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## DRDO News

## DRDO On Twitter



## Defence News

## Defence Strategic: National/International

**NEWS  
NATION**

*Mon, 30 May 2022*

## भारतीय नौसेना को मिलेंगे नए हथियार, मानवरहित एरियल व्हीकल्स होगा लॉन्च

रक्षा क्षेत्र में काम करने वाली कंपनी लार्सेन एंड टुब्रो (Larsen & Toubro, L&T) ने बेंगलुरु में स्थित एक स्टार्ट-अप कंपनी के साथ समझौता किया है. भारतीय नौसेना (Indian Navy) की पनडुब्बियों से निकट भविष्य में बेहद खतरनाक आत्मघाती हमलावर ड्रोन निकलेंगे. ये दुश्मन के जहाज, विमान या जमीनी

पोस्ट को तबाह कर देंगे. या गंभीर रूप से क्षतिग्रस्त कर देंगे. इसलिए रक्षा क्षेत्र में काम करने वाली कंपनी लार्सेन एंड टुब्रो (Larsen & Toubro, L&T) ने बेंगलुरु में स्थित एक स्टार्ट-अप कंपनी के साथ समझौता किया है. इस कंपनी का नाम न्यूस्पेस रिसर्च एंड टेक्नोलॉजी (NRT) है. NRT और L&T मिलकर पनडुब्बी से लॉन्च होने वाले मानवरहित एरियल व्हीकल्स (UAVs) यानी ड्रॉन्स बनाएंगे. इस तरह के हथियारों का कॉन्सेप्ट कुछ ही देशों के पास है. दोनों कंपनियों के बीच यह समझौता ड्रोन महोत्सव के दौरान हुआ है. इस तरह के हथियार में दो तरह के हिस्से होते हैं. पहला पानी के अंदर का हिस्सा और दूसरा हवा में उड़ने वाला हिस्सा. अगर यह हथियार भारत में विकसित होता है, तो एक बेहद अत्याधुनिक हथियार बनेगा.

अभी फिलहाल अमेरिका के पास ही ऐसी टेक्नोलॉजी है. उसने अपनी सबमरीन्स में 'किल चैन' सिस्टम के तहत इस तरह के ड्रॉन्स की तैनाती की है. ये किसी भी तरह के सतह और जमीनी टारगेट को भेद सकते हैं. उन्हें नष्ट कर सकते हैं. हाल ही भारतीय नौसेना ने DRDO के जरिए इस तरह के हथियार को बनाने की जरूरत के लिए एक एक्सप्रेसन ऑफ इंटरैस्ट (EOI) जारी कराया था. जिसमें सबमरीन से लॉन्च होने वाले स्विचब्लेड लॉयटरिंग म्यूनिशन और UAVs के विकास की ओर बात की गई थी. इसका मकसद सिर्फ हमला करना ही नहीं, बल्कि निगरानी, जासूसी, सर्विलांस आदि भी है. ऐसे ड्रॉन्स की नाक पर इलेक्ट्रो-ऑप्टिकल और इन्फ्रारेड सेंसर्स लगे होंगे. हालांकि अभी तक यह नहीं पता चला है कि यह किस तरह से बनाए जाएंगे. कितना समय लगेगा. संचार की क्या तकनीक होगी.

<https://www.newsnationtv.com/india/news/indian-navy-will-get-new-weapons-unmanned-aerial-vehicles-will-be-launched-279628.html>



Mon, 30 May 2022

## Warfare Changing with Technology, India's Security Dynamics will Require Multi-Domain Capabilities: Air Chief Marshal Chaudhari

Air Chief Marshal V.R. Chaudhari on May 30 said warfare is undergoing a fundamental change with the emergence of new technology and radically newer doctrines, and India's security dynamics involve threats and challenges, which would require multi-domain capabilities and execution of operations in shortened time frames. He was speaking after reviewed the Passing out Parade of the 142nd course at the National Defence Academy (NDA) near Pune in Maharashtra. The NDA is the joint services academy of the armed forces where cadets receive training together before they go to their respective service academies for further pre-commissioning training. He also said that the Indian Air Force (IAF) rising to the no. 3 position on the World Air Power Index was a matter of pride for them. Addressing cadets after the Passing out Parade, Air Chief Marshal Chaudhari said they were joining the noble profession when the country was at the cusp of a technological transformation.

