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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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# CONTENTS

S. No.	TITLE	Page No.
<b>DRDO News</b>		<b>1-13</b>
<b>DRDO at Aero India 2021</b>		<b>1-13</b>
1.	DRDO's International Seminar on "Energising R&D capabilities towards Atmanirbhar Bharat"	1
2.	HAL receives request for Proposal for 70 HTT-40 Basic Trainer Aircraft from Indian Air Force at Aero India 2021	2
3.	एचएएल ने एयरो इंडिया 2021 में भारतीय वायुसेना से 70 एचटीटी-40 बेसिक ट्रेनर एयरक्राफ्ट के प्रस्ताव के लिए अनुरोध प्राप्त किया	3
4.	India most attractive centre for R&D, says defence secy	4
5.	Aatmanirbhar Bharat: India's defence PSUs cutting-edge innovations on display at Aero India 2021	5
6.	Tejas, BrahMos and Astra among 156 defence items cleared for exports	6
7.	Thrilled to fly homegrown fighter jet Tejas, the pride of Bengaluru: MP Tejasvi Surya	8
8.	भारत में निर्मित 'तेजस' में तेजस्वी सूर्या ने उड़ान भरी	9
9.	Russian Ambassador lauds Aero India 2021	10
10.	India may take a decade to develop fighter jet engine: BN Kalyani, Bharat Forge	11
11.	Asia's biggest show Aero India to conclude in Bengaluru today	12
12.	Aero India 2021: USA flies heavy bomber B-1B with LCA Tejas in Bengaluru	13
<b>Defence News</b>		<b>14-24</b>
<b>Defence Strategic National/International</b>		<b>14-24</b>
13.	Aero India 2021: IOR seminar building collective maritime competence towards Security and Growth for all in the Region (SAGAR)	14
14.	Raksha Mantri's keynote address at IOR Defence Ministers' Conclave stresses on Prime Minister's 'Five S' vision to tackle global challenges	16
15.	हिन्द महासागर क्षेत्र के रक्षा मंत्रियों के सम्मेलन में रक्षा मंत्री के मुख्य भाषण में वैश्विक चुनौतियों से निपटने के लिए प्रधानमंत्री के 'फाइव एस' दृष्टिकोण पर जोर दिया गया	18
16.	Major Upgrade of Naval Environmental Test Facility Inaugurated by Deputy Chief of Naval Staff	20
17.	HAL signs MoU with MIDHANI to develop	21
18.	Aero India: IAF Chief holds talks with Tajikistan, Bangladesh counterparts	22
19.	Aero India 2021: Surya Kirans, Sarangs win hearts; HAL planes dominate air display	23
20.	Three-day defence expo for MSMEs to be held in March	24
<b>Science &amp; Technology News</b>		<b>25-32</b>
21.	ISRO will transform in 2021 as India pumps big money to draw in startups for the 'second space age'	25
22.	Newly discovered graphene property could impact next-generation computing	27
23.	Developing fibrillated cellulose as a sustainable technological material	29
24.	Transistors built from ultra-thin 2-D materials take a step forward	30
<b>COVID-19 Research News</b>		<b>31-32</b>
25.	Recovered Covid-19 patients may need only one shot of mRNA vaccines: Scientists	31



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Thu, 04 Feb 2021 7:00PM*

## **DRDO's International Seminar on "Energising R&D capabilities towards Atmanirbhar Bharat"**

An International Seminar was organized by Defence Research & Development Organisation (DRDO) on 4 February 2021, during Aero India at Yelahanka, Bengaluru. The theme of the seminar "Energising the R&D Capabilities of Industry for Atmanirbhar Bharat", focused on various existing and new initiatives needed for enabling industry to become self reliant in defence systems. Defence Secretary Shri Ajay Kumar delivered a special address and Secretary DD R&D and Chairman DRDO, Dr G Satheesh Reddy presided over the seminar proceedings.

The seminar was preceded by DRDO-Industry synergetic interaction where aerospace professionals from across the globe shared their ideas, views and opinions for promoting self-reliance in aerospace and defence sector. During the Seminar, the industries were exposed to the latest policy initiatives, sustained engagements, intense technology transfers and test facility support provided to them by DRDO, which will enhance their technological capabilities substantially. Information was also shared regarding the initiatives of DRDO for R&D funding to industry under Technology Development Fund (TDF) and free use of DRDO patents.

There was full spectrum coverage on the topic, right from the Government to Private Industries, including MSMEs, Startups and Foreign Industries. In an invigorating talk on various aspects of Atmanirbhar Bharat, DRDO perspective was elaborated by Shri GN Rao, Director General (Production Coordination & Services Interaction). The startup perspective was covered by a young entrepreneur, Shri Karan Garg, Director, M/s Raphe mPhibr Pvt Ltd, Greater Noida. MSME perspectives were elaborated by Dr Arvind Patel, MD & CEO, M/s Sahajan and Laser Technology Ltd, Gandhinagar, Gujarat and Shri Sachin Agrawal, CMD, M/s PTC Industries, Lucknow.

Shri MV Gowtama, CMD, M/s BEL Bengaluru, highlighted DPSU viewpoints of R&D in defence manufacturing. Shri Baba Kalyani, CMD, M/s Bharat Forge Ltd Pune explained the points of industry which are important for energizing defence R&D in Indian industry. Foreign OEM perspectives were elucidated by Mr Emmanuel de Roquefeuil, VP & Country Director, M/s Thales. The talks were followed by an open house in which constructive suggestions were submitted and debated.

A suggestion from user was a request for funding opportunities and mentoring by DRDO right up to tying up with users. Other suggestions were component level manufacturing capability, IT incentives for R&D, need to cut down on elaborate trial schedule through simulation analysis and third party certification.

The Defence Secretary in his address stated that R&D is the most important pillar of self-reliance. He said that India is the most attractive R&D centre and the world has faith in our capabilities. He spoke about the list of 108 defence items identified by DRDO for local production by the industry to achieve self-reliance in the defence sector. He encouraged and challenged the

industry to take up this wonderful opportunity and make the country self-reliant. He also praised DRDO for leading from the front in fighting the COVID-19 pandemic and developing various technologies.

Dr G Satheesh Reddy, Secretary DD R&D & Chairman DRDO spoke about the initiatives undertaken by DRDO for providing support to industries and said that ideas are welcome which can further the R&D prospects in the country. He spoke about the way forward and how the industry can be encouraged to come out with production of the state-of-art weapon systems. He further said that Aatmanirbhar Bharat in true sense means having the design, development and production capabilities. He stated that getting ideas from industry is important and getting the products inducted is also an important aspect.

DRDO is continuously developing advanced indigenous technologies for the Armed Forces since last six decades. These latest technologies have huge export potential as well. The seminar has further strengthened DRDO's resolve of making our nation Atmanirbhar in defence. The seminar was attended physically by 100 participants and in virtual mode by more than a thousand participants. There was a live streaming of the seminar as well.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695233>



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Thu, 04 Feb 2021 5:13PM*

## **HAL receives request for Proposal for 70 HTT-40 Basic Trainer Aircraft from Indian Air Force at Aero India 2021**

Hindustan Aeronautics Limited (HAL) received a Request for Proposal (RFP) from the Indian Air Force for their Basic Trainers requirement at the Aero India 2021 in Bengaluru on February 04, 2021. The RFP is for 70 HTT-40 Basic Trainer Aircraft with provision for 38 more. The documents were handed over by Deputy Chief of Air Staff Air Marshal Sandeep Singh and DG (Acquisition), Ministry of Defence Shri V L Kantha Raoto Chairman and Managing Director, HAL Shri R Madhavan.

The certification will be given against the Program Compliance and Quality Review (PCQR). The production will take place at two manufacturing facilities of HAL in Bengaluru and Nashik. The RFP has come within six years from the first flight of HAL which is the shortest time-line in aircraft industry. The trainer will have more than 60 percent indigenous content and is supported by agencies such as Centre for Military Airworthiness and Certification (CEMILAC), Regional Director Aeronautical Quality Assurance (RDAQA), Aircraft and Systems Testing Establishment (ASTE) among others.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695163>



पत्र सूचना कार्यालय  
भारत सरकार  
रक्षा मंत्रालय

Thu, 04 Feb 2021 5:13PM

## एचएएल ने एयरो इंडिया 2021 में भारतीय वायुसेना से 70 एचटीटी-40 बेसिक ट्रेनर एयरक्राफ्ट के प्रस्ताव के लिए अनुरोध प्राप्त किया

बेंगलुरु में एयरो इंडिया 2021 में हिंदुस्तान एयरोनॉटिक्स लिमिटेड (एचएएल) ने दिनांक 4 फरवरी, 2021 को भारतीय वायुसेना से अपने बेसिक ट्रेनर्स रिक्वायरमेंट के लिए रिक्वेस्ट फॉर प्रपोज़ल (आरएफपी) प्राप्त किया। आरएफपी 70 एचटीटी-40 बेसिक ट्रेनर एयरक्राफ्ट के लिए है, जिसमें 38 और एयरक्राफ्ट का प्रावधान है। यह दस्तावेज डिप्टी चीफ ऑफ एयर स्टाफ एयर मार्शल संदीप सिंह और रक्षा मंत्रालय के डीजी (अधिग्रहण) श्री वी एल कांठा राव ने एचएएल के अध्यक्ष और प्रबंध निदेशक श्री आर माधवन को सौंपे हैं।

यह प्रमाणन प्रोग्राम कंप्लायंस एंड क्वालिटी रिव्यू (पीसीक्यूआर) के निमित्त दिया जाएगा। यह उत्पादन बेंगलुरु और नासिक में हिंदुस्तान एरोनॉटिक्स लिमिटेड की दो विनिर्माण सुविधाओं में किया जाएगा। आरएफपी एचएएल की पहली उड़ान से छह साल के भीतर आया है जो विमान उद्योग में सबसे कम समय है। ट्रेनर के पास 60 प्रतिशत से अधिक स्वदेशी सामग्री होगी और इसे सेंटर फॉर मिलिट्री एयरक्वालिटी एंड सर्टिफिकेशन (CEMILAC), क्षेत्रीय निदेशक एयरोनॉटिकल क्वालिटी एश्योरेंस (आरडीएक्यूए), एयरक्राफ्ट एंड सिस्टम्स टेस्टिंग एस्टेब्लिशमेंट (एएसटीई) जैसी एजेंसियों द्वारा सहायता प्रदान की गई है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695367>

## India most attractive centre for R&D, says defence secy

By Aksheev Thakur

### Highlights

**Defence Secretary Ajay Kumar on Thursday stated that when Prime Minister Narendra Modi talks about self-reliance in defence it not only centres around sheer manufacturing as India has moved away from licence production regime**

Defence Secretary Ajay Kumar on Thursday stated that when Prime Minister Narendra Modi talks about self-reliance in defence it not only centres around sheer manufacturing as India has moved away from licence production regime. Speaking at DRDO's international seminar on "Energising the R&D Capabilities of Industry for Atma Nirbhar Bharat, he said, "Taking technology from outside and making defence products here is license production, not self-reliance. Research and development is the most important pillar of self-reliance. The latest and best technologies are used in defence."

Kumar said that India proved her mettle in software and digital technologies in previous decades. "India today has become the most attractive centre for R&D, engineering and design leaving China far behind. Moreover, the Covid has shown how Indian innovation has decimated all doubts regarding Indian capabilities. The world has recognised our capabilities," he observed. In 2020 DRDO came out with one innovation followed by another.



