in its definition stage.

<https://www.dnaindia.com/india/report-chandayaan-3-launch-by-mid-2022-mangalyaan-2-in-definition-stage-says-isro-chairman-2881016>

## **ISRO's commercial arm bags orders to launch four foreign satellites as it looks to invest ₹10,000 crore over the next five years**

Bengaluru: State-run NewSpace India Ltd (NSIL), the commercial arm of the space department, bagged orders to launch four foreign satellites for earth observation from Sriharikota spaceport in Andhra Pradesh, a top official said on Friday.

"We have signed contracts with four foreign customers to launch four satellites in the earth's lower orbit using the PSLV and SSLV rockets of the Indian space agency ISRO (Indian Space Research Organisation) from its spaceport at Sriharikota," NSIL Chairman G. Narayanan told reporters here.

The top official, however, did not disclose names of the customers or their location due to non-disclosure agreements with them.

"Of the four satellites, three will be launched using ISRO's polar satellite launch vehicle (PSLV) and one with its small satellite launch vehicle (SSLV). The spacecraft will be used for earth observation applications," said Narayanan, marking the company's two years of completion.

The state-run NSIL was in the news recently for launching Brazil's earth observation satellite Amazonia-1 on February 28 from the spaceport on board ISRO's PSLV-C51 rocket along with 18 other satellites.

Amazonia-1 is the optical earth observation satellite of National Institute for Space Research (INPE) in Brazil.

In addition to these commercial launches, NSIL will launch two communication satellites for Indian customers offering direct-to-home (DTH) services and telecom operators offering broadband services using Ku-band transponders.

"The two communication satellites, to be launched by ISRO from its spaceport, will be owned and operated by us (NSIL) for customers on commercial terms for revenue-generating services," said Narayanan but declined to name the customers claiming confidentiality.

Unlike the now defunct ISRO's commercial arm Antrix Corporation, which has ceased to function after its deal with Multimedia Deval fell through, the 2-year NSIL is a wholly owned state-run of the department of space as a central public sector enterprise.

NSIL has been formed with Rs 10 crore paid-up capital and Rs 100-crore authorised capital. The space department has provided Rs 700 crore in the budget for fiscal 2021-22 for investing in infrastructure and capacity building to make satellites, rockets and launch them on commercial terms.

"We also plan to invest Rs 2,000 crore per annum over the next five years to ramp up infrastructure to build satellites and rockets, launch them and operate their services for domestic use," asserted Narayanan.

The Rs 2,000-crore for investment per annum will be raised through a mix of equity and debt.

"We will also ramp up our headcount by hiring about 300 more people for stepping up operations and prepare to launch more satellites and rockets," said Narayanan on the occasion.

Going forward, the fledgling company will launch heavy satellites for space applications and observation in the earth's geo-synchronous orbit by state-run and private firms.

"The company has generated Rs 300 crore revenue in the first year (2019-20) of operations, Rs 400-crore in the second year (2020-21) amid the Covid pandemic through launches and space-

based services from ISRO's satellites," said NSIL Director for technology and strategy D. Radhakrishnan.

During its first two years of operations, the company has launched 45 auxiliary customer satellites onboard ISRO's 4 PSLV missions, including Amazonia-1.

<https://www.businessinsider.in/science/space/news/isros-commercial-arm-bags-orders-to-launch-four-foreign-satellites-as-it-looks-to-invest-10000-crore-over-the-next-five-years/articleshow/81468017.cms>



Sat, 13 March 2021

## ISRO's NISAR to be first satellite to enable earth observation in 2 frequencies

*After integration, the payload will be sent back to India for launch from the country's only spaceport at Sriharikota sometime in April or May next year*

*By Anonna Dutt*

The Indian Space Research Organisation (Isro) sent its s-band synthetic aperture radar to NASA'S Jet Propulsion Laboratory for integration with their l-band radar last week. Coupled together, the NASA-ISRO Synthetic Aperture Radar (NISAR) will become the first satellite to enable earth observation in two frequencies.

After integration, the payload will be sent back to India for launch from the Country's only spaceport at Sriharikota sometime in April or May next year.

According to NASA, the satellite will provide an "unprecedented view of the Earth" at less than one centimetre across.