### ‘Adapt to change rapidly’

All the three (Defence) Services have invested heavily in the next-generation war-fighting machines, he noted. “You, as future operators of these highly potent systems, need to be fully conversant with them

which can be achieved only through rigorous training, dedication and a professional approach,” he said. As the world is embracing newer technologies and gradually moving away from conventional war fighting methods, it is “imperative for all of us to adapt to the change rapidly so that we can innovate and refine our processes of war fighting”. “Warfare is undergoing a fundamental change with the emergence of new technology and radically newer doctrines. India’s security dynamics involve multi-faceted threats and challenges. It would require us to build multi-domain capabilities and execute operations simultaneously and in shortened time frames,” he said. He told the cadets that they will need to stay abreast with the technological advancements, for which they will have to study, research and analyse. Later, when asked at a press conference about the IAF’s ranking on the World Air Power Index, he said, “It was a pleasant surprise for us also that we are placed at the third position in the ranking... We have got a fairly robust network system which helps us plan our operations, management and maintenance.”

### **No. 3 position**

Referring to the diversity of equipment with the IAF, Air Chief Marshal Chaudhari said they have aircraft from six different countries and a lot of indigenous products also. “I think all these factors have made us rise to the No. 3 position and we are very proud of it,” he said. To a query, he said the regional dynamics were not really going to make big difference and that their focus was on better quality training and technology. Notably, the IAF recently signed a memorandum of understanding with the IIT Madras to develop indigenous solutions to maintain various weapon systems. Asked if there are more such plans, Air Chief Marshal Chaudhari said, “During the outreach programme with the Indian industry, we have found ample opportunities to have similar MoUs not only with the academia, but with the MSMEs also.” There was a push towards Atmanirbharta (self-reliance) and programmes associated with it, he said.

### **IAF Modernisation**

Talking about the IAF’s modernisation, he said a contract for 83 Light Combat Aircraft (LCA) was given last year and the delivery is expected next year. The proposal for the procurement of Medium Multi-Role Combat Aircraft is also in the pipeline, he said, adding that a contract for transport aircraft has also been signed and deliveries will begin from next year. “We are taking more of our weapons from Indian sources. We will minimise import in future,” he said.

To a question about the push towards ‘Atmanirbhar Bharat’ in the defence sector, he said, “All the three forces have set up departments which are directly interacting with the Indian industry. We are working on a positive indigenisation list of items, which we will not import.” Those will be made in India, even if it takes more time, he said.

To a question on the impact of the Russia-Ukraine war on India’s defence sector, he said, “We are dependent on Russia for a large number of items, but the war has not made a major impact on it as our spare stocking policy is robust. We have already catered to the future requirements. We have indigenised a large number of spares that we have been importing from Russia for many years.”

<https://www.thehindu.com/news/national/warfare-changing-with-technology-indias-security-dynamics-will-require-multi-domain-capabilities-air-chief-marshal-chaudhari/article65476056.ece>

## **Rajnath Singh Hails Indian Coast Guard for Strengthening Coastal Security**

Defence Minister Rajnath Singh inaugurated the three-day 39th Commanders' Conference of the Indian Coast Guard (ICG) in New Delhi on May 30. Defence Secretary Dr Ajay Kumar, DG ICG VS Pathania and other senior officials of the Ministry of Defence and the ICG were present on the occasion. In his address, the Defence Minister commended the professionalism and dedication of the ICG and said that its unparalleled performance has made it one of the best and largest coast guards of the world.

Rajnath Singh stressed the need to maintain maritime preparedness in the constantly-changing global scenario, terming it as a "crucial aspect which safeguards the economic and strategic interests of a nation". He pointed out that there has been a shift in India's maritime security needs due to the ever-evolving global situation. Recalling the 2008 Mumbai terror attacks, Singh said, "The incident showed that for a long time, the country's orientation was focused on the security of land borders and not much attention was paid to coastal security". He lauded the ICG for continuously enhancing its capability in the last few years in line with the government's vision and playing a key role in bolstering coastal security. "Due to these efforts, the country has not witnessed any terror activity from the sea route since the 2008 Mumbai attacks", he said.

Rajnath Singh shared his views on the importance of a free and open Indo-Pacific, terming the region as an important aspect of India's maritime security. "The growing regional and global trade in this region has brought forth new challenges. Geopolitical tensions and clashes of strategic interests have led to traditional security challenges. Terrorism, drug trafficking and piracy are some non-traditional challenges in front of us today. The entire region is being affected by these challenges," added Singh. He further added, "Being a responsible maritime power, we have a clear interest in creating a rule-based, peaceful and stable environment. Such a rule-based environment is essential for both regional and global prosperity. In such a situation, the ICG has a big role to play".

