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Wed, 04 Oct 2023

### दुश्मन को ढूंढकर मारती है ये भारतीय मिसाइल, दागने के बाद भी बदल सकते हैं टारगेट

इस साल के अंत तक अस्त्र मिसाइल भारतीय वायुसेना के बेड़े का हिस्सा बन जाएगी. हवा से हवा में मार करने वाली इस स्वदेशी मिसाइल को DRDO ने तैयार किया है. इसकी सबसे खास बात है कि बियॉन्ड विजुअल रेंज यानी जिस टारगेट को पायलट नहीं देख पाता, यह दुश्मन के उस ठिकाने को तबाह करने का काम करेगी. ट्रायल के दौरान यह साबित हुआ है कि यह सटीक हमला करने में सक्षम है.

द हिन्दू की रिपोर्ट के मुताबिक, मई 2022 में भारतीय वायुसेना ने 248 अस्त्र Mk-1 BVR मिसाइल के लिए पहला ऑर्डर दिया था. इस साल के अंत इसे भारतीय वायु सेना के सुपुर्द कर दिया जाएगा. जानिए कितनी पावरफुल है अस्त्र मिसाइल और कैसे दुश्मनों को करेगी तबाह.

#### 5 पॉइंट में समझें अस्त्र मिसाइल क्यों है खास

टारगेट के हिलने पर भी पीछा नहीं छोड़ती: अस्त्र मिसाइल की सबसे खास बात है इसमें लगा ऑप्टिकल प्रॉक्सीमिटी फ्यूज. इसकी मदद से अपने टारगेट पर नजर रखती है. अगर मिसाइल के टारगेट में मूवमेंट होता है तो भी यह उसकी रेंज में पहुंचकर उसे तबाह कर देती है. मिसाइल की यही खूबी इसके खास बनाती है.

घातक मारक स्पीड: मिसाइल का वजन 154 किलो और लम्बाई 12.6 फीट है. इसे घातम मारक स्पीड वाली मिसाइल कहा जा रहा है. यह 15 किलो के हथियार लेकर जा सकती है और इसके जरिए खतरनाक विस्फोटक भेजे जा सकते हैं. 160 किलोमीटर की रेंज में हमला करने वाली यह मिसाइल 66 हजार फीट की ऊंचाई तक जाने में सक्षम है.

बदला जा सकता है टारगेट: एक बार टारगेट सेट होने पर यह 5556.6 किलोमीटर प्रति घंटा की रफ्तार से दुश्मन की ओर बढ़ती है और तबाही मचाती है. खास बात है कि इसमें फाइबर ऑप्टिक गाइरो बेस्ट इनर्शियल नेविगेशन सिस्टम का इस्तेमाल किया गया है. जिसकी मदद से एक बार टारगेट सेट होने के बाद हवा में ही इसका टारगेट सुविधा के हिसाब से बदला जा सकता है.

ऐसे बढ़ाएगी ताकत: इस मिसाइल के शुरुआत वैरिएंट को MIG-29 यूपीजी/MIG-29 के, सुखोई सू-30 एमकेआई, तेजस एमके.1/1A में लगाया जा चुका है और ट्रायल में सफलता मिली है. अस्त्र जिस तरह की मिसाइल है वो फाइटर जेट की ताकत को बढ़ाने का काम करती है. इन्हें हवा में फायर करके दुश्मन को संभलने से पहले कमजोर किया जा सकता है और ढूंढकर मारा जा सकता है.

सफल रही टेस्टिंग: डीआरडीओ ने इस मिसाइल की टेस्टिंग मेड-इन-इंडिया तेजस फाइटर जेट के साथ 23 अगस्त 2023 में की थी. टेस्टिंग गोवा में हुई थी, जो सफल रही थी. इसे भारत की पहली स्वदेशी एयर-टू-एयर मिसाइल कहा गया. भारतीय वायु सेना इसे अपने फाइटर जेट में लगाकर उसे ताकतवर बनाएगी और जंग की स्थिति में ये

दुश्मन पर आफत बनकर बरसेगी. यह साल के अंत तक भारतीय वायुसेना का हिस्सा बनेगी और पाकिस्तान-चीन के लिए बड़ा झटका साबित होगी.

<https://www.tv9hindi.com/knowledge/iaf-to-induct-astra-missile-by-end-2023-know-features-of-astra-bvr-missiles-in-hindi-2145654.html>



Wed, 04 Oct 2023

## **IAF to Induct Astra Missiles: Know how Deadliest this Missile is?**

In a bid to boost the Indian Defence Force and to give a befitting reply to enemies along the border, the Indian Air Force is gearing up to induct Astra, a Beyond Visual Range (BVR) Air to Air Missile, by the end of 2023. Astra is said to be one of the deadliest missile because of its range, speed, and accuracy rate of neutralizing targets beyond human visualisation in all weather condition. Well, the potential of this missile is not just limited to this, it has several features that are attracting global attention. Let's take a look at its lethal characters in detail.

### **What makes it fatal?**

#### **The range of the missile**

The dual pulse rocket motors or booster rocket motor and ramjet sustainer motor of the missile make it capable of engaging targets at a shortest distance of 500 metres (0.31 mi) to the longest distance of 340 kilometres (210 mi).

#### **Autonomous feature of tracking the target**

Designed and developed by the Defence Research and Development Organisation, Research Centre Imarat (RCI) and other DRDO laboratories, the missile uses mid-course inertial guidance, to continuously monitor the speed, velocity, position, and movement of the target. The guidance is driven by fibre-optic gyroscope with terminal guidance through active radar homing, making it capable of tracking the target autonomously. The missile has the potential to receive a course correction link through a secured data link.

#### **Quick enemy target**

The missile's active radar seeker, with a homing range of 25 km (16 mi), allows the missile to lock its target with a radar cross section of 5 square metres from a distance of 15 kilometres, enabling off-boresight launches up to an angle of 45 degrees. This feature of the missile allows fighter pilots to release a missile without changing its direction.

#### **Explosive warhead**

The electronic counter-countermeasures of the Astra Mk-1 allow it to operate even when the enemy tries to block the seeker through electronic countermeasures.

The Astra Mk-1 has been designed to carry a 15 kg (33 lb) high explosive pre-fragmented warhead activated by a proximity fuse, that explodes the explosive device automatically when it reaches a certain distance from its target.

#### **The speed of Astra Mk-1**

A smokeless solid fuelled motor of the missile allows it to attain a speed of Mach 4.5 and operate from a maximum altitude of 20 kilometres (66,000 ft). While the missile has a maximum range of 110 km in head-on chase mode, it has a maximum range of 20 kilometres in tail-on chase mode. When the missile is launched from an altitude of 15 kilometres, it can attain its maximum range. The missile can be launched in both buddy mode and autonomous mode.