It will help scientists understand the surface as well as the interior of the planet we live on. It will provide better understanding of the effects and pace of climate change by measuring ice sheet collapses, officials said.

The satellite will also allow governments to better manage natural disasters—the satellite will provide highly spatial data on tsunamis, earthquakes, landslides, and volcanoes. And, it will also help in better management of natural resources, including detection of disturbances in ecosystems.

Nasa's partnership with ISRO for the mission began after a decadal study identified three thrust areas for Earth Science Studies—ecosystems, deformation of Earth's crust and cryospheric sciences. For its payload, ISRO identified objectives such as agricultural monitoring and characterisation, landslide studies, Himalayan glacier studies, soil moisture, coastal processes, coastal winds, and monitoring hazards. A second radar frequency was added to the mission to better fulfil these science requirements by NASA.

This is not the first time that the two space agencies have collaborated on scientific missions. It was NASA'S Moon Mineralogy Mapper sent aboard Isro's moon mission Chandrayaan-1 that confirmed the presence of water on the celestial body.

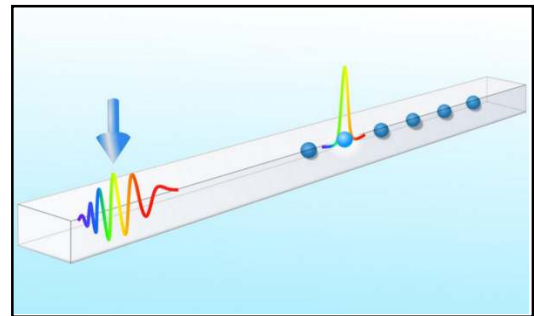
<https://www.hindustantimes.com/india-news>

## Remote control for quantum emitters

In order to exploit the properties of quantum physics technologically, quantum objects and their interaction must be precisely controlled. In many cases, this is done using light. Researchers at the University of Innsbruck and the Institute of Quantum Optics and Quantum Information (IQOQI) of the Austrian Academy of Sciences have now developed a method to individually address quantum emitters using tailored light pulses. "Not only is it important to individually control and read the state of the emitters," says Oriol Romero-Isart, "but also to do so while leaving the system as undisturbed as possible." Together with Juan Jose Garcia-Ripoll (IQOQI visiting fellow) from the Instituto de Fisica Fundamental in Madrid, Romero-Isart's research group has now investigated how specifically engineered pulses can be used to focus light on a single quantum emitter.

### Self-compressing light pulse

"Our proposal is based on chirped light pulses," explains Silvia Casulleras, first author of the research paper. "The frequency of these light pulses is time-dependent." So, similar to the chirping of birds, the frequency of the signal changes over time. In structures with certain electromagnetic properties—such as waveguides—the frequencies propagate at different speeds. "If you set the initial conditions of the light pulse correctly, the pulse compresses itself at a certain distance," explains Patrick Maurer from the Innsbruck team. "Another important part of our work was to show that the pulse enables the control of individual quantum emitters." This approach can be used as a kind of remote control to address, for example, individual superconducting quantum bits in a waveguide or atoms near a photonic crystal.



A light field with time-dependent frequencies - propagating in a waveguide. Due to self-compression the pulse addresses individual quantum emitters. Credit: University of Innsbruck

### Wide range of applications

In their work, now published in *Physical Review Letters*, the scientists show that this method works not only with light or electromagnetic pulses, but also with other waves such as lattice oscillations (phonons) or magnetic excitations (magnons). The research group led by the Innsbruck experimental physicist Gerhard Kirchmair, wants to implement the concept for superconducting qubits in the laboratory in close collaboration with the team of theorists.