India most attractive centre for R&D, says defence secy

"The number of missile demonstrations were unprecedented. India is one of the five countries to have demonstrated hypersonic missile demonstration," he remarked. Giving a thrust to Aatmanirbhar Bharat the process for procurement of 118 indigenous Arjun Mk-1A tanks has commenced. DRDO is going to make six Airborne Early Warning and Control (AEW&C) planes to improve Indian Air Force's surveillance capabilities. It's Rs 10,000 crore project, the defence secretary said.

"One of our banes is trial and testing. We need to reduce the time in this. DAP 2020 paved way for the development and user trials combined. There are things that we are trying to do through simulation so that the time spent could be brought down. One needs to go to high altitude or the places where temperature is high to go for trials. We can do it through simulation and save time," he said.

<https://www.thehansindia.com/karnataka/india-most-attractive-centre-for-rd-says-defence-secy-670366?infinitescroll=1>

## Aatmanirbhar Bharat: India's defence PSUs cutting-edge innovations on display at Aero India 2021

*The event provides BEL, BEML and India's other PSUs with a prime opportunity to exhibit their latest defence technologies and systems under the banner of Prime Minister Narendra Modi's 'Aatmanirbhar Bharat.'*

### Key Highlights

- *Roughly 30 BEL products and systems under India's self-reliance drive will be showcased including airborne missile electronics, receivers for EW systems, 2KW fuel cell, FO Gyro based sensor packaged unit, Athermal laser transmitter, IR jammer, call manager and media gateway, C-band tropo power amplifier and IR seeker missiles*
- *BEL's naval and land products and systems include QRSAM radars (BFMR and BSR), BFSR-XR AESA, DDR (FMCW), coastal surveillance system, GBMES, single combat vehicle (QRSAM), and weapon control systems, among others*
- *BEML's niche products will include the Transporter Landing System (TLS), the Primoco UAV – 'One 150,' and the 25kg Class Tactical UAV*

The 13th edition of Aero India, organised by the Defence Research and Development Organisation, is now underway at the Air Force Station in Yelahanka, Bengaluru.

The event provides the DRDO with a prime opportunity to exhibit its latest defence technologies and systems under the banner of Prime Minister Narendra Modi's 'Aatmanirbhar Bharat' as India ploughs ahead with its efforts to establish itself as a key player within the global defence domain.

“More than 300 products, technologies and innovations are being presented at the show in indoor, outdoor, static and flying displays,” the DRDO noted, with Defence Minister Rajnath Singh previously calling the show a “runway to a billion opportunities.”

But it isn't just the DRDO that gets to show off its latest accomplishments. According to reports, Bharat Electronics Limited is also set to display its cutting-edge products and systems at the event. A statement from the defence ministry said, “The products and systems are clustered as airborne and space application, satellite and space application, products and systems for self-reliance (Aatmanirbhar Bharat), high-performance computing and artificial intelligence systems, land and naval products and systems, communication and laser-based products, non-defence/diversification and outdoor display products.”

It added that roughly 30 products and systems under India's self-reliance drive will be showcased including airborne missile electronics, receivers for EW systems, 2KW fuel cell, FO Gyro based sensor packaged unit, Athermal laser transmitter, IR jammer, call manager and media gateway, C-band tropo power amplifier and IR seeker missiles. As far as innovations within the artificial intelligence and high-performance computing domain go, an RRO (software-based solution), secure video conferencing solution, imagery solution for defence and civilian applications, generic networking system, automatic train supervision system for DMRC and maritime rescue coordination centre will also be on display.

BEL's naval and land products and systems include QRSAM radars (BFMR and BSR), BFSR-XR AESA, DDR (FMCW), coastal surveillance system, GBMES, single combat vehicle



Visitors swarm around various aircrafts on static display during rehearsals for the Aero India 2021, at the Yelahanka air base in Bengaluru, Tuesday, Feb.2, 2021. | Photo Credit: PTI

(QRSAM), and weapon control systems, among others. A MODEM for a troposcatter communication system, frequency-modulated continuous-wave (FMCW) radar for fog vision and drone guard systems for railways, encryptors, 4G secure phone and 5G tablet PC, high power fibre laser, Li-Fi high-speed communication system and software-defined radio under communication and electro-optics segments will make up BEL's displayed arsenal within the realm of communication and laser-oriented products.

Yet, BEL is hopeful that its main attractions at its outdoor display will be its mini shelter-based Mini C4I system, Atulya (ADFCR), CTFCR (X-APAR on 4x4), WLR (mountain version) and its anti-drone system.

Not to be outdone, defence PSU BEML will also be showcasing its own innovations at the mega exhibition. As per latest reports, its niche products will include the Transporter Landing System (TLS), the Primoco UAV – 'One 150,' and the 25kg Class Tactical UAV developed in collaboration with the Indian Institute of Technology in Kanpur.

<https://www.timesnownews.com/india/article/aatmanirbhar-bharat-indias-defence-psus-cutting-edge-innovations-on-display-at-aero-india/715577>



Fri, 05 Feb 2021

## Tejas, BrahMos and Astra among 156 defence items cleared for exports

*According to a list released by Defence Research Development Organisation (DRDO), there are 19 aeronautical systems, 41 armament and combat systems, 4 missile systems, 27 electronic and communication system, 10 life protection items, 4 microelectronic devices, 28 naval systems, 16 Nuclear Biological Chemical equipment NBC and 7 other materials*

*By Abhishek Bhalla*

New Delhi: India has cleared 156 defence equipment for exports including the indigenous Light Combat Aircraft Tejas, artillery guns, battle tanks and missiles, anti-tank mines and explosives.

According to a list released by Defence Research Development Organisation (DRDO), there are 19 aeronautical systems, 41 armament and combat systems, 4 missile systems, 27 electronic and communication system, 10 life protection items, 4 microelectronic devices, 28 naval systems, 16 Nuclear Biological Chemical equipment NBC and 7 other materials.

Other than Tejas that has been the star attraction of Indian indigenous firepower Indian made missiles are also ready for export now. Earlier it was the Akash missile that was given clearance for exports but now other missiles have also been added.

### **Indian Missiles ready for export**

Beyond Visual Range (BVR) air-to-air Missile Astra, anti-tank guided missile Nag and Brahmos weapon systems are also ready for exports, a list released by DRDO showed.

Akash is a surface-to-air missile system which provides short-range air defence and can operate in autonomous or group mode of operation with a range of 3 to 25 km. The Astra missile is a BVR air-to-air that has been integrated with Indian Air Forces Su30 MKI. Other fighter jets will also be integrated with the Astra in future.



The Tejas LCA is one of the defence items that has been cleared for exports. (Photo: Alamy Stock Photo)



Brahmos is a supersonic missile for the Indian Army, Navy and Air Force. This universal missile can be launched from ships, mobile launchers, submarines and aircraft. It has network-centric architecture, multiple trajectories, way-point capability and is capable of engaging any kind of land or naval targets beyond the horizon in a minimum deployment time.

### **Battle Tank**

Indian Army's battle tank Arjun Mark-1A, an upgraded version that offers superior firepower, high mobility and can fire a variety of ammunition, can also be sold to other countries.

### **Pinaka weapon system**

The Pinaka weapon system is also on the list. Pinaka is an all-weather, indirect fire, free-flight artillery multi-barrel rocket system. It can fire 72 rockets in 44 seconds. It delivers a devastatingly lethal and responsive fire against a variety of area targets such as exposed enemy troops, armoured and soft skin vehicles, communication centres, air terminal complexes, fuel and ammunition dumps.

### **Advanced Towed Artillery Gun System (ATAGS)**

This another big Indian military platform on the list. ATAGS is a large-calibre artillery gun system configured with an all-electric drive.

It is a 155 mm, 52-calibre artillery gun with a range of 48 km. It has better accuracy, advanced fire control system, extended range and multiple round simultaneous impact capability with surveillance and sighting systems onboard.

### **India's export targets**

India is now looking at enhancing its defence exports — targeting \$5 billion of all defence exports — to improve strategic relations with friendly foreign countries.

The nation aims to achieve exporting defence equipment worth Rs.35,000 crore by 2025, as per the defence production export promotion policy 2020.

Aimed at enhancing exports and build a domestic defence industry for self-reliance, the policy targets a turnover of Rs 1,75,000 crore (\$25 billion).

The policy also looks at doubling domestic procurement from the Indian industry. The share of domestic procurement in overall defence procurement is about 60 per cent. In order to enhance procurement from domestic industry, it is incumbent that procurement is doubled from the current Rs 70,000 crore to Rs 1,40,000 crore by 2025.

<https://www.indiatoday.in/india/story/tejas-brahmos-and-astra-among-156-defence-items-cleared-for-exports-1765773-2021-02-04>

## Thrilled to fly homegrown fighter jet Tejas, the pride of Bengaluru: MP Tejasvi Surya

*With Surya on board as a co-pilot, the LCA took off from Air Force Station Yelahanka and during a 30-minute sortie, the young MP took control of the fighter jet for around five to six minutes*

Bengaluru: "I was thrilled to fly Tejas, the indigenous fighter jet and pride of Bengaluru," Bengaluru South MP and BJP leader Tejasvi Surya said on Thursday after flying the Light Combat Aircraft (LCA) on the second day of the three-day Aero India 2021.

With Surya on board as a co-pilot, the LCA took off from Air Force Station Yelahanka and during a 30-minute sortie, the young MP took control of the fighter jet for around five to six minutes. "We pulled up to 5G. It was a nice and thrilling experience," said Surya, who used to regularly come to air shows. "Sometimes, we even watched the flying display from outside the air force station as it was difficult to get tickets," said the MP.

After the sortie, the MP said the order for the aircraft shows the Narendra Modi government's belief in the scientific calibre of Indian engineers and the Rs 48,000 crore order will see more than 600 firms or MSMEs come together for the making of an aircraft.

"With Tier 2 and Tier 3 supplier bases predominantly happening from Bangalore, the Tejas order will improve the industrial base in our city to greater heights and create employment. We are grateful to PM Modi, Defence Minister Rajnath Singh and the late former Defence Minister Manohar Parrikar for their support in getting Tejas up in the air. We must also actively pursue export markets and make Tejas a world class brand," the MP said.

The Cabinet Committee on Security cleared the Rs 48,000 crore deal to HAL for 83 LCA aircraft on January 13 and the contract was formally handed over to HAL Chairman and Managing Director R Madhavan by Director General (Acquisition) of the Minister of Defence, VL Kantha Rao, on Wednesday during the Aero India. "The induction of LCA Tejas will not only boost Atmanirbharta, but also help India become a larger global exporter in defence," Surya added.