### **Can be fired from which fighter jets**

Recently in August this year, Astra was successfully test-fired from the Light Combat Aircraft (LCA) Tejas off the coast of Goa. The missile was discharged from the aircraft at an altitude of roughly 20,000 feet. Astra is fully integrated on the SU-30MKI, one of the prominent fighter jets of the Indian Air Force.

### **Why is it in news?**

The Indian Air Force has inked two contracts with Bharat Dynamics Limited (BDL) for the procurement of 200 indigenous Astra Beyond Visual Range (BVR) air-to-air missiles. It is expected that the first batch of missiles will be inducted by the end of this year. The Indian Air Force's move comes amid the ongoing stalemate between India and China along Line of Actual Control in Ladakh region.

<https://www.news9live.com/knowledge/iaf-to-induct-astra-missiles-know-how-deadliest-this-missile-is-2308422>



*Wed, 04 Oct 2023*

## **DRDO's VSHORAD Missile System to be a Game-changer for Short-range Threats**

In a significant stride towards enhancing its air defence capabilities, the Indian defence establishment has initiated a tender for the procurement of 30 units of the indigenous Very Short-Range Air Defence (VSHORAD) missile system. These units mark the transition from the prototype stage to full-fledged industrial production, signifying a major leap in India's quest for self-reliance in defence technology.

The procurement of these VSHORAD missiles falls under the Development cum Production Partner (DcPP) policy, a strategic approach devised by the Defense Research and Development Organization (DRDO). Under this policy, DRDO leads the design phase, offering detailed blueprints and technical specifications to either private or public sector industries for the prototype's development.

### **Cutting-edge technology for short-range aerial threats**

The VSHORAD missile system is a Man Portable Air Defence System (MANPAD) specially designed to counter low-altitude aerial threats over short distances. It boasts an array of advanced technologies, including a miniaturised Reaction Control System (RCS) and integrated avionics, which have demonstrated exceptional performance during rigorous testing.

Powered by a dual-thrust solid motor, the VSHORAD missile ensures remarkable agility and precision when targeting airborne threats. The missile's entire design, including its launcher, has been meticulously optimised to guarantee ease of portability, a crucial element for its effective deployment across various scenarios.

## Strengthening India's air defence capabilities

The issuance of this procurement tender marks a significant milestone in India's ongoing efforts to fortify its air defence capabilities, with a particular focus on countering short-range aerial threats. This move underscores the nation's commitment to self-sufficiency in defence technology, reducing reliance on foreign imports and bolstering its security infrastructure. The use of Very Short Range Air Defence (VSHORAD) missiles in India is primarily by the Indian Army. VSHORAD systems are designed to provide short-range air defence capabilities to protect ground forces and critical assets from aerial threats, including helicopters and low-flying aircraft.

India has procured various VSHORAD systems to enhance its air defence capabilities, and these systems are typically operated by the Indian Army's air defence units. As India continues to invest in indigenous defence projects, it solidifies its position as a regional powerhouse with the capacity to safeguard its airspace effectively. The VSHORAD missile system represents another stride towards a more secure and self-reliant India on the global stage.

<https://www.republicworld.com/india-news/general-news/drds-vshorad-missile-system-to-be-a-game-changer-for-short-range-threats-articleshow.html>

## Defence News

## Defence Strategic: National/International



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Wed, 04 Oct 2023

## रक्षा राज्य मंत्री श्री अजय भट्ट ने भारतीय वायु सेना को द्विन सीटर एलसीए तेजस सौंपा

एलसीए तेजस, रक्षा विनिर्माण में आत्मनिर्भरता की दिशा में राष्ट्र की यात्रा का प्रतीक है: श्री अजय भट्ट

केंद्रीय रक्षा राज्य मंत्री श्री अजय भट्ट ने कहा कि एलसीए तेजस रक्षा विनिर्माण में आत्मनिर्भरता की दिशा में भारत की यात्रा का प्रतीक है। यह कार्यक्रम विदेशी विमानों पर देश की निर्भरता को कम करने की प्रतिबद्धता का एक शानदार उदाहरण रहा है, और यह आत्मनिर्भर भारत के लिए आशा की किरण के रूप में काम करता है। श्री भट्ट आज बेंगलुरु में भारतीय वायु सेना को एलसीए तेजस द्विन सीटर सौंपने के समारोह में बोल रहे थे।

केंद्रीय मंत्री ने आगे कहा कि एलसीए तेजस कार्यक्रम निरंतर समर्पण और नवाचार की एक प्रेरक गाथा रही है। एलसीए तेजस विमान की शुरुआत हमारी भारतीय वायु सेना को एक विश्व स्तरीय स्वदेशी लड़ाकू विमान से लैस करने के सपने में निहित थी। कार्यक्रम की शुरुआत में कई लोगों का मानना था कि यह बहुत महत्वाकांक्षी सपना था, लेकिन हिंदुस्तान एयरोनॉटिक्स लिमिटेड, एयरोनॉटिकल डेवलपमेंट एजेंसी (एडीए), डीआरडीओ प्रयोगशाला,

सीईएमआईएलएसी, डीजीएक्यूए, पीएसयू, आईएफ और अनगिनत अन्य संस्थानों के पुरुष और महिलाएं तथा इस कार्यक्रम में योगदान देने वाले व्यक्तियों ने साबित कर दिया कि जब देश का हित पहले आता है, तो कुछ भी असंभव नहीं है और सभी संस्थान इस महत्वपूर्ण उद्देश्य को पूरा करने के लिए एक साथ आए।

एलसीए तेजस कार्यक्रम के महत्व को रेखांकित करते हुए श्री भट्ट ने कहा कि देश ने अत्याधुनिक लड़ाकू विमान बनाने का बहुत जरूरी ज्ञान प्राप्त किया तथा एयरोस्पेस पारिस्थितिकी तंत्र मजबूत और विकसित किया। एलसीए तेजस के विकास ने भारत में एक मजबूत रक्षा और एयरोस्पेस उद्योग के विकास को बढ़ावा दिया है। इसने अनगिनत छोटे और मध्यम दर्जे के उद्यमों, अनुसंधान संस्थानों और कुशल श्रमिकों के लिए अवसर पैदा किए हैं, जिन्होंने इस परियोजना के विभिन्न पहलुओं में योगदान दिया है।