**More information:** S. Casulleras et al, Remote Individual Addressing of Quantum Emitters with Chirped Pulses, *Physical Review Letters* (2021). DOI: [10.1103/PhysRevLett.126.103602](https://doi.org/10.1103/PhysRevLett.126.103602)

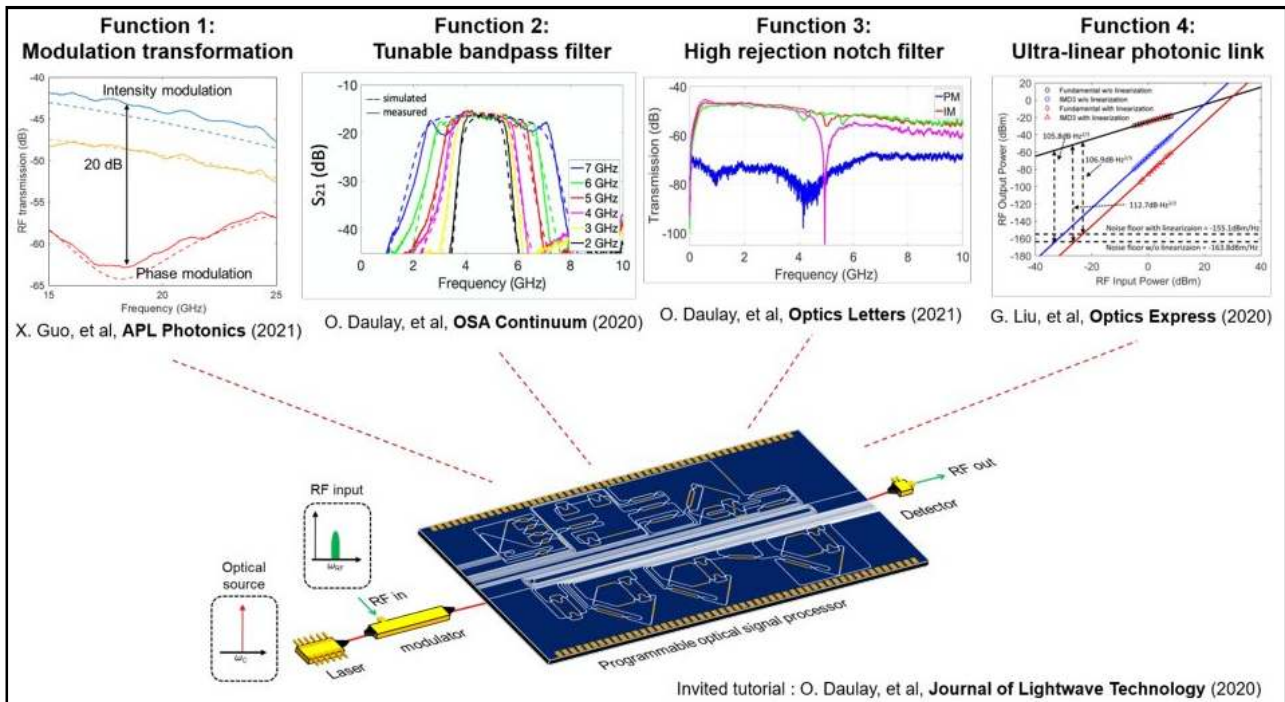
**Journal information:** [Physical Review Letters](https://phys.org/news/2021-03-remote-quantum-emitters.html)

<https://phys.org/news/2021-03-remote-quantum-emitters.html>



# Shaping radio signals using light

Shaping radio signals using photonics technologies seems like a detour. But the versatility of current programmable silicon photonic circuits can open new possibilities according to researchers of the University of Twente. They have presented their microwave photonic spectral shaper in *APL Photonics*.



Credit: *APL Photonics* (2021). DOI: 10.1063/5.0033516

For processing signals in the radio frequency (RF) domain, for example, in 5G communications, future 6G or radar, sharp filtering and other high-precision operations on the high frequency radio signals are important. Light molded in integrated photonic circuits can offer signal processing with high bandwidth and unmatched flexibility thanks to the programmability of integrated photonics. But still, the stage where radio signals are converted to lightwaves, known as optical modulation, is cumbersome. The spectral shaper presented by the researchers solves this bottleneck thanks to a number of flexible photonic components.

## Programmable photonics

In order to shape the information signal, first the light components are taken apart. The separate parts, like the radio side bands around the optical frequency, can then be processed separately. When all photonic processing is done and the desired spectral shape is created, light is recombined and converted back into a radio frequency signal. All of these processes were done in the silicon chip using ring-shaped resonators and filters that can be electronically programmed. The chip also includes a high-speed detector for converting the light back to radiowaves.

