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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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Ministry of Defence

Tue, 24 Aug 2021 3:25PM

## First batch of Multi-Mode Hand Grenades handed over to Indian Army in the presence of Raksha Mantri Shri Rajnath Singh in Nagpur

*Raksha Mantri terms it a shining example of public-private partnership to achieve self-reliance in defence manufacturing*

### *Key highlights:*

- Grenade manufactured by Economic Explosives Limited Co following Transfer of Technology from a DRDO lab
- MMHG works in both offensive & defensive modes with high accuracy and reliability
- Raksha Mantri calls it an important milestone in defence manufacturing and a big step towards 'AatmaNirbhar Bharat'
- Defence exports in last two years cross Rs 17,000 crore

The first batch of Multi-Mode Hand Grenades (MMHG), manufactured by Economic Explosives Limited (EEL) following Transfer of Technology from Terminal Ballistics Research Laboratory of Defence Research & Development Organisation (DRDO), was handed over to the Indian Army in the presence of Raksha Mantri Shri Rajnath Singh in Nagpur, Maharashtra on August 24, 2021.

Chairman of EEL Shri S N Nuwal handed over a scale replica of MMHG to the Raksha Mantri to mark the first delivery of ammunition from the private sector. Chief of the Army Staff General M M Naravane, Secretary, Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy and DG Infantry Lt Gen A K Samantra were among those present on the occasion.

Addressing the gathering, Shri Rajnath Singh termed the handing over of MMHG as a shining example of the increasing collaboration between the public & private sectors and a big step towards self-reliance in defence manufacturing. "Today is a memorable day in the history of Indian defence sector. Our private industry is coming of age when it comes to defence production. It is an important milestone not only in the field of defence manufacturing, but also in achieving 'AatmaNirbhar Bharat' as envisioned by our Prime Minister Shri Narendra Modi," he said. The Raksha Mantri lauded DRDO & EEL for the speedy delivery of the order amidst COVID-19 restrictions and hoped of a faster delivery of the next lot.



The Raksha Mantri listed out the measures undertaken by the Government to transform the defence sector into a self-reliant industry which can cater to the present and the future needs of the Armed Forces. These include setting up of Defence Industrial Corridors in Uttar Pradesh and Tamil Nadu; formulation of draft Defence Production and Export Promotion Policy (DPEPP) 2020; earmarking around 64 per cent of its modernisation funds under capital acquisition budget for 2021-22 for procurement from domestic companies; notifying two Positive Indigenisation Lists of over 200 defence items to promote self-reliance & defence exports; Corporatisation of Ordnance Factory Board (OFB); increasing FDI limit from 49 to 74 per cent under automatic route and beyond 74 per cent through government route and according top priority to 'Buy {Indian-IDD (Indigenously Designed, Developed and Manufactured)}' category for capital procurement.



Shri Rajnath Singh made special mention of another initiative taken by the Government, *i.e.*, Technology Transfer to Industries by DRDO. Describing the measure as the backbone of the defence industry, he lauded DRDO for being an incubator which is undertaking free of cost transfer of technologies as well as providing access to testing facilities and over 450 patents. This has not only enabled the Industry to use ready-to-use technologies, but has also saved time, energy and money, he said.

The Raksha Mantri also underlined the importance of Innovations for Defence Excellence (iDEX) saying that it aims to achieve self-reliance and foster innovation & technology development in defence and aerospace sectors by engaging Industries including MSMEs, start-ups, individual innovators, R&D institutes and academia. Under this initiative, the problems being faced by the Armed Forces, Defence Public Sector Undertakings and OFB are identified and brought before entrepreneurs, MSMEs, start-ups and innovators through Defence India Startup Challenge (DISC) to find solutions.

Shri Rajnath Singh commended the Industry for indigenously developing products like 'Multi-Mode Grenade', 'Arjun-Mark-1' tank, 'Unmanned Surface Vehicle' and 'See Through Armor'. "Such products are not just being produced but exported on a large scale. The number of online export authorisations during 2016-17 to 2018-19 was 1,210. It has increased to 1,774 in last two years. This has resulted in defence exports of over Rs 17,000 crore in the last two years," he added. Shri Rajnath Singh exuded confidence that soon India will manufacture defence products not just for domestic use, but for the whole world.