हिंदुस्तान एयरोनॉटिक्स लिमिटेड (एचएएल) की पहली श्रृंखला प्रोडक्शन ट्विन सीटर एलसीए तेजस बहु-उद्देश्यी, चपलता और अत्याधुनिक तकनीकी से सुसज्जित है तथा यह भारतीय वायुसेना के पायलटों को उपयुक्त प्रशिक्षण प्रदान करेगा। वायुसेना ने पहले ही हिंदुस्तान एयरोनॉटिक्स लिमिटेड (एचएएल) को 83 एलसीए का ऑर्डर दे दिया है।

वायु सेना प्रमुख, एयर चीफ मार्शल विवेक राम चौधरी, सीएमडी, एचएएल श्री अनंतकृष्णनजी, एडीए के महानिदेशक डॉ. गिरीश एस देवधरे, सीईएमआईएलएसी के मुख्य कार्यकारी श्री एपीवीएस प्रसाद, वायु सेना के उप प्रमुख (डीसीएएस) - एयर मार्शल आशुतोष दीक्षित इस अवसर पर उपस्थित थे।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1964273>



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

**Ministry of Defence**

*Wed, 04 Oct 2023*

## **Raksha Rajya Mantri Shri Ajay Bhatt Hands over Twin Seater LCA Tejas to the Indian Air Force**

**LCA Tejas symbolizes Nation's journey towards self-sufficiency in defence manufacturing: RRM**

Raksha Rajya Mantri Shri Ajay Bhatt said that the LCA Tejas symbolizes India's journey towards self-sufficiency in defence manufacturing. This programme has been a shining example of commitment to reduce country's dependency on foreign aircrafts, and it serves as a beacon of hope for a self-reliant India. He was speaking at the handing over ceremony of LCA Tejas Twin Seater to the Indian Air Force in Bangalore on 04 October, 2023.

RRM further said that the LCA Tejas program has been an inspiring saga of relentless dedication and innovation. The inception of the LCA Tejas aircraft was rooted in the dream of equipping our Indian Air Force with a world-class indigenous fighter aircraft. It was a dream that many believed was too ambitious at the beginning of the programme, but the men and women at Hindustan Aeronautics Limited, the Aeronautical Development Agency (ADA), DRDO Labs, CEMILAC, DGAQA, PSUs, IAF and countless other institutions and individuals who contributed to this programme proved that nothing is impossible when the country's interest comes first and all institutions come together for completion of this important cause.

Underlining the significance of LCA Tejas program, RRM said that the country gained the much-required knowledge of building a cutting-edge fighter aircraft and also developed & nurtured

aerospace ecosystem. The development of LCA Tejas has spurred the growth of a robust defence and aerospace industry in India. It has created opportunities for countless small and medium-sized enterprises, research institutions, and skilled workers who have contributed to various aspects of this project.

The HAL's first Series Production twin seater of LCA Tejas is decked with state-of-the-art technology, agility, and versatility, It will provide suitable training to the Pilots of IAF. The IAF has already placed an order for 83 LCAs with HAL.

The Chief of Air staff, Air Chief Marshal Vivek Ram Chaudhari , CMD, HAL Shri. Ananthkrishnanji, Director General of ADA Dr Girish S Deodhare , Chief Executive of CEMILAC Shri APVS Prasad , Deputy Chief of the Air Staff (DCAS) - Air Marshal Ashutosh Dixit were present on the occasion.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1964133>

## THE TIMES OF INDIA

Wed, 04 Oct 2023

### **IAF Gets First LCA Tejas Twin Seater Aircraft from HAL in Boost for 'Aatmanirbhar Bharat'**

The Indian Air Force (IAF), which already has operational squadrons of the light combat aircraft (LCA) Tejas, has received the first Tejas twin-seater from defence PSU Hindustan Aeronautics Limited (HAL).The Tejas twin-seater is a light weight, all-weather multi-role 4.5 generation aircraft designed to support the training requirements of the IAF and augment itself to the role of a fighter in case of necessity.

“It is an amalgamation of contemporary concepts and technologies such as relaxed static-stability, quadruplex fly-by-wire flight control, carefree manoeuvring, advanced glass cockpit, integrated digital avionics systems and advanced composite materials for the airframe,” HAL said.

— timesofindia (@timesofindia)

It added that the production of the LCA twin-seater variant adds India to the list of very few elite countries who have created such a capability and have them operational in their defence forces.

Ajay Bhatt, minister of state (defence) unveiled the twin-seater LCA and said: “In all, the development of LCA Tejas has also brought about a shift in our approach to defence procurement. It has demonstrated that India has the talent, knowledge and capability to design, develop and manufacture world-class fighters.”

Chief of Air Staff Air Chief Marshal VR Chaudhari said that IAF would be going forward to procure 97 more LCAs and with this it will have 220 LCAs in its inventory.

HAL CMD CB Ananthkrishnan said that the company was committed to deliver all the twin-seater aircraft pertaining to the initial operational clearance (IOC) and final operational clearance (FOC) contract to IAF in the current financial year. “With this, we are moving one step closer towards achieving self-sufficiency on the fixed wing segment. These trainers also ensure smooth transition for the pilots from trainer to fighter aircraft in this class”, he added.

<https://timesofindia.indiatimes.com/india/iaf-gets-first-lca-tejas-twin-seater-aircraft-from-hal-in-boost-for-aatmanirbhar-bharat/articleshow/104156488.cms>





**Press Information Bureau  
Government of India**

**Ministry of Defence**

*Wed, 04 Oct 2023*

## **Tri-Services Commanders' Conference 2023 (Western Grouping)**

Tri-Services Commanders' Conference (TSCC)-2023 (Western Grouping) was held at Subroto park, New Delhi on 03 & 04 October 2023 under the aegis of Western Air Command. The two-day conference was hosted by Air Marshal PM Sinha, Air Officer Commanding-in-Chief, Western Air Command. General Anil Chauhan, Chief of Defence Staff presided over the event.

General Officers Commanding in Chief of Northern Command, South Western Command, Southern Command and Western Command; Flag Officer Commanding in Chief, Western Naval Command, Air Officers Commanding in Chief of South Western Air Command and Southern Air Command; Chief of Integrated Defence Staff to Chairman Chief of Staff Committee, Director General Defence Intelligence Agency and Deputy Chief of Integrated Defence Staff (Operations) attended the conference.