"This new spectral shaper is the basis for a whole range of complex operations that can be done on RF signals using programmable photonics," David Marpaung says. He is a professor at the Nonlinear Nanophotonics group at the University of Twente.

The chip that the researchers from Twente, Sydney and Ghent demonstrate in this paper was made using silicon photonics. Next-generation chips made in silicon nitride—the main photonic technology at UT's MESA+ NanoLab—are currently under tests in Marpaung's lab.

The paper, "Versatile silicon microwave photonic spectral shaper," is published in *APL Photonics*.

**More information:** Xin Guo et al. Versatile silicon microwave photonic spectral shaper, *APL Photonics* (2021). DOI: [10.1063/5.0033516](https://doi.org/10.1063/5.0033516)  
<https://phys.org/news/2021-03-radio.html>



Sat, 13 March 2021

## Fourth-generation wire micrometer that rivals best in the world

Researchers at the National Institute of Standards and Technology (NIST) have developed a dramatically improved laser-based instrument that measures the diameter of fine-gauge wires, fibers and other objects only about three times the thickness of a human hair. Known as a laser micrometer, the device's accuracy equals that of its state-of-the-art counterparts but is cheaper, simpler to operate and easier to maintain.

NIST scientists John Stoup and Ted Doiron reported their findings in the December 15, 2020 issue of *Metrologia*.

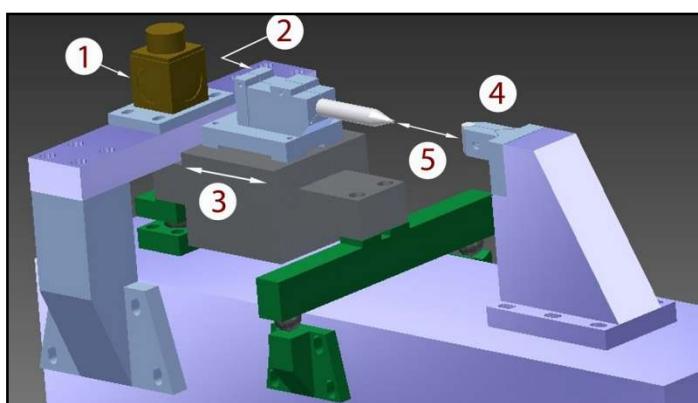
The new micrometer uses an advanced laser displacement interferometer, which relies on light to measure the thickness of objects held between two metal contacts. With the new system, researchers can measure the diameter of any object less than 50 millimeters wide, including fine-gauge wires and fibers, with an uncertainty of just 2 nanometers. That's better than twice the accuracy of previous laser micrometers developed at NIST.

Stoup and Doiron fabricated the new micrometer almost entirely out of Invar, a nickel-iron alloy known for its thermal stability. That means the material does not react to small changes in temperature, resisting expansion or contraction. As a result, the measuring device is less prone to error than other state-of-the-art instruments.

In fact, the improvement "puts the new NIST micrometer at a level equivalent to the best in the world," said Stoup. Moreover, the NIST micrometer is less expensive and simpler to operate. For instance, because the NIST instrument is not as automated as other state-of-the-art instruments, it is cheaper to build, simpler in design and easier to keep under tight statistical control.

"It's always a challenge to achieve best in the world performance without breaking the bank," Stoup said.

Manufacturers are working with fibers and wires much thinner than they had even a decade ago for optical communications and on-chip electrical networks. This has driven the need for a laser micrometer that can measure tiny diameters with high accuracy and establish standard-diameter "master" fibers that can be used as references to assess the diameter of other fibers. At the other



The main structural components of the new NIST micrometer—a device for measuring the thickness of fine wire, narrow fibers and similar objects—are made of Invar, a nickel-iron alloy that does not react to small changes in temperature. As a result, the measuring device is less prone to error than other state-of-the-art instruments. A laser beam enters from the left side of the drawing and enters a beam splitter cube (1), which divides the beam into two parts. One part remains in the cube, is reflected from a side mirror back towards the center and serves as the reference beam. The other part hits the retroreflector (2). As the floating carriage (3) moves away from the splitter cube and toward the back end of the anvil (4), the distance between the retroreflector and the cube splitter varies (5). When the two beams are brought back together, the laser reports the change in distance. Credit: NIST

end of the scale, there is a growing need to measure the size of large, centimeter-diameter pressure pistons and cylinder gauges, which the NIST micrometer can also perform. Because the pressure a piston exerts is proportional to its area, even small errors in measuring the piston's diameter may produce critical errors in calculating pressure.