<https://www.newindianexpress.com/cities/bengaluru/2021/feb/04/thrilled-to-fly-homegrown-fighter-jet-tejas-the-pride-of-bengaluru-mp-tejasvi-surya-2259583.html>



BJP MP Tejasvi Surya gestures as he boards a Light Combat Aircraft Tejas for a sortie during Aero India 2021, in Bengaluru. (Photo | PTI)

## भारत में निर्मित 'तेजस' में तेजस्वी सूर्या ने उड़ान भरी

**बेंगलुरु दक्षिण से भाजपा सांसद तेजस्वी सूर्या (Tejaswi Surya) ने एयरो इंडिया-2021 शो के दौरान भारत में निर्मित (made in India) हल्के लड़ाकू विमान तेजस में उड़ान भरी। उन्होंने हिंदुस्तान एरोनॉटिक्स लिमिटेड (HAL) को 48,000 करोड़ रुपए का ऑर्डर दिए जाने के लिए केंद्र सरकार का आभार माना।**

बेंगलुरु: भाजपा सांसद तेजस्वी सूर्या ने यहां चल रहे 'एयरो इंडिया-2021' (Aero India 2021) शो के दूसरे दिन बृहस्पतिवार को देश में निर्मित हल्के लड़ाकू विमान 'तेजस' में उड़ान भरी। सूर्या ने विमान में सवार होने तथा उड़ान भरने से पहले खुद के तैयार होने की तस्वीरें भी ट्वीट कीं। तेजस्वी सूर्या ने कहा कि 'एलसीए तेजस' को शामिल किए जाने से न केवल 'आत्मनिर्भरता' को मजबूती मिलेगी, बल्कि इससे रक्षा क्षेत्र में एक बड़ा वैश्विक निर्यातक बनने में भी भारत को मदद मिलेगी।

उनके कार्यालय ने एक विज्ञप्ति में कहा कि सूर्या ने 'एलसीए तेजस' में 30 मिनट तक उड़ान भरी और रक्षा क्षेत्र में स्वदेशी विनिर्माण को बढ़ावा देने के लिए प्रधानमंत्री नरेन्द्र मोदी का आभार व्यक्त किया। इसमें कहा गया कि उड़ान के जरिए 'तेजस' की खरीद के लिए बेंगलुरु आधारित हिन्दुस्तान एरोनॉटिक्स लिमिटेड (एचएएल) को 48,000 करोड़ रुपये का ऑर्डर दिए जाने पर केंद्र सरकार को बधाई दी गई।



सूर्या ने विमान में सवार होने तथा उड़ान भरने से पहले खुद के तैयार होने की तस्वीरें भी ट्वीट कीं (Photo-Twitter/Tejaswi Surya)

बेंगलुरु, दक्षिण का प्रतिनिधित्व कर रहे सूर्या के हवाले से विज्ञप्ति में कहा गया, 'हम बेंगलुरु के गौरव के रूप में एलसीए तेजस की प्रशंसा करते हैं। वैश्विक रूप से केवल कुछ ही शहरों को विश्वस्तरीय लड़ाकू विमान बनाने का गौरव प्राप्त है और हमारा शहर उनमें से एक है।'

<https://hindi.news18.com/news/nation/tejaswi-surya-flew-in-tejas-made-in-india-3447517.html>

## Russian Ambassador lauds Aero India 2021

Bengaluru (Karnataka) [India], February 3 (ANI): Russian Ambassador to India Nikolay Kudashev lauded the ongoing Aero India international 2021 air show on Wednesday and expressed happiness on being one of the biggest exhibitors at the event.

The 13th edition of the Aero India show, organised by the Defence Research and Development Organisation (DRDO), is taking place at Air Force Station Yelahanka, Bengaluru.

"Highly appreciate efforts of the Indian organizers to hold in the current conditions the 13th edition of Aero India 2021 - one of the most prominent exhibitions in the world," Ambassador Kudashev said in a statement.



"I am very proud to note that Russia will be one of the biggest exhibitors at the Aero India 2021. We plan to demonstrate Su-57, Su-35 and MiG-35 fighter jets, helicopters Ka-52, Ka-226, Mi-17B-5, Mi-26, S-400 systems, and many others," he added.

Russian-Indian defence ties constitute the main pillar of the special and privileged strategic partnership between the two countries, said Kudashev while adding that both nations are moving towards implementation of all priority projects.

"We are successfully moving towards implementation of all priority projects - S-400 systems deliveries, AK-203 Kalashnikovs contract, Ka-226 helicopters supplies and production in India, as well as an advanced cooperation in the areas of combat aviation (including Su-30MKI), main battle tanks (T-90), frigates, submarines and missiles, along with joint production of the unique Brahmos," the Russian envoy said.

Speaking at the Aero India 2021 here in Bengaluru, Defence Minister Rajnath Singh on Wednesday said that the event, which is being conducted in a hybrid format with a concurrent virtual exhibition, has truly gone digital and global.

"In order to maximise the reach and participation, the event is being conducted in a hybrid format with a concurrent virtual exhibition which will integrate Seminars, B2B interactions etc. It will be not incorrect to say, that Aero India 21 has truly gone digital and global," the Defence Minister said. During the event, Defence Minister Rajnath Singh will release the DRDO export compendium, a new Procedure for Design, Development and Production of Military Aircraft and Airborne Stores (DDPMAS) document and other documents.

According to an official release, the DRDO will exhibit its latest defence technologies and demonstrate many systems. One of the DRDO's major attractions will include flying displays of Airborne Early Warning and Control (AEWC) system, Light Combat Aircraft (LCA) Tejas and LCA Navy.

Organised every two years, Aero India is a platform for aerospace enthusiasts, prospective defence industries, aspirant start-ups and other stakeholders to participate and witness the advances in global defence and aerospace fields and interact with delegations and industries from across the globe.

"The Organisation with its vast defence design and development capability has been working towards Atmanirbhar Bharat and has taken up many policy initiatives to work closely with all stakeholders of the ecosystem. More than thirty laboratories of DRDO connected to aeronautical development are exhibiting their products and technological achievements in this mega event," the statement said. (ANI)

<https://www.bignewsnetwork.com/news/267727337/russian-ambassador-lauds-aero-india-2021>

# India may take a decade to develop fighter jet engine: BN Kalyani, Bharat Forge

By Elizabeth Roche

- *To make a fighter engine, you need a consortium of industry partners to participate in this, as it involves a lot of capital, it involves a lot of talent and it involves multiple technologies, Kalyani said.*

New Delhi: Bharat Forge Chairman and Managing Director Babasaheb Neelkanth Kalyani is confident that India can develop its own fighter jet engine — the lack of which is seen as a reason for the indigenous Light Combat Aircraft taking decades to take shape from the drawing board to the manufacture stage. Kalyani's estimate is that it could take India about a decade to develop a fighter jet engine with India's Defence Research and Development Organisation taking the lead. Edited excerpts from an interview.



Bharat Forge Chairman and Managing Director Babasaheb Neelkanth Kalyani. Photo: Mint

**How have the measures announced for defence production under "Atmanirbhar Bharat" helped?**

We pretty much believe that there are many areas where with this entire focus on Atmanirbhar Bharat and making India self reliant in defence and creating our own technology rather than depending on outside technology, I think India is going to emerge very very strong in many sectors in the defence industry.

**Which are these areas? Artillery guns? That's something you have talked of yourself.**

Many companies in India are going to emerge very strong in this sector in the next five years. As far as Indian companies are concerned and the technology ownership is Indian is largely coming out of the DRDO (Defence Research and Development Organisation) process. I think DRDO is the central pillar which is creating defence technology. And the model that the DRDO is now adopting for the last few years is getting more and more industry partners right in the beginning of every programme making them do part developments on their own. So, there is a huge change in the whole ecosystem that is coming up. We had a DRDO seminar today (Thursday) and the theme was you have one DRDO and if you have 100 companies that are working with DRDO and they have their own little R& D centres then you have 100 mini DRDOs and the result of this is exponential. It is not just a participation of 100 companies, you get exponential results and that is what you are beginning to see in India as a matter of fact.

**You have said that India needs to have its own fighter jet engine, make its own fighter jet engine. Any progress on that from your side?**

India needs to make a fighter engine. This is one technology which is part of the strategic technology development plan of even the DRDO. And for this you need a consortium of industry partners to be involved in this because it involves a lot of capital, it involves a lot of talent and it involves multiple technologies. I think the DRDO has already started the programme on AMCA (Advanced Medium Combat Aircraft) engines, they are putting their internal teams together which is ADA (Aeronautical Development Agency), GTRE (Gas Turbine Research Establishment), HAL (Hindustan Aeronautics) all these people together. And they would obviously need industry partners to make the parts and the real metal that is required in the engine. It will happen.

**Any timeline by when it could happen?**

Making a brand new engine, you know, even on a pessimistic basis is a seven to 10 year programme.

**You spoke about Indian owned technology. India's own technology base is seen as weak if you go by the number patents registered for example. How does one strengthen the Innovation and R & D culture?**

I think it is very necessary for a country and an economy of our size if it wants to grow to the first step – a \$5 trillion economy, the dream that we all have along with our honourable prime minister – without R & D that is not going to happen. It cannot happen on foreign technology. A large of it has to happen on our own technology. We have proven this in the covid-19 pandemic. Within two months we were able to make PPEs (Personal Protection Equipment), ventilators, all kind of facilities that were required for treating patients including tests and testing centres. That shows what capability this country has inherently. It just needs to get rid of its silos and work in a unified direction. I think "Atmanirbhar Bharat" is creating that unified direction. If we can get rid of the silos I think India will go miles.

**When are we likely to see foreign orders for Indian made defence hardware?**

That's a difficult question. But you build the talent, you build the capability, you build an eco system, the business has to flow. Like water finds its own level, business will find its own level.

**Your company was in the process of manufacturing Advanced Towed Artillery Guns (ATAGs). What is the progress on that?**

The ATAG is in testing phase.

**When is the order from the Indian Army expected to come through?**

That's a difficult question to answer.

**You also had plans to develop small arms. Any progress on that?**

We are working on it. We are quite confident that with our capabilities, we can make that happen.

<https://www.livemint.com/news/india/india-may-take-a-decade-to-develop-fighter-jet-engine-bn-kalyani-bharat-forge-11612498266599.html>

## The Dispatch

*Fri, 05 Feb 2021*

### Asia's biggest show Aero India to conclude in Bengaluru today

Aero India, Asia's biggest show will conclude today in Bengaluru with President Ramnath Kovind gracing the valedictory programme. The concluding day will also have a Bandhan Ceremony where over 200 MoUs will be signed for the promotion of defence production within the country.

Seminars on defence industrial corridors in UP and Telangana and opportunities for aerospace industries in Karnataka will be held today. Industry bodies like FICCI and ASSOCHAM are holding seminars on opportunities in the defence production sector.

DRDO, the premier R&D organisation in Defence sector will hold seminar on energising R&D capabilities with industry, academia and certification aspects for Atmanirbhar Bharat.

The third day of the show will also have air display by Indian and foreign fighter aircraft. The Exhibition area has been attracting visitors since day one that gives a peek into the defence production sector and opportunities available in aerospace and military war gear manufacturing.

<https://www.thedispatch.in/asias-biggest-show-aero-india-to-conclude-in-bengaluru-today/>



## Aero India 2021: USA flies heavy bomber B-1B with LCA Tejas in Bengaluru

*Nicknamed 'The Bone', the B-1B has been deployed in  
combat operations over Afghanistan and Iraq since 2001*

The American B-1B Lancer heavy bomber was flown for the first time in India at Aero India 2021, the 13th edition of the biennial show on Wednesday, to showcase its capabilities. The long-range, multi-role bomber flew to Bengaluru a week prior to Aero India from the Ellsworth Air Force Base in USA's South Dakota, to perform a fly-by at the defence exhibition and air show. In a statement, the US Consulate mentioned that the supersonic bomber is capable of carrying out missions worldwide from its bases in the United States, as well as from forward-deployed locations.

"The Boeing's B1-Bomber flew along with the Made in India Light Combat Aircraft (LCA) Tejas during the flying display of various military aircraft at the inaugural event of the three-day air show at the Yelahanka base of the Indian Air Force (IAF) on the city's outskirts," a defence official told IANS.

With the conventional payload of guided and unguided weapons in the US Air Force on board, the massive aircraft is considered the backbone of America's long-range bomber force.

Powered by four General Electric F101-GE-102 turbofan engines with afterburner, the Bomber has 137 feet wingspan, 146 feet length, 34 feet height and weighs a whopping 86,183 kg.

"The bomber's maximum take-off weight is 2,16,634 kg and it has a capacity to carry 1,20,326 kg and can fly at 900 miles per hour at over 30,000 feet," Boeing said in its factsheet.