The commanders reviewed the current geopolitical situation, deliberated on the means to enhance operational preparedness and synergy of operations in the area of interest. Discussions were also held on ensuring integrity of our borders and mitigating threats. Involved discussions and free exchange of ideas took place amidst an environment of bonhomie.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1964203>



**Press Information Bureau  
Government of India**

**Ministry of Defence**

*Wed, 04 Oct 2023*

## **Major Announcements by Raksha Mantri During the Plenary Session of 'Swavlamban 2.0'**

**5th Positive Indigenisation List, comprising 98 items, of DMA released; Highly complex systems, sensors, weapons & ammunition included**

**76 challenges under DISC 10 & DISC 10 PRIME and two under INDUS X also launched**

**One-of-a-kind dual-chip debit card 'SBI NAVeCash Card' unveiled; Can be used in online mode & also offline while at sea**

**India's defence sector is riding on the boat of innovation: Shri Rajnath Singh**

To promote 'Aatmanirbharta' in defence and innovation, a number of big-ticket announcements were made by Raksha Mantri Shri Rajnath Singh during the plenary session of 'Swavlamban 2.0', the two-day seminar of Naval Innovation and Indigenisation Organisation (NIIO), which commenced in New Delhi on October 04, 2023. The main highlight was the release of the fifth

Positive Indigenisation List of Department of Military Affairs (DMA) comprising 98 items. Highly complex systems, sensors, weapons and ammunition have been included in the list. All these items will be procured from indigenous sources as per provisions given in Defence Acquisition Procedure (DAP) 2020 in staggered timeline.

Shri Rajnath Singh also launched 76 challenges for the industry under 10th Defence India Start-up Challenges (DISC 10) & DISC 10 PRIME of Innovations for Defence Excellence (iDEX) and five problem statements under iDEX for Fauji. In addition, two INDUS X challenges under 'INDUS-X Mutual Promotion of Advanced Collaborative Technologies' (IMPACT) challenges jointly finalised by iDEX and United States Department of Defense (US DoD) were launched by the Raksha Mantri. He also released the Indian Navy's updated Indigenisation Roadmap 'Swavlamban 2.0'. A special interactive session for the industry to explain the nuances of the roadmap is planned on Day 2 of the seminar.

In his address, Shri Rajnath Singh appreciated the fact that the SPRINT innovative challenge, which was launched by Prime Minister Shri Narendra Modi during the maiden Swavlamban seminar in 2022 to promote the use of indigenous technology and products in the Navy, has helped in taking the country forward in becoming self-reliant in the defence sector. He credited the Prime Minister's visionary leadership for driving the country ahead in mission mode free from doubt and full of confidence. India's defence sector is currently riding on the boat of innovation, he said, lauding iDEX for providing the youth with a platform to innovate and develop new products, which not only ensures the progress of the start-ups, but also strengthens the country's defence ecosystem.

The Raksha Mantri was of the view that India has always been self-reliant in the field of knowledge & innovation and when the present Government came to power in 2014, it re-kindled the feeling of being 'Aatmanirbhar' in every sector. "Due to foreign invasions, we had forgotten our innovative approach. The word 'local' became synonymous with low quality. We're now freeing ourselves from that mentality. Our Prime Minister launched the 'Vocal for Local' campaign and restored respect for local goods. Our youth are now recognising their inner strength and eliminating inner doubts. In the coming times, they will play a big role in the development of the country with their innovative approach and knowledge," he said.

While Shri Rajnath Singh commended Department of Defence Production for playing a crucial role in building a self-reliant India through initiatives such as iDEX, NIIO and Technology Development Acceleration Cell (T-DAC), he stated that increased efforts are needed to connect the youth with the defence sector, especially R&D and manufacturing. He also gave a number of suggestions to further improve the efficiency of iDEX.

The Raksha Mantri called for a careful assessment of the technology challenges – whether they are state-of-the-art as per today's time and whether any better technology is expected in the near future. He stressed the need to ascertain whether a technology is already available somewhere in the market or "we're just re-inventing the wheel". He also pointed out that it is essential to assess the viability of a technology from the point of view of the economy. This will provide a better value for money on your R&D expenditure, he said. He pitched for devising a robust mechanism which conducts this analysis before the introduction of any technology or challenge. For this, he said, DDP, DRDO and the Armed Forces can together form an independent body of experts, which can further improve the analysis mechanism.

Shri Rajnath Singh also recommended the assessment of products and technologies, developed during the previous challenges, as to where they are placed in the market. He stated that in case there are any shortcomings, improvements should be made in that direction. "If there are 50 challenges and all of them are being achieved, it means that we need to increase the level of challenge. This will provide a push to innovation," he added.

The Raksha Mantri stressed on constant evaluation of work to move forward. He stated that the challenge may be named SPRINT, but there is a need to move ahead like a marathon race. “We don't just have to cover a few metres; we have to travel miles. It is both SPRINT and MARATHON,” he said.

Speaking on the occasion, Chief of the Naval Staff Admiral R Hari Kumar stated that, last year, the Navy sought solutions to 75 challenges, received more than 1,000 responses, declared 118 winners under DISC 7 SPRINT and SPRINT-PRIME and concluded over 100 technological developmental agreements between iDEX and the industry. He termed these as global firsts, game changers and force multipliers. The Chief of the Naval Staff emphasised that the Navy's aim is to go beyond linear growth and adopt compounding i.e., one technology leading to multiple offshoots, each in turn, producing numerous products. He expressed satisfaction that the vision has got off to a dream start. He congratulated the defence industry, MSMEs, start-ups and academia for showing the world “what we are capable of”.

### **Fifth Positive Indigenisation List**

The Fifth Positive Indigenisation List has been prepared by DMA after several rounds of consultations with all stakeholders. It lays special focus on import substitution of components of major systems besides important platforms, weapon system & sensors and munitions which are being developed and likely to translate into firm orders in the next five to ten years.

Prominent items include Futuristic Infantry Combat Vehicle, Articulated All-Terrain Vehicles, Remotely Piloted Air Borne Vehicles upto 25 Km with 2Kg Payload for Army, Naval Shipborne Unmanned Aerial System, Medium Upgrade Low Endurance Class Tactical Drone, Electric Light Vehicle for Army, Medium Range Precision Kill System for Artillery, Next Generation Low Level Light Radar for Army, Automatic Chemical Agent Detection & Alarm System, Armoured Fighting Vehicle (AFV) Protection and Counter Measures System, Integrated Mobile Camouflage System, AI Based Satellite Image Analysis, Test Equipment for Guided Weapon System for Tank T- 90 S/SK, Quantum Key Distribution System for Optic Fiber based Networks (Upto 200 Km range), Very High Frequency Radar, Electro Optic Fire Control System for Naval Platforms, Armour Plates for Cabin Nose Section for Mi-17 Helicopter, Automated Mobile Test System for OSA-AK-M Missile System; Multifunction Aviation Ground Equipment for Air Force, Gravity Rollers for Mi-17 V5 Helicopter and flares of P-8I and MiG 29-K Aircraft.

The items in the list will provide ample visibility and opportunity to the domestic industry to understand the trend and futuristic needs of the Armed Forces and create requisite R&D and manufacturing capacity within the country.