The grenade is not just more lethal, but is safer to use. It has a distinctive design that gives flexibility of employment in both defensive (fragmentation) and offensive (stun) modes. It has a highly accurate delay time, very high reliability in usage and safe for carriage. These new grenades will replace Grenade No 36 of World War I vintage design, which had been continuing in service till date.

The EEL had signed a contract with Ministry of Defence on October 01, 2020 to supply 10 lakh modern hand grenades for Indian Army and Indian Air Force. The deliveries would be spread over two years from the bulk production clearance, which was accorded to EEL in March 2021. The first order has been delivered within five months.

The EEL had taken the technology from DRDO in 2016, absorbed it successfully while maintaining very high quality in detonics. Extensive trials were successfully undertaken by the Indian Army and Directorate General of Quality Assurance (DGQA) in plains, deserts and high altitude over summer & winter.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1748523>



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Tue, 24 Aug 2021 3:25PM

## नागपुर में रक्षा मंत्री श्री राजनाथ सिंह की उपस्थिति में मल्टी-मोड हैंड ग्रेनेड का पहला बैच भारतीय सेना को सौंपा गया

रक्षा मंत्री ने इसे रक्षा मैनुफैक्चरिंग में आत्म-निर्भरता प्राप्ति के लिए सार्वजनिक-निजी भागीदारी का आदर्श उदाहरण बताया

प्रमुख आकर्षण:

- डीआरडीओ प्रयोगशाला से टेक्नोलॉजी हस्तांतरण के बाद इकोनॉमिक एक्सप्लोसिव लिमिटेड कंपनी द्वारा ग्रेनेड बनाया गया
- मल्टी-मोड हैंड ग्रेनेड आक्रामक और रक्षात्मक दोनों मोड में अत्यधिक सटीक और विश्वसनीय ढंग से कार्य करता है
- रक्षा मंत्री ने इसे रक्षा मैनुफैक्चरिंग में महत्वपूर्ण मील का पत्थर और आत्म-निर्भर भारत की दिशा में बड़ा कदम बताया
- पिछले दो वर्षों में 17,000 करोड़ रुपए से अधिक का रक्षा निर्यात किया गया

रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) के टर्मिनल बैलिस्टिक अनुसंधान प्रयोगशाला से टेक्नोलॉजी हस्तांतरण के बाद इकोनॉमिक एक्सप्लोसिव लिमिटेड (ईईएल) द्वारा बनाया गया मल्टी-मोड हैंड ग्रेनेड (एमएमएचजी) का पहला बैच नागपुर, महाराष्ट्र में 24 अगस्त, 2021 को रक्षा मंत्री श्री राजनाथ सिंह की उपस्थिति में भारतीय सेना को सौंपा गया।

ईईएल के अध्यक्ष श्री एस एन नुवाल ने निजी क्षेत्र से हथियार की पहली डिलीवरी के मौके पर एमएमएचजी की स्केल प्रतिकृति रक्षा मंत्री श्री राजनाथ सिंह को सौंपी। इस अवसर पर सेनाध्यक्ष जनरल एस एस नरवणे, रक्षा अनुसंधान और विकास विभाग के सचिव और डीआरडीओ के अध्यक्ष डॉ. जी सतीश रेड्डी, इनफैंट्री महानिदेशक ले. जनरल ए के सामंत्रा और अन्य लोग भी उपस्थित थे।

रक्षा मंत्री श्री राजनाथ सिंह ने उपस्थित लोगों को संबोधित करते हुए सेना को एमएमएचजी सौंपे जाने को सार्वजनिक और निजी क्षेत्र के बीच बढ़ते सहयोग का आदर्श उदाहरण और रक्षा मैनुफैक्चरिंग में आत्म-निर्भरता की दिशा में बड़ा कदम बताया। उन्होंने कहा “ आज का दिन भारतीय रक्षा क्षेत्र के इतिहास में यादगार दिन है। रक्षा उत्पादन के मामले में हमारा निजी उद्योग परिपक्व हो रहा है। यह न केवल रक्षा मैनुफैक्चरिंग के क्षेत्र में मील का पत्थर है बल्कि प्रधानमंत्री श्री नरेन्द्र मोदी के आत्म-निर्भर भारत के विजन को हासिल करने में भी मील का पत्थर है।” रक्षा मंत्री ने कोविड-19 प्रतिबंधों के बीच ऑर्डर की तेजी से डिलीवरी के लिए डीआरडीओ तथा ईईएल की सराहना की और आशा व्यक्त की कि अगली खेप की डिलीवरी तेजी से होगी।