On the Indian Ocean Region (IOR), Rajnath Singh said that India's geographical location is crucial from the strategic and economic point of view. "Our long coastline with deep-water ports, a prosperous exclusive economic zone and islands at both ends present a unique position. The IOR accounts for more than two-thirds of the world's oil shipments. One-third of bulk cargo and more than half of container traffic pass through it. The safety of these sea routes is not only directly connected to our economic interests, but it also establishes India as a net security provider in the IOR," he stated. Rajnath Singh emphasised that the role of the ICG is not only limited to coastal areas, describing them as the protectors of India's national interests and sovereign rights in the territorial seas and exclusive economic zone. "There have been no reports of any breach in coastal security in the last 14 years due to the ICG's dynamic strategy and its cooperation with the Indian Navy and local administration," he said.

Rajnath Singh added that Prime Minister Narendra Modi's vision of SAGAR (Security and Growth for All in the Region) is based on the spirit of friendship, openness, dialogue, co-existence with the neighbours. "It is our main responsibility which is being fulfilled by the ICG successfully", he said. Pointing out that India has emerged as a strong and reliable investment destination due to the Government's efforts, Rajnath Singh said, "The country's true potential can only come to the fore if a safe, secure and rule-based maritime environment is provided to the country's economy, especially the blue economy". He exhorted the ICG to strive towards maintaining order along the country's vast coastline and exclusive economic zone to achieve this objective.

The Defence Minister also pointed out that as the pressure on mainland resources is increasing, countries around the world are turning to sea for sustenance. Deep sea exploration has further increased the competition for marine resources, he said while underlining the increasing role of marine exploration, resource exploitation and conservation. Rajnath Singh praised the ICG for playing an incomparable role in assisting the civil administration during natural calamities; the efforts which extend to littoral neighbours as well. "More than 3,000 fishing boats, along with 24,000 fishermen, were brought to safety during devastating cyclones last year due to the preventive and measured response stance of ICG operations", he said. The Defence Minister lauded the ICG for achieving success in trade security, pollution control and environment protection. He added that keeping in view all aspects such as security, trade, environment and humanitarian assistance, the Ministry of Defence has sanctioned a large number of projects, including acquisition of Pollution Control Vessels and mid-term Life Upgradation of Dornier Fleet, to modernise the ICG. He appreciated the ICG's efforts towards achieving 'Aatmanirbhar Bharat'. "Today, the manufacturing and servicing/repairing of ships and aircraft of ICG is being done indigenously. The ICG is spending almost 90% of its capital budget on the development of indigenous assets," he added.

<https://www.indiatoday.in/india/story/rajnath-singh-indian-coast-guard-coastal-security-1956236-2022-05-31>



*Tue, 31 May 2022*

## **India Cuts Back World's Largest Fighter Jet Procurement Program by Half from 114 to 57**

The Indian Air Force (IAF) is cutting down its largest fighter jet procurement program by half and has indicated the likelihood of a change in the procurement model to one which is more acceptable to foreign suppliers for compliance to Make in India requirements in view of the reduced numbers. It is learnt from highly placed sources that the estimated \$20 Billion Multi-Role Fighter Aircraft (MRFA) procurement program for 114 foreign jets is being shrunk to acquisition of 57 jets through a global competition. The original proposal to make these jets in India under the ambitious Strategic Partnership (SP) Model is set to be dumped and the shrunken program is likely to be rebooted under the Buy Global (Make in India) category of the Defence Acquisition Procedure 2020, sources elaborated. All the 57 fighters will be made in India with transfer of technology from the foreign OEM to an Indian company.

The cutback is mainly on account of the Government's Aatmanirbhar Bharat (self-reliant India) policy directive to minimize Defence imports and build up a domestic Defence Industrial complex instead to meet military requirements. A renewed drive is afoot to commit most of the capital budget for Defence modernization to domestic sources. Even the Indian Navy requirement for imported deck-borne fighters was reduced from 57 to 26. The cutback on the MRFA and the Navy fighters is both an opportunity and challenge for domestic industry to make up the numbers. The timeline for issuance of a global tender for acquisition of 57 jets is end-2022, it is learnt. The IAF had approached the global market with an RFI for 114 fighters in 2018. Responses were received by Air Headquarters on behalf of Lockheed Martin's F-21, Boeing's F-15EX and F/A-18 Super Hornet, Dassault's Rafale, SAAB's Gripen, the European consortium's Eurofighter, Sukhoi S-35 and MiG's MiG-35.