Nicknamed 'The Bone', the B-1 has been deployed in combat operations over Afghanistan and Iraq since 2001.

As a major partner, the US is participating in the air show to strengthen its defence ties with India, reflecting its shared vision of a free and open Indo-Pacific region. Leading US defence firms are participating in the maiden hybrid exhibition amid the pandemic.

In the spirit of bilateral support, the US Air Force Band of the Pacific-based out of Hawaii is set to perform with ghatam artist Giridhar Udupa at Aero India.

<https://www.thenewsminute.com/article/aero-india-2021-usa-flies-heavy-bomber-b-1b-lca-tejas-bengaluru-142757>



Representative Image/ Aero India

# Defence Strategic: National/International



Press Information Bureau  
Government of India

Ministry of Defence

Thu, 04 Feb 2021 7:22PM

## Aero India 2021: IOR seminar building collective maritime competence towards Security and Growth for all in the Region (SAGAR)

Indian Navy conducted a seminar on Building Collective Maritime Competence towards Security and Growth for All in the Region (SAGAR) on 4<sup>th</sup> February, 2021, during the ongoing Aero India 2021.

The seminar was attended by Defence Ministers/ Service Chiefs/ Delegations from Friendly Foreign Countries, academia, Diplomats from various Missions and media personnel in a hybrid format involving both physical and virtual participation.

Admiral Karambir Singh PVSM, AVSM, ADC, Chief of Naval Staff delivered the Welcome Remarks.

Shri Rajnath Singh, Honourable Raksha Mantri, delivered the Keynote Address. Quoting historic wisdom from our scriptures, he said “*ऐक्यं बलं समाजस्य, तद्भावेन दुर्बलः*”, which clearly enunciates that, ‘Unity is Strength of any Society, and a Society is weak without it’, the RM lauded the topic of the seminar as chosen by the Indian Navy, which delves into building collective maritime competence.

The prominence of Indian Ocean Region in global strategy has mandated many nations establishing a presence in the region to ensure their strategic interests and assist in overcoming challenges in the maritime domain viz., piracy, maritime terrorism, human trafficking, Illegal Unreported and Unregulated Fishing, loss of bio-diversity and battling climate change. Since energy and trade are critical in geo-political strategies, any disruption and consequent turbulence in smooth flow would have strategic security implications for all of us (in the Region) and the world at large.

In order to ensure collective growth and prosperity, it is imperative that we build competence in the maritime domain, on a collective basis. India, due to its geostrategic location in IOR, quintessential maritime character, historical and cultural ties with the littoral states, considers it obligatory to keep the maritime neighbourhood safe and secure, through unity and togetherness, against menace originating from the maritime domain. We believe that, in unity lies our strength.

In recent years, India has taken a number of initiatives driven by the need for ‘collective growth’ in the region, which has included our initiatives of ‘Look East’ policy of the late nineties to the more recent ‘Act East’ policy and our maritime initiatives of Security and Growth for All in the





Region (SAGAR). All these initiatives have underscored the need for a ‘Whole of Government’ approach to strengthen relations in the IOR in a mutually supportive and cooperative manner and we have identified shared concerns from our partner countries. These concerns, necessitate that our response must be synchronised and coordinated, to accomplish a common goal.

Indian Navy has sustained its prominence as the ‘First Responder’ in the IOR during natural disasters and also during the testing times of COVID. ‘Mission Sagar’ was aimed at providing medical and humanitarian aid, food supplies to our maritime neighbours. The prompt assistance provided for arresting fire onboard Motor Tanker Diamond off Sri Lanka, assistance rendered in aftermath of the oil spill incident involving Motor Vessel Wakashio off Mauritius and search and rescue efforts undertaken off Indonesia to locate missing fisherman, were indicative of collective readiness at all times to respond to the unforeseen.

The Hon’ble RM emphasised that, “Towards maintaining a safe and secure maritime environment in the IOR, the Navies/ Maritime Agencies in the region are partnering to develop a comprehensive Maritime Domain Awareness in the IOR.”

Shri Ajay Kumar, Defence Secretary provided the Closing Remarks. Quoting Mahatma Gandhi, “One Must Continue to Grow and Evolve”, he drew relevance, as the Indian Navy continues to be the ‘Preferred Security Partner’ and eventually aims to be the ‘Dependable Maritime Neighbour’.

Speaking on relevance of the IOR, the Defence Secretary stressed that, Any threat, ‘whether man made or natural’, emanating from within this region or from adjacent domains, would have adverse effect on the livelihood of population. The issues that plague are not limited by boundaries and not specifically against a particular sovereign state. Therefore, the Navies/ maritime agencies which are also not limited by boundaries, and are work horses of the maritime domain, need to aim at working together by ‘Keeping Station’ with each other.

During the Seminar, two panel discussions were held on Identifying Common Maritime Security Challenges and Building Collective Maritime Competence to Overcome Security Challenges. Details are given below.

#### Panel 1- Identifying Common Maritime Security Challenges

Moderator - RAdm SJ Singh, NM, Commandant Naval War College, Goa

Panelists:-

- Maj Gen Abdulla Shamaal, MA, MSC, NDU, OPSC, Chief of Defence Force, Maldives
- Dr Frederic Grare, Nonresident Senior Fellow, South Asia Program, Carnegie Endowment for International Peace, Washington DC (Virtual)
- VAdm Pradeep Chauhan (Retd), Director General National Maritime Foundation, New Delhi (Virtual)
- Mr PS Raghavan, Former Chairman NSAB
- Adm Ravindra Chandrasiri Wijegunaratne, WV, RWP & Bar, RSP, VSV, USP, NI(M), NDC, PSN, Former Chief of Defence Staff, Sri Lanka

#### Panel 2 - Building Collective Maritime Competence to Overcome Security Challenges

Moderator - RAdm Sudhir Pillai (Retd), NM

Panelists:-

- Adm Aurangzeb Chowdhury, NBP, OSP, BCGM, PCGM, BCGMS, NDC, PSC. Former CNS Bangladesh Navy
- RAdm VK Saxena (Retd), Chairman and Managing Director, Garden Reach Shipbuilders & Engineers Ltd, Kolkata
- Ms Jane Chan, Senior Fellow and Coordinator of the Maritime Security Programme at the S. Rajaratnam School of International Studies (RSIS), Singapore (Virtual)
- Timothy Walker, Maritime Project Leader and Senior Researcher, Institute for Security Studies (ISS), Pretoria (Virtual)

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695245>



## **Raksha Mantri's keynote address at IOR Defence Ministers' Conclave stresses on Prime Minister's 'Five S' vision to tackle global challenges**

**Raksha Mantri: Linked futures for IOR nations depend on tackling emerging challenges & opportunities**

**Raksha Mantri: Open seas and respect for international law essential for security for IOR**

**26 out of 28 IOR countries participate and share their views on enhancing regional cooperation**

The Indian Ocean Region (IOR) Defence Ministers' Conclave began with a keynote address from Raksha Mantri Shri Rajnath Singh on 4th February on the sidelines of Aero India 2021 in Bengaluru. Several Defence Ministers, Ambassadors, High Commissioners and senior officials from IOR countries have attended the event physically or in virtual mode. Outlining the agenda, Raksha Mantri said that as the largest nation in the IOR region with a vast coast line of 7500 Kms, India has an active role to play for peaceful and prosperous co-existence of all countries. Shri Rajnath Singh stressed that the Indian Ocean is a shared asset and a lifeline to international trade and transport due to its control of major sea-lanes carrying half of the world's container ships, one third of the world's bulk cargo traffic and two thirds of the world's oil shipments.

Shri Rajnath Singh said SAGAR - Security and Growth for All in the Region is the theme of Indian Ocean Policy as outlined by Prime Minister Shri Narendra Modi in 2015. He added that in line with this the IOR conclave should focus on security, commerce, connectivity, fight against terrorism and inter cultural exchanges. Raksha Mantri identified areas such as deepening economic and security cooperation in the littorals, enhancing capacities to safeguard land and maritime territories, working towards sustainable regional development, Blue Economy, including sustainable and regulated fishing, and promoting collective action to deal with non-traditional threats like natural disasters, piracy, terrorism, illegal, unreported and unregulated (IUU) fishing etc. as inter-related elements of SAGAR. He said IOR faces a number of challenges such as piracy, smuggling of drugs/people and arms, humanitarian and disaster relief, and Search & Rescue (SAR) which can be met through maritime co-operation.

Raksha Mantri identified maritime resources as the key to sustained growth and development of IOR nations in the 21st century. He said that the negative impact of conflicting claims in some maritime areas of the world highlighted the need to ensure peace in the IOR region. He added that IOR countries have demonstrated mutual respect for a rules-based order and commitment to abide by international law. Raksha Mantri spoke of the various policy initiatives of the government to promote trade and tourism among IOR countries through sea link Sagarmala, Project Mausam, and Asia Africa Growth Corridor etc. He emphasized the need to take economic, trade, naval cooperation and collaboration further in the region. He said that the linked futures of IOR countries depend on how they tackle emerging challenges and leverage opportunities.

Referring to India's growing Aerospace & Defence sector and its emergence as a global R&D hub with one of the world's largest start up ecosystems, Raksha Mantri said IOR countries can

leverage these sectors for mutual benefit. He said the recent order from the Indian Air Force to buy 83 Light Combat Aircraft (LCA) Tejas Mk-1A from Hindustan Aeronautics Limited (HAL) is a milestone in India's indigenization of defence manufacturing capabilities. Shri Rajnath Singh added that India is ready to supply various types of weapons systems to IOR countries. Shri Rajnath Singh said that in consonance with the Prime Minister Narendra Modi's vision of SAGAR, Neighbourhood First and Act East Policies, India has adopted a cooperative approach through capacity building assistance in partner countries. This was reflected in India's supply of Indian made ships, maritime aircraft and setting-up of Coastal Surveillance Radar Systems, he said.

Raksha Mantri said India was developing a comprehensive Maritime Domain Awareness picture in the IOR, which has resulted in signing of Technical Agreements for sharing of 'White Shipping Information'. He added that Humanitarian Assistance and Disaster Relief (HADR), Non-combatant Evacuation (NEO), and Search and Rescue (SAR) Operations are important and highlighted India's swift response during the cyclones in Mozambique and Madagascar and reaching out to countries through medical teams, medicines such as hydroxychloroquine, Remdesivir and paracetamol tablets, diagnostic kits, ventilators, masks, gloves and other medical supplies through Operation-Sagar-I during COVID times. He further said that Op-SAGAR-II saw over 300 metric tons of humanitarian aid being delivered to 4 nations in the IOR.

Shri Rajnath Singh said vaccine supplies under grant assistance to Bhutan, Maldives, Bangladesh, Nepal, Myanmar and Seychelles have already highlighted India's commitment to protect humanity from COVID-19. He said that India was conducting training programmes for immunization managers, cold chain officers, communication officers and data managers of the recipient countries before delivery of the vaccines. He highlighted development of effective response mechanism to humanitarian crisis and natural disasters in the IOR region as one of the most visible element of India's Indian Ocean strategy.

Raksha Mantri said India's approach and vision to tackle global challenges was highlighted by Prime Minister Shri Narendra Modi's dynamic five 'S' vision - Samman (Respect), Samvaad (Dialogue), Sahyog (Cooperation), Shanti (Peace) and Samriddhi (Prosperity).