रक्षा मंत्री ने रक्षा क्षेत्र को सशस्त्र बलों की वर्तमान और भविष्य की जरूरतों को पूरा करने वाले आत्म-निर्भर उद्योग में बदलने के लिए सरकार द्वारा किए गए उपायों की जानकारी दी। इन उपायों में उत्तर प्रदेश और तमिलनाडु में डिफेंस इंडस्ट्रीयल कॉरिडोर की स्थापना, रक्षा उत्पादन और निर्यात संवर्धन नीति (डीपीईपीपी) 2020 का प्रारूप तैयार करना, घरेलू कंपनियों से खरीद के लिए 2021-22 के लिए पूंजी प्राप्ति बजट के अंतर्गत आधुनिकीकरण कोष का 64 प्रतिशत निर्धारित करना, आत्म-निर्भरता और रक्षा निर्यात को बढ़ावा देने के लिए 200 रक्षा सामग्रियों की स्वदेशीकरण की सार्थक सूचियों को अधिसूचित करना, आयुध फैक्ट्री बोर्ड (ओएफबी) का निगमीकरण, ऑटोमेटिक रूट के अंतर्गत एफडीआई की सीमा 49 से 74 प्रतिशत तथा सरकारी रूट से 74 प्रतिशत से ऊपर करना तथा पूंजी प्राप्ति के लिए बाइ इंडियन -आईडीडीएम (स्वदेश में डिजायन, विकसित और निर्मित) को शीर्ष प्राथमिकता देना शामिल है।



श्री राजनाथ सिंह ने सरकार की एक अन्य पहल यानी डीआरडीओ द्वारा तकनीक हस्तांतरण का विशेष उल्लेख किया। इन उपायों को रक्षा उद्योग की रीढ़ बताते हुए उन्होंने इनक्यूबेटर होने के लिए डीआरडीओ की सराहना की जो निशुल्क टेक्नोलॉजी हस्तांतरण कर रहा है और 450 से अधिक पेटेंटों को परीक्षण सुविधाओं की पहुंच प्रदान कर रहा है। इससे उद्योग न केवल उपयोग के लिए तैयार टेक्नोलॉजी में सक्षम बना है बल्कि समय, ऊर्जा और धन की बचत की है।

रक्षा मंत्री ने रक्षा उत्कृष्टता के लिए नवाचार (आईडेक्स) के महत्व को रेखांकित करते हुए कहा कि इसका लक्ष्य आत्म-निर्भरता की प्राप्ति और एमएसएमई, स्टार्ट-अप, व्यक्तिगत अन्वेषकों, अनुसंधान और विकास संस्थानों तथा एकेडेमी को शामिल करके रक्षा और एयरोस्पेस क्षेत्रों में नवाचार तथा टेक्नोलॉजी विकास को बढ़ावा देना है। इस पहल के अंतर्गत सशस्त्र बलों, सार्वजनिक क्षेत्र के रक्षा प्रतिष्ठानों तथा ओएफबी की कठिनाइयों को चिन्हित किया गया है और समाधान के लिए डिफेंस इंडिया स्टार्ट-अप चैलेंज ((डीआईएससी) के माध्यम से उद्यमियों, एमएसएमई, स्टार्ट-अप तथा अन्वेषकों के समक्ष लाया गया है।

श्री राजनाथ सिंह ने 'मल्टी-मोड ग्रेनेड', 'अर्जुन-मार्क-1' टैंक, ' अनमैन्ड सरफेस व्हेकिल ' और ' सी थू आर्मर ' जैसे स्वदेश में विकसित उत्पादों के लिए उद्योग की सराहना की। उन्होंने कहा कि ऐसे उत्पाद न केवल तैयार किए जा रहे हैं बल्कि बड़े पैमाने पर इनका निर्यात किया जा रहा है। वर्ष 2016-17 से 2018-19 के दौरान निर्यात प्राधिकृत संख्या 1,210 थी जो पिछले दो वर्षों में बढ़ कर 1,774 हो गई। परिणामस्वरूप पिछले दो वर्षों में 17,000 करोड़ रुपए से अधिक का रक्षा निर्यात हुआ। श्री राजनाथ सिंह ने विश्वास व्यक्त किया कि भारत जल्द ही न केवल घरेलू उपयोग के लिए रक्षा उत्पाद बनाएगा बल्कि पूरे विश्व के लिए बनाएगा।