India's record at procurement of a foreign fighter through global competition is tortuous. The MRFA's predecessor, the Medium Multi-Role Combat Aircraft (MMRCA) program for 126 fighters, was aborted after a decade-long procurement process threw up Dassault's Rafale as the winner but failed to secure a contractual agreement. In 2016, India went in for a direct purchase of 36 Rafale fighters as an emergency procurement in a Government-to-Government deal with France. A foreign fighter is critical to the IAF's plan to peg its numbers to about 35 squadrons over the next 15 years. A proven foreign combat jet is also meant to ensure interim reliability and assurance till the indigenous Light Combat Aircraft variants and the futuristic Fifth Generation Advanced Medium Combat Aircraft (AMCA) mature and stabilize. The authorized fighter strength for the IAF is 42 squadrons, which IAF Chief Air Chief Marshal VR Chaudhari acknowledged will not be realized in the foreseeable future.

The IAF's anxiety to ensure minimum force levels is also on account of the impending retirement of its legacy jets comprising the Mirage-2000, MiG-29 and the Jaguars fleets over the next decade. The residual squadrons of the MiG-21 will also be out by 2024. Two new Rafale squadrons are operational. Delivery of 83 TEJAS MK-1A fighters will commence in 2024. The TEJAS M2-2 and AMCA are expected in a decade in a best-case scenario. The MRFA was envisaged to mitigate the gap of fighter squadrons and combat capability. But the IAF, which was hoping for six fall back MRFA squadrons, will now have to work around three. Industry sources expressed the view that reduced numbers in a global tender make it more difficult to meet stringent Make in India and transfer of technology requirements profitably.

"A cutback in numbers by half makes it more challenging to execute a complex tender like this one. Numbers provide viability, cost-effectiveness and affordability," an observer reasoned. The other big concern is that the SP model - a key reform to kickstart the emergence of a private sector Defence Industrial complex by reserving one big procurement per category as a one-time measure - has failed to take off. The Naval Utility Helicopter (NUH) program - the first under the SP Model - has been dumped. There's little progress in the Project 75 (I) submarine program, and now the re-categorisation of the MRFA is a body blow. This initiative is likely to head back to the drawing board, insiders reckon. The recategorization of the MRFA means that the tender would be awarded to a foreign OEM, which would deliver the Make in India element through an Indian partner of its choice. Under the SP Model, an Indian company would have been the prime, with the option to choose a technical collaborator from among a pool of foreign OEMs shortlisted by the Ministry of Defence.

<http://www.indiandefensenews.in/2022/05/india-cuts-back-worlds-largest-fighter.html?m=1>



Tue, 31 May 2022

## Navy to Develop Submarine Drone: L&T Signs Up with a Bangalore Start-Up

The Larsen & Toubro (L&T) has signed up with a Bangalore based start-up for a joint research to develop a new range of submarine drones to meet the requirements of Indian Navy. Submarine launched Unmanned Aerial Vehicles (UAVs) are a relatively new concept to design drones to navigate through water before taking to the air for flight. The L&T signed a memorandum of understanding (MoU) with NewSpace Research & Technology (NRT) at the Drone Festival – Bharat Drone Mahotsav 2022 on Friday in the national capital. The Drone Mahotsav was inaugurated by Prime Minister Narendra Modi.

Promoting the use of drones, the Prime Minister highlighted the importance of drone technology in the fields of defence, disaster management, agriculture, tourism, film and entertainment. He said that the use of this technology is bound to increase in the coming days. The Prime Minister also narrated the use of drones in his official decision making through examples of PRAGATI reviews and Kedarnath projects.

<http://www.indiandefensenews.in/2022/05/navy-to-develop-submarine-drone-l-signs.html?m=1>

## Science & Technology News



Mon, 30 May 2022

## Chip-Scale Floquet Topological Insulators to Enhance 5g Wireless Communications

Floquet topological insulators are materials with topological phases that originate from tailored time-dependent perturbations of their crystal structure. These materials have been proved to feature highly unusual electron conduction properties. In recent years, there has been significant interest in exploring analogous features for electromagnetic waves using tailored metamaterials, which promise exciting opportunities for a wide range of applications, including the development of wireless communication, radar and quantum technology. Researchers at Columbia University, City University of New York, and the University of Texas at Austin have recently introduced Floquet topological insulators for radio-waves with a unique design, based on the quasi-electrostatic propagation of radio signals in switched-capacitor networks. Their paper, published in *Nature Electronics*, builds on the team's previous work focusing on photonic

topological insulators (PTIs), a class of materials that can guide light in unusual and advantageous ways.