The MoD has taken numerous steps for self-reliance in the defence sector and Positive Indigenisation Lists is one of the most important transformative reforms in pursuit of indigenisation. It is one of the key constituents of the Government's 'Aatmanirbhar Bharat Abhiyan' to transform the defence sector to achieve self-reliance and boost exports with the active participation of public and private sector. The DMA had earlier promulgated four Positive Indigenisation Lists comprising 411 military items. Separately, the DDP has notified four Positive Indigenisation Lists consisting of a total of 4,666 items, including Line Replacement Units/Sub-systems/Spares & Components for Defence Public Sector Undertakings (DPSUs).

It is encouraging to note that with the various reforms put in by the Government, the industry, especially the private sector, is gaining confidence and building capability to manufacture/integrate highly complex systems, sensors, simulator, weapons and ammunitions etc. It is likely to stimulate the potential of domestic R&D by attracting fresh investment into technology and manufacturing capabilities. Besides recognising the growing capability of domestic industry in defence manufacturing, the Positive Indigenisation Lists have signalled a strong resolve to promote a robust

and self-reliant defence industry and cut down imports. It also recognises the fact that the defence sector will be one of the key contributors to the nation's economy and growth in the next five to 10 years.

### **iDEX DISC 10 & DISC 10 PRIME Challenges**

76 challenges were launched for the industry by the Raksha Mantri under DISC 10 & DISC 10 PRIME to celebrate the 76th year of India's independence. These challenges include problem statements from the three Services, Indian Coast Guard, DPSUs, Border Roads Organisation and Mission DefSpace. In addition, five problems under the iDEX for Fauji (i4F) scheme were also launched.

### **INDUS X Challenges**

iDEX in partnership with the US DoD had recently conducted the India-US Defence Acceleration Ecosystem (INDUS X) event in Washington DC to expand the strategic technology partnership and defence industrial cooperation between the start-up ecosystems, businesses and academic institutes of India and US. In a short span of three months, iDEX and US DoD have finalised two joint INDUS X challenges under the IMPACT which were launched by the Raksha Mantri during the seminar. US Ambassador to India Mr Eric Garcetti was also present at the launch.

iDEX winners, and especially those who have already been awarded procurement contracts, were felicitated during the event.

### **INVenT**

The NIIO and the Defence Innovation Organisation (DIO) entered into an agreement for jointly working on facilitating the infusion of Venture Capital into the defence ecosystem through the iDEX Innovators Hub (iIH). The seminar witnessed 'INVenT' (iDEX-Navy Venture for Technology) being launched. In addition, a number of other MoUs were exchanged. These include NIIO MoUs with the academia and the industry.

### **SBI NAVeCash Card**

Raksha Mantri Shri Rajnath Singh also launched SBI NAVeCash Card – a one-of-its-kind dual-chip debit card developed by the State Bank of India (SBI) and the Indian Navy. The card can be used in online mode (as a regular debit card) as well as in offline mode while at sea with no direct connectivity with the bank. The card has been developed and tested onboard various Indian Naval ships and is now ready for launch pan-Navy. The card is a positive step towards the Prime Minister's dream of Digital India with cashless financial transactions as it obviates the usage of cash onboard ships even in high seas.

### **Exhibition**

Products developed under the SPRINT (Supporting Pole-vaulting in R&D through iDEX, NIIO and TDAC) initiative were showcased in an exhibition during the seminar. Under the SPRINT, launched during the first Swavlamban, the Indian Navy aimed to develop at least 75 technologies/products to celebrate 75 years of India's Independence as a part of the 'Azadi ka Amrit Mahotsav'. The stated aim has been met and surpassed.

Chief of Defence Staff General Anil Chauhan; Vice Chiefs of Indian Army & Indian Air Force; President, Society of Indian Defence Manufacturers (SIDM) Shri SP Shukla and industry representatives were among those who attended the session.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1964272>

## **Defence Revolution: Rajnath Singh Unveils Game Changing Initiatives for Self-Reliance at ‘Swavlamban 2.0’**

A series of transformative announcements including the release of the fifth Positive Indigenisation List, comprising 98 items, was made at ‘Swavlamban 2.0 today by the defence minister Rajnath Singh.

The fifth Positive Indigenisation List which was released during the plenary session of ‘Swavlamban 2.0,’ organized by the Naval Innovation and Indigenisation Organisation (NIIO) in New Delhi, includes items like highly intricate systems, sensors, weapons, and ammunition.

### **Fifth Positive Indigenisation List:**

The highlight of the event was the release of the fifth Positive Indigenisation List by the Department of Military Affairs (DMA). This list comprises 98 items, including highly complex systems, sensors, weapons, and ammunition. All these items will be procured from indigenous sources, following the provisions outlined in the Defence Acquisition Procedure (DAP) 2020, with a phased timeline.

The fifth Positive Indigenisation List focuses on import substitution of components, major systems, platforms, weapon systems, sensors, and munitions. It includes items such as Futuristic Infantry Combat Vehicles, Unmanned Aerial Systems, and more, intended to be developed domestically.

### **Challenges Launch:**

Singh launched 76 challenges under the 10th Defence India Start-up Challenges (DISC 10) & DISC 10 PRIME of Innovations for Defence Excellence (iDEX). Additionally, he introduced two INDUS X challenges under the ‘INDUS-X Mutual Promotion of Advanced Collaborative Technologies,’ jointly finalized by iDEX and the United States Department of Defense (US DoD).

### **SBI NAVeCash Card:**

A unique dual-chip debit card named ‘SBI NAVeCash Card’ was unveiled during the event. This card can be used both online and offline, even while at sea, offering convenience and security.

### **Focus on Innovation:**

The minister stressed that India’s defence sector is currently experiencing a surge of innovation and praised iDEX for providing a platform for youth to innovate and contribute to strengthening the country’s defence ecosystem.

### **Promotion of ‘Aatmanirbharta’:**

Singh highlighted the importance of ‘Aatmanirbharta’ (self-reliance) in the defence sector and praised the ‘Vocal for Local’ campaign initiated by the Prime Minister. And expressed confidence in the youth’s potential to drive the country’s development through innovation and knowledge.

### **Efforts to Connect Youth:**

The minister stressed the need to connect the youth with the defence sector, particularly in research and development (R&D) and manufacturing. Also, provided suggestions to enhance the efficiency of iDEX.

### **Technology Assessment:**

The minister called for a rigorous assessment of technology challenges, ensuring their relevance and avoiding duplication. And advocated for a mechanism involving DDP, DRDO, and the Armed Forces to conduct this analysis before introducing any technology or challenge.