ग्रेनेड न केवल अधिक घातक है बल्कि उपयोग में भी सुरक्षित है। इसकी डिजायन विशिष्ट है जो रक्षात्मक (फ्रैगमेंटेशन) तथा आक्रामक (स्टन) मोड में भी काम करता है। इसमें सटीक विलंब समय है, उपयोग में उच्च विश्वसनीयता है तथा ले जाने में सुरक्षित है। नए ग्रेनेड प्रथम विश्व युद्धके विशिष्ट जायन के ग्रेनेड नंबर 36 का स्थान लेगा जो अभी तक सेवा में है।

ईएल ने भारतीय सेना और भारतीय वायु सेना के लिए 10 लाख आधुनिक हैंड ग्रेनेड की आपूर्ति के लिए 01 अक्टूबर, 2020 को रक्षा मंत्रालय के साथ एक करार पर हस्ताक्षर किया था। डिलीवरी थोक उत्पादन

मंजूरी से दो वर्षों में की जाएगी। ईईएल को थोक उत्पादन मंजूरी मार्च, 2021 में दी गई थी। पहले आदेश की डिलीवरी पांच महीने के भीतर की गई है।

ईईएल ने 2016 में डीआरडीओ से तकनीक प्राप्त की थी, इसे डेटोनिक्स में उच्च गुणवत्ता बनाए रखते हुए सफलतापूर्वक समाविष्ट किया गया। भारतीय सेना और गुणवत्ता आश्वासन महानिदेशालय (डीजीक्यूए) ने 2017-18 की गर्मियों और सर्दियों में मैदानों, रेगिस्तान और ऊंचाई पर व्यापक परीक्षण सफलतापूर्वक किया।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1748614>



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

**Ministry of Defence**

*Wed, 25 Aug 2021 9:16PM*

## **CAS visit to Bengaluru**

Air Chief Marshal RKS Bhaduria PVSM AVSM VM ADC, Chief of the Air Staff (CAS) visited IAF units and flight test establishments/ facilities of DRDO and HAL at Bengaluru on 23 & 24 Aug 21. On arrival, CAS was received by AVM Jeetendra Mishra VSM, Commandant Aircraft and Systems Testing Establishment (ASTE).

During his visit to ASTE, CAS was given an overview of ongoing projects and briefed on progress of operational trials. During his interaction with personnel, CAS spoke of the unique and challenging role of ASTE, noted its laudable achievements and reemphasised the need for staying ahead of the curve in order to leverage its expertise in delivering the requirements of IAF Operational units.



CAS also visited Software Development Institute (SDI), the unit tasked for undertaking development of avionics software. He noted that the sustained focus on critical projects by the Institute had contributed significantly in increasing the operational and functional capability of IAF. CAS outlined his vision for SDI to move towards software indigenisation for integration of various weapons on IAF aircraft and achieving self-reliance in enhancing combat potential.

As part of the visit, CAS met and interacted with the test crew and engineers of Aeronautical Development Agency (ADA), DRDO and Hindustan Aeronautics Limited (HAL). CAS underscored the crucial role of both the establishments in furthering the shared goal of building an indigenous aviation industry capability of meeting our future requirements.

During his visit to Bengaluru, CAS flew in an IOC LCA Tejas.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1748729>



Wed, 25 Aug 2021 9:16PM

## वायु सेना प्रमुख का बंगलुरु का दौरा

वायु सेना प्रमुख (सीएएस) एयर चीफ मार्शल आर.के.एस.भदौरिया पीवीएसएम, एवीएसएम, वीएम, एडीसी ने 23 और 24 अगस्त 2021 को बंगलुरु में भारतीय वायुसेना की इकाइयों और रक्षा अनुसंधान एवं विकास संगठन तथा हिंदुस्तान एयरोनॉटिक्स लिमिटेड के उड़ान परीक्षण प्रतिष्ठानों व सुविधा केंद्रों का दौरा किया। वायु सेना प्रमुख के आगमन पर कमांडेंट एयरक्राफ्ट एंड सिस्टम्स टेस्टिंग एस्टाब्लिशमेंट (एएसटीई) एवीएम जीतेंद्र मिश्रा वीएसएम ने उनका स्वागत किया।