"Prof. Alu and I have both been very active in the area of time-modulated materials and circuits," Harish Krishnaswamy, one of the researchers who carried out the study, told Phys.org. "These are materials or circuits where some parameter is varied in time. Such time-modulated materials or circuits can break several fundamental limits associated with static materials or circuits. For example, one can achieve non-reciprocity, where signals travel in different ways in forward and reverse directions, to build non-reciprocal components such as circulators and isolators."

The notion of building a time-modulated, non-reciprocal circulator could be extended to the design of topological insulators, by connecting many circulators in a lattice. While material scientists had previously explored this idea from a theoretical standpoint, so far it had never been experimentally demonstrated. A key reason for this is that building many time-modulated circulators in a robust and generalizable fashion, and connecting them, is a challenging task, and so far these devices featured a moderate bandwidth of operation. As part of their study, Krishnaswamy and his colleagues were able to successfully integrate these time-modulated circulators on a silicon chip and dramatically extending their bandwidth of operation based on their quasi-electrostatic nature. "Integrated circuits are a powerful platform to build complex time-modulated circuits with many elements in a robust and repeatable fashion," Krishnaswamy said. "So naturally, the questions that arose were: 1) can we build a time-modulated non-reciprocal topological insulator on a chip? 2) what practical applications would it be useful for?"

<https://phys.org/news/2022-05-chip-scale-floquet-topological-insulators-5g.html>



*Mon, 30 May 2022*

## **A New Ultra-Thin Electrode Material: A Step Closer to Next-Generation Semiconductors**

Dramatically improved the performance of 2D semiconductor devices by suppressing the Fermi-level pinning phenomenon. Expected to speed up the commercialization of next-generation system technologies such as miniaturization of artificial intelligence system. To realize artificial intelligence systems and autonomous driving systems, which is often seen in movies, in everyday life, processors that function as the brain of computers must be able to process more data. However, silicon-based logic devices, which are essential components of computer processors, have limitations in that processing costs and power consumption increase as miniaturization and integration progress.

To overcome these limitations, studies are being conducted on electronic and logic devices based on very thin two-dimensional semiconductors at an atomic layer level. However, it is more difficult to control the electrical properties through doping in two-dimensional semiconductors than in conventional silicon-based semiconductor devices.

Thus, it has been technically difficult to implement various logic devices with two-dimensional semiconductors. The Korea Institute of Science and Technology (KIST; President: Seok-jin

Yoon) announced that a joint research team led by Dr. Do Kyung Hwang of the Center for Opto-Electronic Materials and Devices and Professor Kimoon Lee of the Department of Physics at Kunsan National University (President: Jang-ho Lee), has succeeded in implementing two-dimensional semiconductor-based electronic and logic devices, whose electrical properties can be freely controlled by developing a new ultra-thin electrode material (Cl-SnSe<sub>2</sub>).

The joint research team was able to selectively control the electrical properties of semiconductor electronic devices using Cl-doped tin diselenide (Cl-SnSe<sub>2</sub>), a two-dimensional electrode material. It was difficult to implement complementary logic circuits with conventional two-dimensional semiconductor devices because they only exhibit the characteristics of either N-type or P-type devices due to the Fermi-level pinning phenomenon.

In contrast, if the electrode material developed by the joint research team is used, it is possible to freely control the characteristics of the N-type and P-type devices by minimizing defects with the semiconductor interface. In other words, a single device performs the functions of both N-type and P-type devices. Hence, there is no need to manufacture the N-type and P-type devices separately. By using this device, the joint research team successfully implemented a high-performance, low-power, complementary logic circuit that can perform different logic operations such as NOR and NAND.

Dr. Hwang said that, "this development will contribute to accelerating the commercialization of next-generation system technologies such as artificial intelligence systems, which have been difficult to use in practical applications due to technical limitations caused by the miniaturization and high integration of conventional silicon semiconductor devices." He also anticipated that "the developed two-dimensional electrode material is very thin; hence, they exhibit high light transmittance and flexibility. Therefore, they can be used for next-generation flexible and transparent semiconductor devices."

<https://www.eurekalert.org/news-releases/954145>