### **Constant Evaluation:**

He encouraged continuous evaluation of work and the need to set increasingly challenging goals for innovation.

### **Chief of the Naval Staff's Remarks:**

Chief of the Naval Staff Admiral R Hari Kumar highlighted the success of previous challenges and expressed the Navy's ambition to go beyond linear growth and adopt compounding technologies, which would result in multiple product developments.

These announcements reflect the government's commitment to achieving self-reliance in the defence sector, fostering innovation, and strengthening the domestic defence industry. The aim is to promote 'Aatmanirbharta' and reduce reliance on imports, ultimately contributing to India's economic growth and security.

<https://www.financialexpress.com/business/defence-defence-revolution-rajnath-singh-unveils-game-changing-initiatives-for-self-reliance-at-swavlamban-2-0-3263056/>

## THE ECONOMIC TIMES

Wed, 04 Oct 2023

### **Two Super High Altitude Firing Ranges in Arunachal Pradesh Made Available for Armed Forces**

Two super high altitude firing ranges were made available to the armed forces for the practice of various kinds of weapons and surveillance equipment in Arunachal Pradesh within an aerial distance of 50 kilometres from the highly sensitive Line of Actual Control, sources said. The initiative to hand over the land of the Mandala and Kamrala firing ranges, located at an altitude of above 10,000 feet, to the armed forces was taken by Chief Minister Pema Khandu.

While the first of the integrated surveillance and firepower training exercises named 'Buland Bharat' has already been conducted at Mandala in May, a major firing exercise is yet to be conducted at the Kamrala firing range, security sources told PTI.

Both the super high altitude firing ranges are located within 50 km aerial distance of the LAC.

Arunachal Pradesh shares a 1,129-km-long LAC with China's Tibet Autonomous Region.

A top security officer deployed in the region said both the firing ranges in Arunachal Pradesh were made available to the armed forces at the personal initiative of Chief Minister Khandu.

When contacted, Khandu told PTI: "National interests come first. We have decided to hand over the land for the two firing ranges taking into account the need of the armed forces."

Yangste, where PLA troops intruded on December 9 last year, comes under the chief minister's own assembly constituency Mukto in Tawang district.

After the PLA troops had entered Yangste, they clashed with the Indian Army, resulting in injuries to soldiers on both sides.

The sources said the two firing ranges will be highly advantageous for the armed forces as troops deployed in high-altitude strategic locations in Ladakh, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh can test their firepower and get acclimatised.

During the 'Buland Bharat' exercise, the armed forces carried out an integrated surveillance and firepower training exercise to test "simulated war conditions in high altitude areas".

The exercise involved the synergised application of surveillance and firepower capabilities of the infantry and artillery radars and weapon systems. Firing from the air was also practised.

It was done in close coordination with the special forces, aviation and Central Armed Police Forces deployed in the Kameng and Tawang sectors in Arunachal Pradesh, the sources said.

At Mandala, the Army used 155 mm Bofors howitzers, 105 mm field guns and 120 mm mortars among other heavy weapon systems.

Dhanush and Sharang guns, Pinaka and Smerch multi-launch rocket systems, new M-777 ultra-light howitzers and the winterised K-9 Vajra self-propelled tracked guns were also used during the exercise, the sources said.

<https://economictimes.indiatimes.com/news/defence/two-super-high-altitude-firing-ranges-in-arunachal-pradesh-made-available-for-armed-forces/articleshow/104150688.cms>

## THE TIMES OF INDIA

*Thu, 05 Oct 2023*

### **Army Set for Massive Drill to Test New-Generation Weapons, Tech**

The Army has geared up for a massive combat exercise to test new-generation weapon systems and technologies as well as to validate new concepts in long-range firepower, battle-readiness and force-preservation, including lessons learnt from the ongoing Russia-Ukraine war.

Preparations are in full swing on the western front in Rajasthan for the 'Trishakti Prahar' exercise of the 21 Corps, which is one of the four major "strike formations" of the 12-lakh strong Army, sources told TOI.

"The final phase of the two-side exercise will be in the first half of November. Over 30,000 troops, T-90S and Arjun main-battle tanks, a wide array of howitzers, choppers and the like are participating in the exercise. Fighter jets, Apache attack and Chinook heavy-lift helicopters and other aircraft from the IAF and Navy will also be there," a source said.

Integrated air-land and combined arms operations, swifter mobilisation and deep-strike offensive capabilities, including "degradation by long-range vectors and precision high-volume strikes" backed by ISR (intelligence, surveillance, reconnaissance) and electronic warfare capabilities, will all be tested during the war game.

"Better mobility and effective shoot-and-scoot capabilities, another crucial force-preservation lesson from the Russia-Ukraine conflict, will be another focus area. Similarly, armed swarm drones and loitering munitions or kamikaze drones will also be in play," the source said.

The ongoing military confrontation with China in eastern Ladakh, which is into its fourth year now, has led the Army to go in for huge emergency procurements (EP), including niche technologies

ranging from unmanned aerial vehicles(UAVs/drones), precision-guided missiles and loiter munitions to counter-drone, communication and automatic spectrum monitoring systems.

After 68 deals worth Rs 6,600 crore in the first three EP tranches, another 49 schemes worth Rs 7,600 crore have been inked in the fourth tranche. “Moreover, 34 other schemes worth around Rs 7,000 crore are in the final stages,” another source said.

Several of the newly-inducted weapon systems and technologies will be “test-bedded” during the Trishakti Prahar exercise. “Parallely, a large number of cases for modernization and technology-infusion are also underway to ensure an agile future-ready force, incorporating niche technologies through indigenous solutions,” he added.

The critical need for self-reliance in defence production, technologies and R&D, with resilient supply chains for military sustenance, is after all one of the key lessons that has emerged from the Russia-Ukraine war.

“Moreover, it has underscored the need to also prepare for multi-domain wars of longer durations. Earlier, the dominant thought was that conflicts will be short, intense and swift,” a senior officer said.

The heightened tensions all along the 3,488-km Line of Actual Control has also seen the Army — which has 14 corps, each with around 40,000 to 70,000 troops — re-balance a large number of additional forces and firepower to the frontier with China.

<https://timesofindia.indiatimes.com/india/army-set-for-massive-drill-to-test-new-generation-weapons-tech/articleshow/104168539.cms>



*Wed, 04 Oct 2023*

## **Indian Air Force Boosts Air Defence Arsenal, Orders Indigenous Astra Missiles**

The Indian Air Force (IAF) is set to bolster its air defence capabilities with a significant contract for indigenous Astra Beyond Visual Range (BVR) Air to Air Missiles. These contracts, awarded to Bharat Dynamics Limited (BDL), are poised to enhance India's self-reliance in defence manufacturing. The initial batch of Astra missiles is expected to be inducted into the IAF's inventory by the end of 2023.