**Twenty six out of 28 countries from the IOR region attended the conclave either physically or in virtual mode.** In his closing remarks, Shri Rajnath Singh said the enthusiastic participation was a symbol of the collective desire of the nations of the IOR region to work together. He applauded the dynamism, ideas and conviction for a brighter future displayed at the conclave. Highlighting the global geopolitical and commercial significance of the Indian ocean, he said 75 per cent of global trade and 50 per cent of daily global transfers already pass through the region. He further said the deployment of ships by the Indian Navy and the Indian Coast guard for maritime security and anti-piracy operations had been successful in minimising threats to commercial shipping.

Shri Rajnath Singh said the conclave showcased what the IOR nations were capable of achieving in terms of trade, security and facilitation, fighting non-traditional threats, promoting uninterrupted access to the open seas. He emphasised that easy uninterrupted access to the open seas and respect for the international law was essential for stability and security in the region. Raksha Mantri ended his address by saying that he hoped that ideas germinated at the conclave would lead to sustainable action and partnerships.

Defence Secretary Dr Ajay Kumar delivered the welcome address at the conclave. Chief of Defence Staff General Bipin Rawat, Chief of Naval Staff Admiral Karambir Singh, Chief of Army Staff General MM Naravane and Secretary (Defence Production) Shri Raj Kumar were also present.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695120>



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Thu, 04 Feb 2021 3:25PM

## हिन्द महासागर क्षेत्र के रक्षा मंत्रियों के सम्मेलन में रक्षा मंत्री के मुख्य भाषण में वैश्विक चुनौतियों से निपटने के लिए प्रधानमंत्री के 'फाइव एस' दृष्टिकोण पर जोर दिया गया

रक्षा मंत्री: हिंद महासागर क्षेत्र के देशों के लिए मिला जुला भविष्य उभरती चुनौतियों और अवसरों से निपटने पर निर्भर करता है

रक्षा मंत्री: हिंद महासागर क्षेत्र की सुरक्षा के लिए खुले समुद्र और अंतरराष्ट्रीय कानून का सम्मान आवश्यक है

हिंद महासागर क्षेत्र के 28 में से 26 देशों ने भाग लिया और क्षेत्रीय सहयोग बढ़ाने पर अपने विचार साझा किए

हिंद महासागर क्षेत्र (आईओआर) के रक्षा मंत्रियों के सम्मेलन की शुरुआत बेंगलुरु में एयरो इंडिया 2021 के मौके पर दिनांक 4 फरवरी को रक्षा मंत्री श्री राजनाथ सिंह के मुख्य भाषण के साथ हुई। कई रक्षा मंत्रियों, राजदूतों, उच्चायुक्तों और आईओआर देशों के वरिष्ठ अधिकारियों ने इस कार्यक्रम में स्वयं आकर या आभासी तरीके से भाग लिया है। इस एजेंडे को रेखांकित करते हुए रक्षा मंत्री ने कहा कि 7500 किलोमीटर की विशाल तट रेखा वाले हिंद महासागर क्षेत्र के सबसे बड़े राष्ट्र के रूप में भारत की सक्रिय भूमिका सभी देशों के शांतिपूर्ण और समृद्ध सह-अस्तित्व के लिए है। श्री राजनाथ सिंह ने जोर देकर कहा कि हिंद महासागर एक साझा परिसंपत्ति है और दुनिया के आधे कंटेनर जहाजों, दुनिया के थोक कार्गो यातायात का एक तिहाई और दुनिया के दो तिहाई तेल लदान को ले जाने वाले प्रमुख समुद्री लेन के नियंत्रण के कारण अंतरराष्ट्रीय व्यापार और परिवहन के लिए एक साझा परिसंपत्ति और जीवन रेखा है।

श्री राजनाथ सिंह ने कहा कि सागर - इस क्षेत्र में सभी के लिए सुरक्षा और विकास हिंद महासागर नीति का थीम है जैसा कि प्रधानमंत्री श्री नरेन्द्र मोदी ने 2015 में रेखांकित किया था। उन्होंने कहा कि इसके अनुरूप हिंद महासागर क्षेत्र के कॉन्क्लेव में सुरक्षा, वाणिज्य, कनेक्टिविटी, आतंकवाद के खिलाफ लड़ाई और अंतर सांस्कृतिक आदान-प्रदान पर ध्यान केंद्रित करना चाहिए। रक्षा मंत्री ने तटवर्ती देशों में आर्थिक और सुरक्षा संबंधी सहयोग को मजबूत करना, भूमि और समुद्री क्षेत्रों की सुरक्षा के लिए क्षमताओं को बढ़ाना, टिकाऊ क्षेत्रीय विकास की दिशा में काम करना, टिकाऊ और विनियमित फिशिंग सहित ब्लू अर्थव्यवस्था और प्राकृतिक आपदाओं, समुद्री डकैती, आतंकवाद, अवैध, असूचित और अनियमित (आईयूयू) फिशिंग आदि जैसे क्षेत्रों की पहचान की। उन्होंने कहा कि आईओआर को समुद्री डकैती, ड्रग्स/ लोनों और हथियारों की तस्करी, मानवीय एवं आपदा राहत और खोज और बचाव (एसएआर) जैसी कई चुनौतियों का सामना करना पड़ता है, जिन्हें समुद्री सहयोग के ज़रिए पूरा किया जा सकता है।

रक्षा मंत्री ने 21वीं सदी में हिंद महासागर क्षेत्र के राष्ट्रों के सतत संवृद्धि और विकास की कुंजी के रूप में समुद्री संसाधनों की पहचान की। उन्होंने कहा कि दुनिया के कुछ समुद्री क्षेत्रों में परस्पर विरोधी दावों के नकारात्मक प्रभाव ने हिन्द महासागर क्षेत्र (आईओआर) में शांति सुनिश्चित करने की जरूरत पर प्रकाश डाला। उन्होंने कहा कि आईओआर देशों ने नियम आधारित व्यवस्था और अंतरराष्ट्रीय कानून का पालन करने की प्रतिबद्धता के लिए आपसी सम्मान का प्रदर्शन किया है। रक्षा मंत्री ने समुद्री संपर्क सागरमाला, प्रोजेक्ट मौसम और एशिया अफ्रीका ग्रोथ कॉरिडोर आदि के माध्यम से हिंद महासागर क्षेत्र के देशों के बीच व्यापार और पर्यटन को बढ़ावा देने के लिए सरकार की विभिन्न नीतिगत पहलों की बात कही। उन्होंने इस क्षेत्र में आर्थिक, व्यापारिक, नौसैनिक सहयोग और साझेदारी को और आगे ले जाने की जरूरत पर जोर दिया। उन्होंने कहा कि हिंद महासागर क्षेत्र के देशों का मिला जुला आपसी भविष्य इस बात पर निर्भर करता है कि वे उभरती चुनौतियों से कैसे निपटते हैं और अवसरों का लाभ कैसे उठाते हैं।

भारत के बढ़ते एयरोस्पेस और रक्षा क्षेत्र और दुनिया के सबसे बड़े स्टार्ट अप पारितंत्र प्रणालियों में से एक के साथ वैश्विक अनुसंधान एवं विकास केंद्र के रूप में उभरने का जिक्र करते हुए रक्षा मंत्री ने कहा कि आईओआर देश पारस्परिक लाभ के लिए इन क्षेत्रों का फायदा उठा सकते हैं। उन्होंने कहा कि भारतीय वायु सेना की ओर से हिंदुस्तान एयरोनॉटिक्स लिमिटेड (एचएएल) से 83 उन्नत हल्के हेलीकॉप्टर एमके-1ए खरीदने का हालिया आदेश रक्षा विनिर्माण क्षमताओं के मामले में भारत के स्वदेशीकरण में मील का पत्थर है। श्री राजनाथ सिंह ने कहा कि भारत आईओआर देशों को विभिन्न प्रकार की हथियार प्रणालियों की आपूर्ति करने के लिए तैयार है। श्री राजनाथ सिंह ने कहा कि प्रधानमंत्री श्री नरेन्द्र मोदी के सागर, नेबरहुड फ्रंट और एक्ट ईस्ट पॉलिसियों के नज़रिए के अनुरूप भारत ने साझेदार देशों में क्षमता निर्माण सहायता के माध्यम से सहयोगात्मक दृष्टिकोण अपनाया है। उन्होंने कहा कि यह भारत द्वारा भारत निर्मित जहाजों, समुद्री विमानों की आपूर्ति और तटीय निगरानी रडार प्रणालियों की स्थापना में परिलक्षित हुआ।

रक्षा मंत्री ने कहा कि भारत हिंद महासागर क्षेत्र (आईओआर) में एक व्यापक समुद्री डोमेन जागरूकता खाका विकसित कर रहा है, जिसके परिणामस्वरूप 'व्हाइट शिपिंग सूचना' के बंटवारे के लिए तकनीकी समझौतों पर हस्ताक्षर किए गए हैं। उन्होंने कहा कि मानवीय सहायता और आपदा राहत (एचएडीआर), संघर्ष बगैर निकासी (एनईओ) तथा खोजबीन और बचाव (एसएआर) अभियान महत्वपूर्ण हैं और साथ ही उन्होंने मोजांबिक और मेडागास्कर में चक्रवातों के दौरान भारत की तेजी से प्रतिक्रिया, चिकित्सा टीमों के माध्यम से देशों तक पहुंचने, कोविड के दौरान ऑपरेशन सागर-1 के माध्यम से हाइड्रोक्सीक्लोरोक्वीन, रेमडेसिवर और पैरासिटामोल टेबलेट, डायग्नोस्टिक किट, वेंटिलेटर, मास्क, दस्ताने और अन्य चिकित्सा आपूर्ति जैसी दवाएं पहुंचाने पर प्रकाश डाला। उन्होंने आगे कहा कि ऑपरेशन सागर-11 के अंतर्गत हिंद महासागर क्षेत्र में 4 राष्ट्रों को 300 मीट्रिक टन से अधिक मानवीय सहायता प्रदान की गई।

श्री राजनाथ सिंह ने कहा कि भूटान, मालदीव, बांग्लादेश, नेपाल, म्यांमार और सेशेल्स को अनुदान सहायता के तहत वैक्सीन की आपूर्ति ने पहले ही कोविड-19 से मानवता की रक्षा के लिए भारत की प्रतिबद्धता को रेखांकित किया है। उन्होंने कहा कि भारत टीकों की डिलीवरी से पहले प्राप्तकर्ता देशों के प्रतिरक्षण प्रबंधकों, कोल्ड चेन अधिकारियों, संचार अधिकारियों और डेटा प्रबंधकों के लिए प्रशिक्षण कार्यक्रम आयोजित कर रहा था। उन्होंने हिंद महासागर क्षेत्र में मानवीय संकट और प्राकृतिक आपदाओं के लिए प्रभावी प्रतिक्रिया तंत्र के विकास को भारत की हिंद महासागर रणनीति के सबसे स्पष्ट तत्व के रूप में रेखांकित किया।

रक्षा मंत्री ने कहा कि वैश्विक चुनौतियों से निपटने में भारत का रवैया और दृष्टिकोण प्रधानमंत्री श्री नरेन्द्र मोदी के गतिशील फाइव 'एस' विजन- सम्मान, संवाद, सहयोग, शांति और समृद्धि से उजागर हुआ।