एएसटीई के निरीक्षण के दौरान वायु सेना प्रमुख को वर्तमान में चल रही परियोजनाओं का विवरण दिया गया और परिचालन परीक्षणों की प्रगति के बारे में भी बताया गया। संस्थान के कर्मियों के साथ अपनी बातचीत के दौरान श्री भदौरिया ने एएसटीई की अनूठी और चुनौतीपूर्ण भूमिका के बारे में चर्चा की। उन्होंने इसकी प्रशंसनीय उपलब्धियों के बारे में जानकारी एकत्र की और भारतीय वायुसेना की परिचालन इकाइयों की आवश्यकताओं को पूरा करने में अपनी विशेषज्ञता का लाभ उठाने के लिए आगे रहकर कार्य करने की आवश्यकता पर जोर दिया।

वायु सेना प्रमुख ने सॉफ्टवेयर डेवलपमेंट इंस्टीट्यूट (एसडीआई) का भी दौरा किया, जो एवियोनिक्स सॉफ्टवेयर के विकास के लिए काम करने वाली इकाई है। उन्होंने कहा कि संस्थान द्वारा महत्वपूर्ण परियोजनाओं पर निरंतर ध्यान केंद्रित करने से भारतीय वायुसेना की परिचालन एवं कार्यात्मक क्षमता को बेहतर बनाने में महत्वपूर्ण योगदान मिला है। श्री भदौरिया ने एसडीआई द्वारा आईएफ विमानों पर विभिन्न हथियारों के एकीकरण के लिए सॉफ्टवेयर स्वदेशीकरण की ओर बढ़ने तथा वायु सेना की लड़ाकू क्षमता को बढ़ाने में आत्मनिर्भरता प्राप्त करने के लिए अपने दृष्टिकोण को सामने रखा।

वायु सेना प्रमुख ने एयरोनॉटिकल डेवलपमेंट एजेंसी (एडीए), डीआरडीओ और हिंदुस्तान एयरोनॉटिक्स लिमिटेड (एचएएल) के परीक्षण दल के कर्मियों तथा इंजीनियरों से भी बातचीत की। श्री भदौरिया ने देश में भविष्य की आवश्यकताओं को पूरा करने के लिए स्वदेशी विमानन उद्योग क्षमता के निर्माण के साझा लक्ष्य को आगे बढ़ाने में दोनों प्रतिष्ठानों की महत्वपूर्ण भूमिका को रेखांकित किया।

अपनी बंगलुरु यात्रा के दौरान, वायु सेना प्रमुख ने आईओसी एलसीए तेजस में उड़ान भरी।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1748764>



## Army accepts delivery of grenades made by private sector firm

*The ministry signed a contract with Nagpur-based private firm Economic Explosives Ltd (EEL) last October*

The Indian Army on Tuesday accepted the delivery of the first batch of multi-mode hand grenades, manufactured by a private sector firm, at a ceremony held in Nagpur. The move is expected to provide thrust to the goal of 'Atmanirbhar Bharat' (Self-Reliant India), the defence ministry said in a statement.

The ministry signed a contract with Nagpur-based private firm Economic Explosives Ltd (EEL) last October for supplying 1 million multi-mode hand grenades to the army. These will replace a World War II vintage hand grenade design being used by the army. The EEL is expected to execute the order by October 2022.

The multi-mode hand grenade has been designed by the Chandigarh-based Terminal Ballistic Research Laboratories (TBRL) - a Defence Research and Development Organisation (DRDO) laboratory - and produced by the EEL.

The ceremony at Nagpur was attended by defence minister Rajnath Singh, army chief General Manoj Mukund Naravane and DRDO chief G Satheesh Reddy. EEL chairman SN Nuwal handed over a scale replica of the grenade to the minister to mark the first delivery of ammunition from the private sector. Singh said the grenades were "a shining example" of public-private partnership to achieve self-reliance in defence manufacturing.

"Today is a memorable day in the history of the Indian defence sector. Our private industry is coming of age when it comes to defence production. It is an important milestone not only in the field of defence manufacturing but also in achieving 'Atmanirbhar Bharat'," Singh said.

Multi-purpose grenades figured on the first list of 101 types of weapons and ammunition whose import India will ban progressively over the next five years. The government published the list in August 2020. In May 2021, the government notified a list of another 108 defence items that cannot be imported by the armed forces with the ban kicking off from December 2021. The list, called the 'positive indigenisation list', will be implemented progressively from December 2021 to December 2025.