Development efforts are already in progress for the more advanced and longer-range Astra-Mk2, marking a significant step in India's quest for defence self-sufficiency. Successful static firing tests have been conducted, demonstrating the missile's readiness for production. BDL has secured Bulk Production Clearance from the Centre for Military Airworthiness and Certification (CEMILAC), a noteworthy milestone in India's defence manufacturing.

The Astra missile system has already showcased its capabilities by being fully integrated into the Su-30MKI. In a successful August test, it was launched from the Light Combat Aircraft (LCA) Tejas off the coast of Goa, releasing the missile at an altitude of approximately 20,000 feet.

### **Astra MK-1 to lead the way: Reducing import dependency**

The IAF has set its sights on equipping its frontline fighters with the Astra MK-1 missiles, signifying the system's importance in India's air defence strategy. Furthermore, officials have



affirmed that the Astra MK-2 is poised to become the backbone of the IAF's BVR missile arsenal, significantly diminishing India's reliance on imported defence equipment.

The Defence Ministry had previously sealed a deal with BDL in May 2022 for the supply of Astra MK-I missiles and associated equipment, with a total cost of ₹2,971 crore. According to reports, the IAF is seeking an initial procurement of over 200 MK-1 missiles, underscoring the system's effectiveness and reliability.

The Astra missile system is a state-of-the-art BVR air-to-air missile with a range exceeding 100 kilometres. It is designed to engage and neutralise highly manoeuvrable supersonic aerial targets. This technological achievement is the result of collaborative efforts between the Defence Research and Development Laboratory (DRDL), Research Centre Imarat (RCI), and several other DRDO laboratories. The successful development and integration of the Astra missile system underscore India's commitment to advancing its indigenous defence capabilities.

<https://www.republicworld.com/india-news/general-news/indian-air-force-boosts-air-defence-arsenal-orders-indigenous-astra-missiles-articleshow.html>



Wed, 04 Oct 2023

## East Tech 2023: Advancing Indian Defence with Indigenous Innovation

For the first time, the Eastern Command of the Indian Army is organizing “East Tech 2023” in Guwahati. This event will take place at the Maniram Dewan Trade Centre on October 10 and 11, 2023.

### Significance

It is the first of its kind in the entire Northeastern region and is being jointly organized by the Indian Army and the Ministry of Commerce and Industries, Government of Assam.

Sources in the military establishment have revealed that the purpose of this event is to identify advanced technologies that can address operational challenges in the Eastern Sector and benefit the entire Indian Army.

### What is the goal of East Tech?

The main goal of East Tech 2023 is to assist the Eastern Command in addressing its operational challenges by integrating modern indigenous technology. The event will bring together Indian manufacturers, including MSMEs, DRDO, DPSUs, research organizations, and academia. They will showcase their latest advancements in weapon and equipment technology. Additionally, this event aims to provide a platform for startups and established players in the defence industry from Assam and other Northeastern states to display their innovations.

The primary objective of East Tech is to enhance the technological knowledge of participants and familiarize them with cutting-edge technologies and commercial off-the-shelf solutions available in the defence sector. The event seeks to raise awareness about contemporary technologies and hardware solutions offered by Indian defence manufacturers to address the evolving operational dynamics in the Eastern Command using indigenous, innovative, and future-proof technologies, thus promoting self-reliance in defence.

Furthermore, the event will boost defence manufacturing in the North East and facilitate their integration into supply chains. It will include seminars on niche technologies with IIT Guwahati and a medical symposium with AIIMS, Guwahati.

The Indian Armed Forces have identified specific technologies necessary to enhance their existing and future capabilities. Dependence on imported hardware could potentially compromise the country's defence readiness during crises due to technology restrictions.

Therefore, this event focuses on providing tools to enhance the capabilities of our forces, including battlefield transparency, command and control architecture, communication systems, information dominance, electronic warfare, nano technology/MEMS, artificial intelligence and robotics, unmanned warfare systems, mobility, chemical-biological-radiological-nuclear (CBRN) defence, advanced weapon systems, survival systems, and non-lethal weapons.

This event will also facilitate interactions between defence manufacturers and the Field Army to align their products with specific operational requirements and drive further research and development.

### **Eastern Command**

The Eastern Command, headquartered in Kolkata, is the oldest and largest command of the Indian Army, covering around 10 states. Its troops work in coordination with all elements of the Indian Armed Forces and the paramilitary forces to counter potential threats from neighbouring countries. East Tech 2023 aims to identify suitable technologies and solutions tailored to meet the operational needs of the Field Army, establishing an efficient ecosystem for procurement and maintenance of selected defence products.

<https://www.financialexpress.com/business/defence-east-tech-2023-advancing-indian-defence-with-indigenous-innovation-3262840/>

# **The Tribune**

*Thu, 05 Oct 2023*

## **Defence Theatre Commands Back to the Drawing Board**

The creation of proposed defence theatre commands is back to the drawing board with fresh permutations and combinations being now studied by the Department of Military Affairs (DMA).

Sources said this includes the task of defining fresh geographical and operational limits of the proposed commands and a consensus on the rank of theatre commanders. A formula to integrate existing logistics, maintenance, training and supply lines of the three forces is also being worked out.

The DMA, working under Chief of Defence Staff Gen Anil Chauhan, and the three services had originally arrived at an understanding on having three theatre commands — one each for the northern and western fronts and third for maritime domain.

“This concept has been put on hold for now,” the sources told The Tribune. They said the services and the DMA have options of having more than three commands. “The previous formula of three theatre commands is not final. A new combination is under examination,” said an official. The DMA has sought a feedback from the government on what kind of structure would be acceptable, as this is seen as the single biggest change to the form and shape of the country's war-fighting

structure. The idea is to have a structure that is acceptable to the government and the services. Once the outline is made, the theatre commands can be allocated resources, assets and manpower.

A theatre commander is expected to control all war assets of a defined geographical area. At present, the Army, Indian Air Force and Navy have their separate war-fighting assets and strategies. One thing is certain within the top echelons of the government that the theatre commander will be a three-star officer, and not a four-star officer.

“It is logical to have three-star officers at the helm of theatre commands, else what will be the service chief’s role,” said an official, adding that the US concept of the chief just looking after recruitment, training and sustaining the forces might not work in India.

The services chiefs are likely to retain their operational control of the forces. A notification in December 2019 that created the post of CDS explicitly bars him from having any operational command over the military.

Also, once the theatre commands come up, the role of 17 regional commands of the three services will need to be defined. The big question is whether these will be subsumed within the theatre commands.