Measuring the diameter of thin fibers and wires is a delicate operation because these objects can deform, or change their shape, relatively easily. If those deformations are not taken into account, they could lead to a significant error in measured size. To account for the deformation, the NIST researchers designed their micrometer so that they could vary the force applied by the contacts that hold the object in place. By measuring the variations in diameter of the object when different contact forces were applied, the researchers were able to extrapolate the diameter when no force is exerted on the object, the undeformed diameter.

The new design allows researchers to operate the device remotely, eliminating the possibility of introducing heat into the system through human contact. The researchers also engineered a more stable way for the carbide contacts to hold the measured object. All of these improvements increased the accuracy of the device.

**More information:** John Stoup et al. A novel high accuracy micrometer for the measurement of diameter, *Metrologia* (2020). [DOI: 10.1088/1681-7575/abd3b2](https://doi.org/10.1088/1681-7575/abd3b2)

**Journal information:** [Metrologia](https://phys.org/news/2021-03-fourth-generation-wire-micrometer-rivals-world.html)  
<https://phys.org/news/2021-03-fourth-generation-wire-micrometer-rivals-world.html>

## COVID-19 Research News



Sun, 14 March 2021

### Covid-19 vaccine-induced antibodies less effective against some variants: Study

*Antibodies raised by some Covid-19 vaccines are less effective at neutralising new, circulating variants of the novel coronavirus such as the ones first reported in the UK, South Africa and Brazil, according to a new study*

Boston: Antibodies raised by some Covid-19 vaccines are less effective at neutralising new, circulating variants of the novel coronavirus such as the ones first reported in the UK, South Africa and Brazil, according to a new study.

The research, published in the journal *Cell*, noted that the neutralising antibodies induced by the Pfizer and Moderna Covid-19 vaccines were less effective against the coronavirus variants first described in Brazil and South Africa.

According to the scientists, including Alejandro Balazs from the Massachusetts General Hospital (MGH) in the US, neutralising antibodies work by binding tightly to the virus and blocking it from entering cells, thus preventing infection.

They said this binding only happens when the antibody's and the virus' shapes are perfectly matched to each other "like a key in a lock."

If the shape of the virus changes where the antibody attaches to it -- in this case, in the spike protein of the novel coronavirus -- they said the antibody may no longer be able to recognise and neutralise the virus as well.

In the study, the researchers developed assays for Covid-19, comparing how well the antibodies worked against the original strain versus the new variants.

"When we tested these new strains against vaccine-induced neutralizing antibodies, we found that the three new strains first described in South Africa were 20-40 times more resistant to neutralization," said Balazs, who is also an assistant professor of Medicine at Harvard Medical School in the US.

According to the scientists, the two strains first described in Brazil and Japan were five to seven times more resistant, compared to the original SARS-CoV-2 virus lineage from Wuhan, China.

"In particular we found that mutations in a specific part of the spike protein called the receptor binding domain were more likely to help the virus resist the neutralizing antibodies," said Wilfredo Garcia-Beltran, first author of the study from MGH.

The study noted that the three South African variants, which were the most resistant, all shared three mutations in the receptor binding domain, which may contribute to their high resistance to neutralising antibodies.

However, the scientists said the ability of these variants to resist neutralising antibodies doesn't mean the vaccines won't be effective.

"The body has other methods of immune protection besides antibodies. Our findings don't necessarily mean that vaccines won't prevent COVID, only that the antibody portion of the immune response may have trouble recognizing some of these new variants," Balazs said.

The researchers added that understanding which mutations are most likely to allow the virus to evade vaccine-derived immunity is essential to develop next-generation vaccines that can provide protection against new variants.

They said this can also help researchers develop more effective preventative methods, such as broadly protective vaccines that work against a wide variety of variants, regardless of which mutations develop.

<https://www.hindustantimes.com/lifestyle/health/covid19-vaccine-induced-antibodies-less-effective-against-some-variants-study-101615625347865.html>