From raising foreign direct investment (FDI) in defence manufacturing to creating a separate budget for buying locally made military hardware and notifying two lists of weapons/equipment that cannot be imported, the government has taken a raft of measures to boost self-reliance in the defence sector over the last two years.

The first list included artillery guns, missile destroyers, ship-borne cruise missiles, light combat aircraft, light transport aircraft, long-range land-attack cruise missiles, communication satellites, basic trainer aircraft, multi-barrel rocket launchers, a variety of radars, assault rifles, sniper rifles, mini-UAVs and different types of ammunition.

The second list consists of several military systems including specified types of helicopters, next-generation corvettes, airborne early warning and Control (AEW&C) systems, tank engines, medium power radar for mountains, medium-range surface to air missile systems and anti-material rifles.



Defence minister Rajnath Singh at the EEL factory. (@rajnathsingh/Twitter)

India has set aside ₹70,221 crore this year for domestic defence procurement, accounting for 63 per cent of the military's capital budget. Last year, the ministry spent over ₹51,000 crore, or 58 percent of the capital budget, on domestic purchases.

The defence minister commended the industry for indigenously developing defence products. "Such products are not just being produced but exported on a large scale. The number of online export authorisations during 2016-19 was 1,210. It has increased to 1,774 in the last two years. This has resulted in defence exports of over ₹17,000 crore in the last two years," he said.

<https://www.hindustantimes.com/india-news/army-accepts-delivery-of-grenades-made-by-private-sector-firm-101629814924466.html>

# अमर उजाला

Wed, 25 Aug 2021

## रक्षा मंत्रालय: राजनाथ सिंह ने कहा- रक्षा क्षेत्र की आत्मनिर्भरता में पीपीपी मॉडल बड़ा कदम

सार

- भारत का रक्षा निर्यात बीते दो वर्ष में 17 हजार करोड़ पार हुआ
- प्रथम विश्वयुद्ध के दौर के ग्रेनेड्स की जगह लेंगे नए ग्रेनेड, जवान रहेंगे सुरक्षित
- कुल 10 लाख ग्रेनेड मिला है आदेश, दो वर्ष में आपूर्ति पूरी होगी

विस्तार

नई दिल्ली: रक्षामंत्री राजनाथ सिंह ने रक्षा विनिर्माण के क्षेत्र में सार्वजनिक-निजी भागीदारी (पीपीपी मॉडल) की सराहना करते हुए कहा कि यह बड़ा कदम है, जिससे भारत जल्द ही घरेलू रक्षा जरूरतों के लिहाज से आत्मनिर्भर हो जाएगा। साथ ही पूरी दुनिया के लिए रक्षा उत्पाद बनाने की क्षमता भी हासिल कर लेगा। मंगलवार को उन्होंने नागपुर स्थित एक निजी फर्म की तरफ से निर्मित मल्टी-मोड हैंड ग्रेनेड (एमएमएचजी) का पहला बैच भारतीय सेना को सौंपा।



राजनाथ सिंह - फोटो : पीटीआई

भारत का रक्षा निर्यात बीते दो वर्ष में 17 हजार करोड़ पार हुआ इस दौरान उन्होंने कहा, भारत का रक्षा निर्यात बीते दो वर्ष में 17 हजार करोड़ रुपये पार कर गया है। रक्षा विनिर्माण के लिहाज से यह सार्वजनिक और निजी क्षेत्र के बीच बढ़ते सहयोग का आदर्श उदाहरण है। यह प्रधानमंत्री के आत्मनिर्भर भारत के विजन को साकार करने में भी मददगार है।

प्रथम विश्वयुद्ध के दौर के ग्रेनेड्स की जगह लेंगे नए ग्रेनेड, जवान रहेंगे सुरक्षित

एमएमएचजी का उत्पादन रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) की टर्मिनल बैलिस्टिक अनुसंधान प्रयोगशाला की तरफ से किए गए टेक्नोलॉजी ट्रांसफर के बाद इकोनॉमिक एक्सप्लोसिव लिमिटेड (ईईएल) की तरफ से किया गया है। एमएमएचजी प्रथम विश्वयुद्ध के दौर से काम आ रहे ग्रेनेड की जगह लेंगे, जो ज्यादा प्रभावी और सेना के लिए सुरक्षित हैं।