हिंद महासागर क्षेत्र के 28 में से 26 देशों के नुमाइंदों ने स्वयं आकर या आभासी रूप से इस सम्मेलन में भाग लिया । अपने समापन भाषण में श्री राजनाथ सिंह ने कहा कि उत्साही भागीदारी हिंद महासागर क्षेत्र के राष्ट्रों की सामूहिक इच्छा का प्रतीक है। उन्होंने कॉन्क्लेव में प्रदर्शित उज्ज्वल भविष्य के लिए गतिशीलता, नये विचारों और दृढ़ विश्वास की सराहना की । हिंद महासागर के वैश्विक भू-राजनीतिक और वाणिज्यिक महत्व पर प्रकाश डालते हुए उन्होंने कहा कि वैश्विक व्यापार का 75 प्रतिशत और दैनिक वैश्विक हस्तांतरण का 50 प्रतिशत पहले से ही इस क्षेत्र से गुजरता है । उन्होंने आगे कहा कि समुद्री सुरक्षा और समुद्री डकैती रोधी अभियानों के लिए भारतीय नौसेना और भारतीय तटरक्षक बल द्वारा जहाजों की तैनाती वाणिज्यिक नौवहन के खतरों को कम करने में सफल रही है।

श्री राजनाथ सिंह ने कहा कि सम्मेलन में यह प्रदर्शित किया गया कि हिंद महासागर क्षेत्र के राष्ट्र व्यापार, सुरक्षा और सुविधा, गैर-पारंपरिक खतरों से लड़ने, खुले समुद्रों तक निर्बाध पहुंच को बढ़ावा देने के मामले में क्या हासिल कर पाने में सक्षम हैं । उन्होंने इस बात पर जोर दिया कि इस क्षेत्र में स्थिरता और सुरक्षा के लिए खुले समुद्रों तक आसानी से निर्बाध पहुंच और अंतरराष्ट्रीय कानून का सम्मान जरूरी है । रक्षा मंत्री ने अपने संबोधन को यह कहते हुए समाप्त किया कि उन्हें आशा है कि सम्मेलन में प्रकट विचारों से ठोस कार्रवाई और साझेदारियां होंगी।

सम्मेलन में रक्षा सचिव डॉ अजय कुमार ने स्वागत भाषण दिया । इस दौरान चीफ ऑफ डिफेंस स्टाफ जनरल बिपिन रावत, नौसेना प्रमुख एडमिरल करमबीर सिंह, सेनाध्यक्ष जनरल एम एम नरवणे और सचिव (रक्षा उत्पादन) श्री राज कुमार भी मौजूद थे।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695270>



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*Thu, 04 Feb 2021 6:19PM*

## **Major Upgrade of Naval Environmental Test Facility Inaugurated by Deputy Chief of Naval Staff**

The Defence Testing Infrastructure required for realisation of 'AatmaNirbhar Bharat' in Defence sector, got a major boost with inauguration of the upgraded Naval Environmental Test Facility (NETF) by Vice Admiral MS Pawar, Deputy Chief of the Naval Staff on 04 Feb 21.

While common test facilities for Climatic and Dynamic testing of military equipment are available in public and private sector, a critical gap existed in the country with regard to qualifying the equipment for turbulence experienced by ships and submarines at higher sea states which induce platform motion in six degrees of freedom – Roll, Pitch, Yaw, Heave, Surge and Sway.

This capability gap has been overcome by the Chief Quality Assurance Establishment (Warship Equipment) Bengaluru, with major augmentation of its infrastructure, which includes a first-of-its-kind, indigenously developed Ship Motion Test Platform (SMTP). The SMTP has been indigenously designed and developed to meet qualification requirements for ship motion in extreme marine conditions up to Sea State 7.



The upgraded NETF also includes a number of other state-of-the-art test facilities such as High Ramp Rate Thermal Cycling Chamber for accelerated climatic testing, Mould Growth Test Chamber and Dust/Salt/Tilt/Drop/Immersion test facilities for military equipment.

Vice Admiral MS Pawar appreciated the efforts put in by Naval QA team in augmentation of the test facilities and adoption of global best practices in Quality Assurance domain.

All test facilities at NETF, Bengaluru are open for use by the Defence and Aerospace industry, including MSMEs and Start Up firms.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695214>



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*Thu, 04 Feb 2021 7:50PM*

## **HAL signs MoU with MIDHANI to develop**

Hindustan Aeronautics Limited (HAL) and Mishra Dhatu Nigam Limited (MIDHANI) have signed a Memorandum of Understanding (MoU) for development and production of composite raw materials during the Aero India 2021 in Bengaluru on February 04, 2021. This is the first time that such an MoU has been signed for composite raw materials. The MoU was signed by Chairman and Managing Director, HAL Shri R Madhavan and Chairman and Managing Director, MIDHANI Dr S K Jha in the presence of other senior officials.

Mr R Madhavan said composites are one area where HAL will collaborate. Composites raw materials, mainly in the form of prepregs used in platforms like Light Combat Aircraft (LCA), Advanced Light Helicopter (ALH), Light Combat Helicopter (LCH) and Light Utility Helicopter (LUH) are currently imported.

The CMD of MIDHANI Shri SK Jha said, this is the major step forward in the area of composite materials. The HAL is not only taking care of frontline aircraft production but also raw materials. There is no equivalent proven Indian approved/qualified supplier for various types of prepregs (carbon, aramid, glass types, etc) for the aircraft applications. This creates dependency on foreign Original Equipment Manufacturers (OEMs). Aligned with “Atmanirbhar Bharat” initiative, efforts need to be made to develop and manufacture such prepregs in India through collaboration, he added.

The usage of composites in the aerospace is going to exist and increase, particularly for fighter aircraft/helicopter because of its inherent advantages over metallic raw materials. In addition, similar requirement exists for other aerospace and defence programmes, including those of Indian Space Research Organisation (ISRO), Defence Research Development Organisation (DRDO) and National Aerospace Laboratories (NAL).

<https://pib.gov.in/PressReleasePage.aspx?PRID=1695265>

## Aero India: IAF Chief holds talks with Tajikistan, Bangladesh counterparts

*Air Chief Marshal Bhadauria also met a French delegation and affirmed deep strategic partnership between India and France*

Indian Air Force (IAF) Chief Air Chief Marshal RKS Bhadauria on Friday met his counterparts from Tajikistan and Bangladesh and a delegation from France in separate meetings on the last day of Aero India 2021 in Bengaluru.

"IAF Chief Air Chief Marshal RKS Bhadauria met Lt Gen Safaralizoda Rahmonali, Chief of Air Force and Air Defence Forces of the Republic of Tajikistan during Aero India 2021. The chiefs acknowledged strong bilateral ties and discussed enhancement of ongoing defence engagements," IAF tweeted.

IAF chief Bhadauria also held extensive talks with Bangladesh air force chief.

"CAS, Air Chief Marshal RKS Bhadauria and Air Chief Marshal Masihuzzaman Serniabat, CAS, Bangladesh Air Force during a bilateral meeting at [Aero India](#) 21. The wide range of exchanges between the two Air Forces is a reflection of strong bonds of friendship that bind India & Bangladesh," IAF said in another tweet.

Air Chief Marshal Bhadauria also met a French delegation and affirmed deep strategic partnership between India and France.

"General Thierry Carlier, Dir for Intl Development, French Defence Procurement Agency (DGA), met with the CAS at #AeroIndia21. Defence cooperation is an important pillar of a deep strategic partnership between India & France," the IAF said.

On Thursday, IAF Chief had met Lt Gen Issameldin Saeid Koko Abdalrrahman, Commander of Air Force, Sudan and discussed measures to enhance bilateral cooperation.

"CAS met with Lt Gen Issameldin Saeid Koko Abdalrrahman, Cdr of Air Force, Sudan and discussed measures to enhance bilateral cooperation and training mechanisms between the two Air Forces," tweeted IAF.

Aero India is being held from February 3 to 5 at the Yelahanka Air Force Station in Bengaluru.

*(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)*

[https://www.business-standard.com/article/current-affairs/aero-india-iaf-chief-holds-talks-with-tajikistan-bangladesh-counterparts-121020500227\\_1.html](https://www.business-standard.com/article/current-affairs/aero-india-iaf-chief-holds-talks-with-tajikistan-bangladesh-counterparts-121020500227_1.html)



Chief of Defence Staff General Bipin Rawat, Chief of Army Staff General Manoj Mukund Naravane and Air Force Chief Air Chief Marshal RKS Bhadauria during the inauguration of the 13th edition of Aero India, at Yelahanka air base in Bengaluru on Wednesday



# Aero India 2021: Surya Kirans, Sarangs win hearts; HAL planes dominate air display

By Chethan Kumar

Bengaluru: The inaugural of Aero India 2021 was a simple affair compared to flair and colour of previous editions. The integrated display of Surya Kirans and Sarangs enthralled the limited number of spectators allowed on the first day.

The air display was crowded by HAL-manufactured aircraft in the absence of a big foreign presence. Other than the Rafale — which for the first time flew in Indian colours at Aero India — and the US B-1B Lancer bomber, all other aircraft, including choppers, were from the hangars of HAL.

Chief Minister BS Yediyurappa said: “It is a matter of pride for Karnataka and the people of Bengaluru for being chosen to host another edition of the show. Over the years, the state has created a unique infrastructure and ecosystem for holding an event of this magnitude.” Yediyurappa said around 65% of India’s aerospace exports are done from here, while 67% of production also happens in the state.

Defence Minister Rajnath Singh, terming Karnataka a progressive and technologically advanced state inspired by people like Basavanna and M Visvesvaraya, said: “The investor-friendly government and infrastructure has made the state an attractive destination. Aero India has become one of the brightest galaxies in the universe of aerospace.”

The inaugural flying display, which usually is a major highlight of the show, was incomparable with the previous editions. It began with three Mi-8 helicopters flying in formation before Singh and others spoke. The actual display started with two ALH maritime choppers and a light utility helicopter flying in formation, followed by a Dhanush formation by light combat helicopter and HAL’s Atmanirbhar formation flight that had the HTT-40, Hawk-i, Sitara (intermediate jet trainer) and Dornier-228.

This was followed by the AeWA&CS and a Vijay formation involving a C-17 and two Su-30 aircraft. Three Rafale aircraft flew past three galleries of people at top speed.

The Su-30 also did a flypast followed by some manoeuvres by LCH, as the Surya Kirans (SK) and Sarangs prepared for take off.

The US B-1B Lancer was then escorted by a Tejas before the much-awaited integrated display started with a wine-glass formation by Sarangs, followed by a diamond formation fly past by SKs. Sarangs performed multiple manoeuvres, including the diamond formation, while SKs performed the Tejas, Sukhoi and delta formations. For the first time since SKs moved to the Hawks, they used smokewinders, through which two of their aircraft drew a heart in the sky.

## A nine-aircraft aerobatic team

Surya Kiran (ray of Sun in Sanskrit), is the 52nd squadron of IAF based in Bidar. It is a 9-aircraft aerobatic team. Raised in 1996 on the Kiran Mk II ac, the team enthralled spectators in India and abroad till 2011. In 2015 it was resurrected on the Hawk Mk 132 aircraft. Since then, it has slowly yet steadily built up from a 4ac formation to the current graceful 9ac composite formation followed by the heart-stopping synchro manoeuvring. It is currently procuring and integrating smoke pods to paint the sky all over the world in tricolour.



### **It has been part of disaster relief ops**

Sarang (peacock) team of IAF, which flies four modified HALs Advanced Light Helicopters, was based in Sullur Air Force station in Tamil Nadu before shifting base to Bengaluru in 2009. Apart from display flying, the team has been part of many humanitarian assistance and disaster relief (HADR) missions across the country, saved thousands of lives and inducted tonnes of relief material braving inclement weather and hazardous terrain. This is the only Indian aerobatic team to have a woman pilot: Squadron Leader Sneha Kulkarni.