The CDS is to give a report to the Defence Minister recommending the structure of commands, ranks of commanders and crucially who will be in-charge operationally. “It will take some more time for the report,” said another official, adding that fresh inputs were being examined.

Originally, the CDS was to give the report to Defence Minister Rajnath Singh by August-end. The minister is then to initiate the decision-making process at political level.

<https://www.tribuneindia.com/news/india/defence-theatre-commands-back-to-the-drawing-board-550423>



Wed, 04 Oct 2023

## **Ukraine Strikes Russian Air Defence Complex Near Belgorod with Drones: Report**

Ukraine carried out a drone attack on the western Russian region of Belgorod overnight and hit an S-400 air defence complex and its radar, a source in the Security Service of Ukraine (SBU) told Reuters on Wednesday.

Russia's defence ministry said earlier on Wednesday that it had downed 31 drones launched by Kyiv overnight over the regions of Belgorod, Bryansk and Kursk, but reported no casualties or damage. The two accounts could not be independently verified.

The SBU source pointed to videos posted online by Russian nationals showing what he said were 20 explosions at the location of the air defence system and its radar near the city of Belgorod.

Ukraine has tried to step up its attacks on Russian air defences in recent months. The source said it was the second time the SBU had struck a "Triumpf" air defence system since Sept. 14. The last one, also not confirmed by Russia, was located on the western part of the Russian-occupied Crimea peninsula.

<https://www.hindustantimes.com/world-news/ukraine-russia-war-ukraine-strikes-russian-air-defence-complex-near-belgorod-drones-101696421010440.html>



### **Researchers Synthesize Highly Crystalline Pyrite at Low Temperatures Useful for Fabricating High Energy Density Supercapacitors**

Researchers have synthesised highly crystalline pyrite FeS<sub>2</sub> at low temperatures and utilized them for fabricating electrochemical energy storage devices such as batteries and high energy density supercapacitors (SCs).

Transition metal sulfides (TMS) are an important class of inorganic materials and find applications in diverse fields including electrochemical energy storage devices such as batteries and supercapacitors (SCs). Solid-state synthetic methods are used to generate metal sulfides from the corresponding metal salts or their equivalent oxides usually by annealing at high temperatures.

However, the experiments carried out by Ms. Savithri Vishwanathan, under the supervision of Dr. H. S. S. Ramakrishna Matte at Centre for Nano and Soft Matter Sciences, Bengaluru, an autonomous institute under Department of Science & Technology (DST) demonstrated the low-temperature synthesis of crystalline pyrite FeS<sub>2</sub> through a solid-state synthesis route. They have utilized a metastable oxyhydroxide (FeOOH) precursor for this process.

The team reported stabilising this intermediate oxyhydroxide and utilizing it as a precursor for sulfidation, in the presence of H<sub>2</sub>S gas, for the first time in their paper published in the journal *Chemical Communications*

Using a metastable precursor helped in lowering the annealing temperature, as FeOOH converted into pyrite FeS<sub>2</sub> with fairly good crystallinity at a low temperature. This synthetic route of obtaining sulfides from their corresponding metastable oxyhydroxides can be extended to other transition metals to obtain crystalline materials in an energy intensive way.

Electrodes for high-energy density SCs were fabricated from the as-synthesized FeS<sub>2</sub>, resulting in superior performance in the presence of organic and ionic-liquid (IL)-based electrolytes. This could be attributed to the improved conductivity as a result of good crystallinity of the material as well as the significantly enhanced wettability of the FeS<sub>2</sub> electrode in the presence of the organic and IL-based electrolytes. The FeS<sub>2</sub> electrode exhibited high energy and power densities, clearly highlighting the role of the synthetic procedure employed for enhancing electrochemical properties.

Link to published paper: DOI: 10.1039/D3CC02153J

<https://pib.gov.in/PressReleasePage.aspx?PRID=1964333>

## 2023 Nobel Prize in Chemistry: Three Share Prize for Discovery of Quantum Dots, now Used in LEDs

The 2023 Nobel Prize in Chemistry has been awarded to Mounqi G. Bawendi, Louis E. Brus and Alexei I. Ekimov for the discovery and synthesis of quantum dots, the Royal Swedish Academy of Sciences said in Stockholm.

Quantum dots have unique properties and now spread their light from television screens and LED lamps. They catalyse chemical reactions and their clear light can illuminate tumour tissue for a surgeon, the Academy said in a press release.

Researchers have primarily utilised quantum dots to create coloured light. They believe that in the future quantum dots can contribute to flexible electronics, miniscule sensors, slimmer solar cells and perhaps encrypted quantum communication.

Today quantum dots are an important part of nanotechnology's toolbox. The 2023 Nobel Prize laureates in chemistry have all been pioneers in the exploration of the nanoworld, said the Academy.

In the early 1980s, this year's chemistry laureates Louis Brus and Alexei Ekimov succeeded in creating — independently of each other — quantum dots, which are nanoparticles so tiny that quantum effects determine their characteristics.

In 1993, chemistry laureate Mounqi Bawendi revolutionised the methods for manufacturing quantum dots, making their quality extremely high — a vital prerequisite for their use in today's nanotechnology. "Quantum dots are thus bringing the greatest benefit to humankind. Researchers believe that in the future they could contribute to flexible electronics, tiny sensors, thinner solar cells and encrypted quantum communication — so we have just started exploring the potential of these tiny particles," the release added.

Last year the prestigious Prize was cinched by Carolyn R. Bertozzi, Morten Meldal and K. Barry Sharpless for the development of click chemistry and bioorthogonal chemistry. Their work in click chemistry has been used to develop pharmaceuticals, mapping DNA while bioorthogonal chemistry refined the pharmaceuticals used to treat cancer.

On October 3, the Royal Swedish Academy of Sciences announced the winners of this year's Nobel Prize in Physics which was shared by Pierre Agostini, Ferenc Krausz and Anne L'Huillier for "experimental methods that generate attosecond pulses of light for the study of electro dynamics in matter."

The Nobel Prize for Medicine or Physiology was granted to Katalin Karikó and Drew Weissman for their "discoveries concerning nucleoside base modification that enabled the development of effective mRNA vaccines against COVID-19."

The recipients of the Nobel Prize in Literature will be announced on October 5 followed by the Prize for Peace on October 6 while the Prize for Economic Sciences will be released on October 9.

The prizes carry a cash award of 10 million Swedish kronor (nearly \$900,000) and will be awarded on December 10. The money comes from a bequest left by the prize's creator, Swedish inventor Alfred Nobel, who died in 1895.

<https://www.thehindu.com/sci-tech/science/2023-nobel-prize-chemistry/article67377618.ece>