कुल 10 लाख ग्रेनेड मिला है आदेश, दो वर्ष में पूरी होगी आपूर्ति

सेना और वायु सेना को 10 लाख आधुनिक हैंड ग्रेनेड दो साल में मिल जाएंगे। ईईएल को इसके उत्पादन की मंजूरी मार्च, 2021 में दी गई थी, जिसके महज पांच माह के भीतर पहली खेप मिल गई है। इस अवसर पर सेनाध्यक्ष जनरल एसएस नरवणे, रक्षा अनुसंधान और विकास विभाग के सचिव और डीआरडीओ के अध्यक्ष डॉ. जी सतीश रेड्डी, इन्फैंट्री महानिदेशक ले. जनरल एके सामंत्रा उपस्थित थे।

रक्षा क्षेत्र की आत्मनिर्भर की तरफ बढ़ता भारत

रक्षा क्षेत्र को आत्मनिर्भर उद्योग में बदलने के लिए केंद्र की तरफ से उठाए गए कदमों की जानकारी देते हुए रक्षामंत्री ने कहा कि उत्तर प्रदेश और तमिलनाडु में डिफेंस इंडस्ट्रियल कॉरिडोर की स्थापना की गई है। रक्षा उत्पादन और निर्यात संवर्धन नीति (डीपीईपीपी) 2020 का प्रारूप तैयार हो चुका है।

घरेलू कंपनियों से खरीद के लिए 2021-22 के रक्षा बजट में से आधुनिकीकरण कोष के तौर पर 64 फीसदी हिस्सा आरक्षित किया गया है। इसके अलावा आत्मनिर्भरता और रक्षा निर्यात को बढ़ावा देने के लिए 200 रक्षा उपकरणों के स्वदेशीकरण की प्रक्रिया शुरू की गई है।

डीआरडीओ ने दिए रक्षा उद्योग को पंख

डीआरडीओ की तरफ से तकनीकी हस्तांतरण का उल्लेख करते हुए राजनाथ सिंह ने कहा कि डीआरडीओ निशुल्क टेक्नोलॉजी हस्तांतरण कर रहा है और 450 से अधिक पेटेंटों के लिए परीक्षण सुविधाएं मुहैया करा रहा है। इससे रक्षा उद्योग न केवल कम समय में टेक्नोलॉजी के लिहाज से सक्षम बना है, बल्कि इससे समय, ऊर्जा और धन की भारी बचत भी हुई है।

<https://www.amarujala.com/india-news/defense-ministry-rajnath-singh-says-ppp-model-is-a-big-step-in-the-self-reliance-of-the-defense-sector>



Wed, 25 Aug 2021

## जानिए क्या है भारतीय सेना का नया मल्टी मोड हैंड ग्रेनेड

*भारतीय सेना (Indian Army) अब तक उपयोग में लाए जा रहे परंपरागत हैंड ग्रेनेड (Hand Grenade) की जगह मल्टीमोड हैंड ग्रेनेड (MMHG) अपनाते जा रही है जो एक बड़ा सुधार बताया जा रहा है।*

सुसज्जित हथियारों (Modern Arms) की लंबे समय से जरूरत बनी हुई है। इन हथियारों को हासिल करने के लिए में विदेशों हथियार मंगाने होते जो महंगे तो होते ही हैं, साथ ही उन्हें हासिल करने की प्रक्रिया बहुत जटिल और लंबी भी होती है। इसीलिए आत्मनिर्भर भारत अभियान में ऐसे प्रयास किए जा रहे हैं जिससे आधुनिक हथियार और उपकरण भारत में ही निर्मित हो सकें। इसी



दिशा में भारत के रक्षा मंत्रालय ने ऐलान किया है कि उसने भारतीय सेना के लिए स्वदेश में विकसित किया हुआ मल्टीमोड हैंड ग्रेनेड (MMHG) की सप्लाई के लिए करार किया है।

यह ग्रेनेड (Grenade) भारतीय सेना के हथियारों के लिए एक बड़ा सुधार माना जा रहा है. (फाइल फोटो)

## कितनी आपूर्ति और कीमत

रक्षा मंत्रालय का यह करार नागपुर की एक निजी कंपनी से इस आधुनिक ग्रेनेड की 10 लाख यूनिट की आपूर्ति के लिए किया गया है जिनकी कीमत भारतीय सेना के लिए 400 करोड़ पड़ेगी। ये ग्रेनेड भारतीय सेना के उन पुराने 36M वाले मिल्स बम ग्रेनेड की जगह लेंगे जो द्वितीय विश्व युद्ध में प्रयोग किए जाते थे।