<https://timesofindia.indiatimes.com/city/bengaluru/surya-kirans-sarangs-win-hearts-hal-planes-dominate-air-display/articleshow/80683143.cms>



*Fri, 05 Feb 2021*

## **Three-day defence expo for MSMEs to be held in March**

*It is being organised by Swatantra Foundation and the Aerospace Industry Development Association of Tamil Nadu*

Chennai: A three-day defence expo, which will see the participation of more than 400 micro, small, and medium enterprises (MSMEs), will be held between March 19 and 21 at the Chennai Trade Centre here.

The expo is being organised by Swatantra Foundation, a Chennai-based policy research and advocacy institution, and the Aerospace Industry Development Association of Tamil Nadu (AIDAT).

The 'Defence Expo Empowering MSME '21' is aimed at connecting MSMEs with end users in the defence services, Indian defence manufacturing majors and the various R&D institutions under the DRDO and DPSUs, an official press release said.

The expo would help build and harness the capacity and capability of the MSME sector to cater to the needs of the defence sector, create a broad and sustainable supply chain base for the MSME sector for defence and defence exports, provide a forum for interaction, help identify business opportunities and enable an ecosystem for innovation by promoting new start-ups and academia-industry collaborations.

Organisations such as Larsen & Toubro, Bharat Forge, DRDO, DGQA, Super Auto Forge, Ordnance Factories Board, including Heavy Vehicles Factory, Engine Factory, Lucas TVS Ltd., and Hindustan Aeronautics Ltd. have confirmed their participation, the release said.

<https://www.thehindu.com/news/cities/chennai/three-day-defence-expo-for-msmes-to-be-held-in-march/article33753837.ece>

## ISRO will transform in 2021 as India pumps big money to draw in startups for the 'second space age'

By Prabhjote Gill

- *The Indian Space Research Organisation (ISRO) is turning into a facilitator as it looks for the private sector to play a bigger role in space technology in the 'second space age'.*
- *Despite the COVID-19 cash crunch, the Budget 2021-22 has not deprioritised the space sector with a 3.48% increase in expenditure allocation.*
- *Money earmarked for New Space India Limited — the Indian Space Research Organisation's commercial arm — saw its budget increase 138 times.*
- *According to space policy expert Chaitanya Giri, the government is looking to monetise ISRO's intellectual property and bring in fresh revenue.*

The Indian Space Research Organisation (ISRO) is on the road to transforming itself from an end-to-service provider for India's space programme into a facilitator. The latest budget allocation is a signal that the Indian government is serious about giving private players a serious role in the 'second space age'.

Despite the cash crunch caused by the COVID-19 pandemic, India did not cut back on the money for the space programme. In fact, the outlay increased by 3.5%. More importantly, bulk of the funds will be routed to a new entity, New Space India Limited (NSIL).

Budget 2021-22 allocation for the Department of Space, India

NSIL, the commercial arm of ISRO, saw a 138 times jump in allocation. The money that earlier went from the Department of Space (DoS) to ISRO, will now be routed to NSIL, which will then authorise the participation of private players.

"That means that the government is super serious about commercialising whatever IP (intellectual property) it has under its kitty and just monetising that. It's a departure from the mindset of yesteryears where ISRO was only there to cater to the government's requirements," Chaitanya Giri, space policy expert and fellow with think tank Gateway House, told Business Insider.

### Doubling down on space sector reforms

The push for private sector participation in the space sector is a strategic necessity, according to Giri. "For our commercial sector to get started on this front, it will need governmental space agency ISRO to get things done at its end first," he points out.

India's edge in the global market was its ability to keep things cheap. An advantage that has now been diluted by the emergence of companies like Elon Musk's SpaceX who have made launching satellites more competitive.

Year	NSIL expenditure budget
2019-20	₹10 crore
2021-22	₹1380 crore



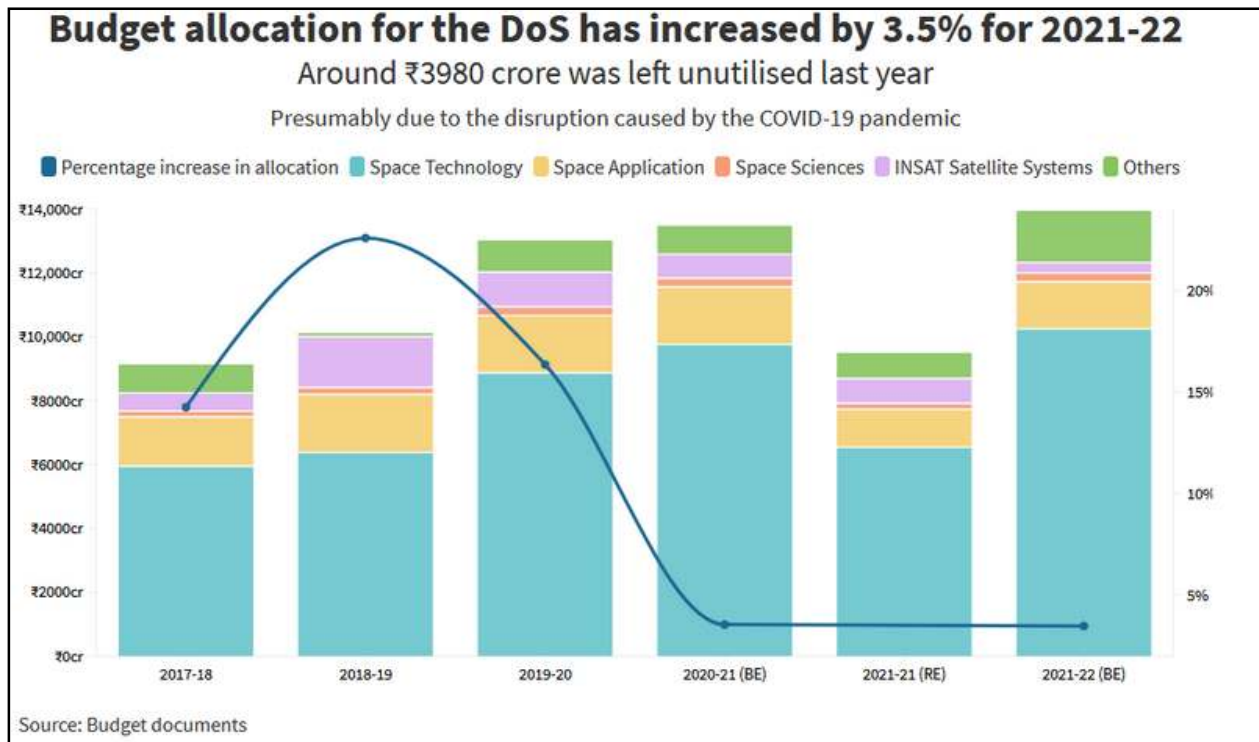
Indian Space Research Organisation (ISRO) did not see a dip in its budget despite it being a COVID year. [BCCL](#)

Its Crew Dragon capsule is another indication that the second space age will be run by the commercial sector. “They will be building the rockets, launch services, building space capsules and providing logistics,” explained Giri.

**NSIL is set up, but what comes next?**

Last year, in May, Finance Minister Nirmala Sitharaman announced major reforms for the space sector as a part of the Atma Nirbhar package — including the setting up of the Indian National Space Promotion and Authorisation Centre (IN-SPACe).

“In-SPACe was supposed to be formed by the end of last year — by December 2020 — so it’s getting slightly extended. But, I’m pretty sure that it will be completely established within the next two months,” Pawan Kumar Chandana, co-founder of Skyroot Aerospace told Business Insider in a pre-budget interaction.



**Budget 2021-22 allocation for the Department of SpaceBI India**

According to Giri, the Indian Space Research Organisation (ISRO) has always built its own rockets and satellites. But, that will no longer be the case. “They want to include all of these small startups that have emerged and start giving them contracts according to their niche,” said Giri.

In-SPACe opens up ISRO’s treasure trove of satellite data to private players and will allow startups to use the apex space agency’s testing facilities to develop their own technologies. The challenge lies in setting the price points for this use.

“Like always, when it comes to finance, every rupee counts when it comes to the government... And, the government's mandate is to encourage the private sector, so they cannot charge it as high as they may want to,” Chandana explained.

DataLabs by Inc42 shows that there are around 120 active startups working in the space sector right now. Most of them emerged in or after 2014.

Moreover, the Economic Survey 2020-21 pointed out that only around 40 startups are already working with the government. "This number is likely to increase in coming years with technology to play a big role," it added optimistically.

<https://www.businessinsider.in/science/space/news/isro-will-transform-in-2021-as-india-pumps-big-money-to-draw-in-startups-for-the-second-space-age/articleshow/80683054.cms>

# Newly discovered graphene property could impact next-generation computing

By Elizabeth A. Thomson

MIT researchers and colleagues have discovered an important—and unexpected—electronic property of graphene, a material discovered only about 17 years ago that continues to surprise scientists with its interesting physics. The work, which involves structures composed of atomically thin layers of materials that are also biocompatible, could usher in new, faster information-processing paradigms. One potential application is in neuromorphic computing, which aims to replicate the neuronal cells in the body responsible for everything from behavior to memories.

The work also introduces new physics that the researchers are excited to explore.

"Graphene-based heterostructures continue to produce fascinating surprises. Our observation of unconventional ferroelectricity in this simple and ultra-thin system challenges many of the prevailing assumptions about ferroelectric systems and it may pave the way for an entire generation of new ferroelectrics materials," says Pablo Jarillo-Herrero, the Cecil and Ida Green Professor of Physics at MIT and leader of the work, which involved a collaboration with five other MIT faculty from three departments.

## A New Property

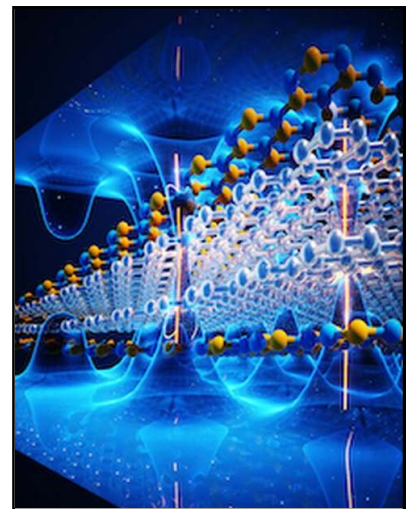
Graphene is composed of a single layer of carbon atoms arranged in hexagons resembling a honeycomb structure. Since the material's discovery, scientists have shown that different configurations of graphene layers can give rise to a variety of important properties. Graphene-based structures can be either superconductors, which conduct electricity without resistance, or insulators, which prevent the movement of electricity. They have even been found to display magnetism.

In the current work, which was reported last December in *Nature*, the MIT researchers and colleagues show that bilayer graphene can also be ferroelectric. This means that positive and negative charges in the material can spontaneously separate into different layers.

In most materials, opposite charges are attracted to each other; they want to combine. Only the application of an electric field will force them to opposite sides, or poles. In a ferroelectric material, no external electric field is necessary to keep the charges apart, giving rise to a spontaneous polarization. However, the application of an external electric field does have an effect: an electric field of opposite direction will cause the charges to switch sides and reverse the polarization.

For all of these reasons, ferroelectric materials are used in a variety of electronic systems, from medical ultrasounds to radio frequency identification (RFID) cards.

Conventional ferroelectrics, however, are insulators. The MIT-led team's ferroelectric based on graphene operates through a completely different mechanism—different physics—that allows it to conduct electricity. And that opens up myriad additional applications. "What we've found here is a new type of ferroelectric material," says Zhiren (Isaac) Zheng, an MIT graduate student in physics and first author of the *Nature* paper.



Artist's representation of the nanoscopic structure of the new ferroelectric material developed by MIT researchers and colleagues. Blue and gold dots represent the boron and nitride atoms in two atomically thin sheets of boron nitride. Between these sheets are two layers of graphene; the whitish/blue dots represent carbon atoms. The gold vertical lines running through the figure represent the movement of electrons. Credit: Ella Maru Studio

Qiong Ma, MIT Ph.D. 2016, a co-author of the paper and an assistant professor at Boston College, puts the work in perspective. "There are challenges associated with conventional ferroelectrics that people have been working to overcome. For example, the ferroelectric phase becomes unstable as the device continues to be miniaturized. With our material, some of those challenges may be automatically solved." Ma conducted the current work as a postdoctoral associate through MIT's Materials Research Laboratory (MRL).

### **Important Patterns**

The structure the team created is composed of two layers of graphene—a bilayer—sandwiched between atomically thin layers of boron nitride (BN) above and below. Each BN layer is at a slightly different angle from the other. Looking from above, the result is a unique pattern called a moiré superlattice. A moiré pattern, in turn, "can dramatically change the properties of a material," Zheng says.

Jarillo-Herrero's group demonstrated an important example of this in 2018. In that work, also reported in *Nature*, the researchers stacked two layers of graphene. Those layers, however, weren't exactly on top of each other; rather, one was slightly rotated at a "magic angle" of 1.1 degrees. The resulting structure created a moiré pattern that in turn allowed the graphene to be either a superconductor or an insulator depending on the number of electrons in the system as provided by an electric field. Essentially the team was able to "tune graphene to behave at two electrical extremes," according to an MIT news story at the time.

"So by creating this moiré structure, graphene is not graphene anymore. It almost magically turns into something very, very different," Ma says.

In the current work, the researchers created a moiré pattern with sheets of graphene and boron nitride that has resulted in a new form of ferroelectricity. The physics involved in the movement of electrons through the structure is different from that of conventional ferroelectrics.

"The ferroelectricity demonstrated by the MIT group is fascinating," says Philip Kim, a Professor of Physics and Applied Physics at Harvard University, who was not involved in the research.

"This work is the first demonstration that reports pure electronic ferroelectricity, which exhibits charge polarization without ionic motion in the underlying lattice. This surprising discovery will surely invite further studies that can reveal more exciting emergent phenomena and provide an opportunity to utilize them for ultrafast memory applications."

The researchers aim to continue the work by not only demonstrating the new material's potential for a variety of applications, but also developing a better understanding of its physics. "There are still many mysteries that we don't fully understand and that are fundamentally very intriguing," Ma says.

**More information:** Zhiren Zheng et al. Unconventional ferroelectricity in moiré heterostructures, *Nature* (2020). DOI: [10.1038/s41586-020-2970-9](https://doi.org/10.1038/s41586-020-2970-9)

**Journal information:** *Nature*  
<https://phys.org/news/2021-02-newly-graphene-property-impact-next-generation.html>

## Developing fibrillated cellulose as a sustainable technological material

Nanocellulose lines the cell walls of plants, trees, algae and bacteria consisting of glucose rings that link together like a chain and give it a rigged structure. In a perspective published in *Nature*, a University of Maryland (UMD) research team led by Liangbing Hu—a professor in the Department of Materials Science and Engineering (MSE) and Center for Materials Innovation (CMI) Director—offers a perspective of using nanocellulose as a sustainable technological material towards addressing global challenges. Tian Li and Chaoji Chen, both MSE and CMI Scientists, served as first authors on the paper.

Cellulose fibers can be separated into individual fibrils that look like strands of hair, ranging in diameter from less than 100  $\mu\text{m}$  to roughly nanometer scale. Such fibrillated cellulose is not only eco-friendly, but tunable and cost-effective making its commercialization attractive to manufacturers and consumers alike. As the most abundant organic polymer on Earth, it can enable a vast array of mechanical, optical, thermal, fluidic and ionic applications and explores the possibility of its use as bioplastics, thin films, porous membranes and soft gels. Industry challenges and promises have also been discussed.

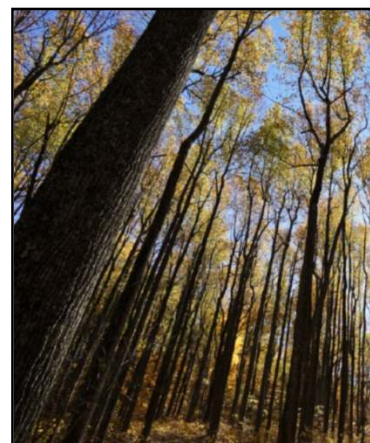
According to the study, "With improved fundamental understanding and control of its hierarchical structure, we anticipate that fibrillated cellulose could form the foundation of economically viable, sustainable solutions towards a range of near-term applications in high-performance structural materials and biodegradable technologies, as well as far-term applications in optoelectronics, bio-engineering and membrane science."

Ongoing challenges include sustainability, the balance between biodegradability and product durability, fire safety and public health concerns, although these challenges can be addressed through additional material design and structural engineering. Scalable manufacturing of cellulose, however, shouldn't be an issue given that roughly three trillion trees and plants, such as fast-growing bamboo and sugarcane, are produced daily. Indeed, fibrillated cellulose can provide a practically unlimited resource for innovative new materials.

**More information:** Tian Li et al. Developing fibrillated cellulose as a sustainable technological material, *Nature* (2021). DOI: [10.1038/s41586-020-03167-7](https://doi.org/10.1038/s41586-020-03167-7)

**Journal information:** *Nature*

<https://phys.org/news/2021-02-fibrillated-cellulose-sustainable-technological-material.html>



Credit: Dr. Hua Xie for University of Maryland, College Park

# Transistors built from ultra-thin 2-D materials take a step forward

By Megan Lakatos

Two-dimensional materials can be used to create smaller, high-performance transistors traditionally made of silicon, according to Saptarshi Das, assistant professor of engineering science and mechanics (ESM) in Penn State's College of Engineering.

Das and his collaborators report in *Nature Communications* on tests to determine the technological viability of transistors made from 2-D materials. Transistors are tiny digital switches found in cell phones, computer circuits, smart watches and the like.

"We live in a digital and connected world driven by data," Das said. "Big data requires increased storage and processing power. If you want to store or process more data, you need to utilize more and more transistors."

In other words, as modern technology continues to get more compact, so must transistors, which are considered the building blocks of computer processing.

Silicon, a 3-D material that has been used to manufacture transistors for six decades, cannot be produced any smaller, according to Das, which makes its use in transistors increasingly challenging.

"It is difficult to manufacture silicon transistors that are only a few atoms thick," Das said.

Past research studies determined that the 2-D materials, as an alternative, can be manufactured 10 times thinner than the silicon technology currently in practice.

In the current study, researchers grew monolayer molybdenum disulfide and tungsten disulfide using a metal organic chemical vapor deposition technique obtained from the 2-D Crystal Consortium NSF Materials Innovation Platform (2DCC-MIP) at Penn State.

To understand how the new 2-D transistors perform, the researchers analyzed statistical measures as seen in relation to threshold voltage, subthreshold slope, ratio of maximum to minimum current, field-effect carrier mobility, contact resistance, drive-current and carrier saturation velocity.

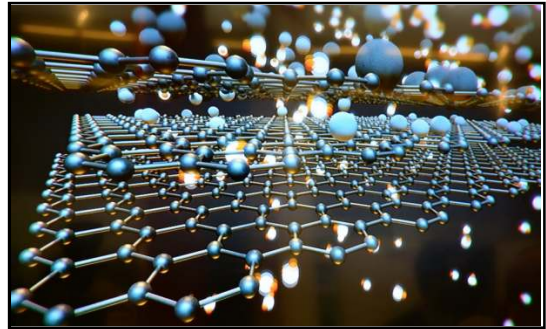
The tests confirmed the viability of the new transistors, proving the technology can now move forward to manufacturing and development, according to Das.

"These new transistors can help make the next generation of computers faster, more energy efficient and able to withstand more data processing and storing," Das said.

**More information:** Amritanand Sebastian et al. Benchmarking monolayer MoS<sub>2</sub> and WS<sub>2</sub> field-effect transistors, *Nature Communications* (2021). DOI: [10.1038/s41467-020-20732-w](https://doi.org/10.1038/s41467-020-20732-w)

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

<https://phys.org/news/2021-02-transistors-built-ultra-thin-d-materials.html>



Credit: CC0 Public Domain



## Recovered Covid-19 patients may need only one shot of mRNA vaccines: Scientists

New Delhi: People who have recovered from the novel coronavirus infection may need only one shot as opposed to the recommended two jabs if they are taking the Moderna or Pfizer Covid-19 vaccines, according to a study which suggests ways to minimise doses when supplies are limited.

The yet-to-be peer-reviewed study, posted in the preprint repository medRxiv, assessed the antibody responses in 109 individuals with and without documented pre-existing immunity to the novel coronavirus.

According to the researchers, including Florian Krammer from the Icahn School of Medicine in the US, a single dose of mRNA vaccine elicits very rapid immune responses in individuals already possessing antibodies against the coronavirus from previous exposure to it.

“For individuals with pre-existing immunity to SARS-CoV-2 the first vaccine dose likely immunologically resembles the booster dose in naive individuals,” the scientists wrote in the study.

In the research, the scientists analysed mRNA vaccines which use segments of the viral genetic material to enable human cells to make the coronavirus spike proteins. These proteins train the immune system of vaccine recipients to fight the actual infectious coronavirus when their body encounters the pathogen.

The scientists said the post-vaccine antibody levels in recovered Covid-19 patients are comparable to, or exceed levels, found in those without prior exposure to the virus who received two vaccinations.

Another yet-to-be peer-reviewed study in medRxiv also studied antibody responses to a single dose of the Pfizer-BioNTech or Moderna vaccines in healthcare workers who had previously recovered from the infection. It found that their antibody levels started peaking at seven days since immunisation, and achieved higher titers and neutralisation in 14 days compared to volunteers exposed to the vaccine for the first time.

“Although we did not have peak titers for these individuals after natural infection, the titers developed after single vaccination was higher than peak titers in inpatients and outpatients with Covid-19, similar to what has been described in primary vaccination after two doses of the spike-based mRNA vaccines,” the researchers wrote in the study.

According to the scientists from the University of Maryland School of Medicine in the US, the secondary response occurs through activation of the immune system’s memory B cells. Based on the findings, the researchers recommend a strategy of single dose vaccination for patients who have already had laboratory-confirmed Covid-19. They said those who have recovered from the disease can be placed lower on the vaccination priority list.

Commenting on the two studies, Eleanor Riley, Professor of Immunology and Infectious Disease at the University of Edinburgh in the UK, said the findings are “very reassuring”, adding that the vaccines are “very effectively boosting the immunity induced by infection.” While the two studies suggest that people who have had laboratory-confirmed Covid-19 infection may only



require one dose of the vaccine, Riley, who was unrelated to the studies, said incorporating this into a mass vaccination programme may be logistically complex. He believes it may be safer to ensure that everyone gets two doses.

The preprint platform, medRxiv, also cautions that the posted reports are preliminary in nature and have not been certified by peer review. “They should not be relied on to guide clinical practice or health-related behavior,” it adds.

Lawrence Young, Virologist and Professor of Molecular Oncology, University of Warwick in the UK, believes this question can be resolved with further studies. “We should be doing further studies which look at giving previously infected individuals one dose of an mRNA vaccine,” said Young, who was also unrelated to the two studies.

“If future work can confirm this high level of immunity post a single mRNA vaccine in this group of individuals, this could become a viable option when there are concerns around vaccine supply,” he added in a statement.

<https://www.thehindubusinessline.com/news/recovered-covid-19-patients-may-need-only-one-shot-of-mrna-vaccines-say-scientists/article33747253.ece>