अब तक 20 सदी की शुरुआत वाले ग्रेनेड

इन ग्रेनेड की खासियतों की वजह से यह कदम भारतीय सेना के लिए एक बड़ा सुधार माना जदा रहा है। अभी तक उपयोग में लाए जा रहे नंबर 36 ग्रेनेड पुराने हैं जो 20वीं सदी की शुरुआत में दुनिया भर में उपयोग में लाए जाने लगे थे। यह हाथ में रखा जा सकने वाला छोटा बम होता है जिसका आवरण इस तरह से बना होता है कि फूटने पर इसके टुकड़े बहुत नुकसान पहुंचाते हैं।

कैसे होते हैं ये परंपरागत ग्रेनेड

इस ग्रेनेड में भी कई तरह के सुधार हुए लेकिन इसका अन्ननास जैसा बाहरी आवरण उसी तरह का रहा जिससे इसे पकड़ना आसान बना रहे। भारतीय सेना अंग्रेजों के बनाए इस ग्रेनेड का 36एम संस्करण उपयोग में लाती रही है। मिल्स बम नाम ने प्रसिद्ध ये ग्रेनेट राइफल से भी दागे जा सकते हैं। इसका निर्माण भारतीय ने के ऑर्डिनेन्स फैक्ट्रियों में बनाया जाता है।

क्या सुधार किया गया है एमएमएचजी में

इस परंपरागत ग्रेनेड के उपयोग में विश्वस्नीयता को लेकर कई तरह के समस्याएं हैं। इसका बिखराव बहुत असामान्य होता है जिससे यह फेंकने वाले तक के लिए असुरक्षित हो जाता है। लेकिन मल्टीमोड ग्रेनेड को इन खामियों को दूर करता है। इसके बनाने वाली डीआरडीओ की टर्मिनेल बैलेस्टिक रिसर्ज लैबोरेटरी के आधिकारिक पेज के अनुसार इसमें 'प्रीफर्म्ड सिलेंड्रिकल माइल्ड स्टील प्री फ्रेग्मेंट्स' का उपयोग किया गया है जो यह सुनिश्चित करता है कि इसके फूटने पर बिखराव समान रूप से हो।

दो अलग-अलग मोड

एमएमएचजी दो तरह की संरचनाओं में आता है। इस वजह से यह दो अलग अलग मोड वाला हैंड ग्रेनेड बन गया है। एक मोड डिफेंसिव मोड है तो दूसरा ऑफेंसिव मोड। अभी तक जो ग्रेनेड भारतीय सेना में उपयोग में लाए जा रहे थे वे डिफेंसिव मोड के ग्रेनेड थे। ये तभी कारगर थे जब दुश्मन खुले में हो और फेंकने वाले सैनिक को कोई सुरक्षा या आड़ मिल हो।

ऑफेंसिव मोड नई खासियत

वहीं ऑफेंसिव ग्रेनेड फटता नहीं है। इसमें दुश्मन को नुकसान विस्फोट से होता है जबकि इसे फेंकने वाला सैनिक सुरक्षित होता है। एमएमएचजी के डिफेंसिव मोड में भी एक फ्रेग्मेंटिंग स्लीव होती है उसकी



परंपरागत ग्रेनेड (Grenade) द्वितीय विश्व युद्ध के समय का था जो सेना में अब तक उपयोग में लाया जा रहा था. (प्रतीकात्मक तस्वीर: shutterstock)



इस ग्रेनेड (Grenade) को जरूरत के मुताबिक दो तरह के मोड में उपयोग में लाया जा सकता है. (तस्वीर: Solargroup)



मारक दूरी 8 मीटर के दायरे की होती है। वहीं ऑफेंसिव मोड में ग्रेनेड में स्लीव नहीं हैं और इसे मुख्यतया विस्फोट कर दुश्मन को चौंकाने और डराने के लिए उपयोग में लाया जाता है। इस मोड में मारक प्रभाव 5 मीटर का दायरा होता है।

इस ग्रेनेड पर काम पिछले 15 साल से चल रहा है। डीआरडीओ ने इकोनॉमिक एक्सप्लोजिव लिमिटेड कंपनी को चार साल पहले तकनीक प्रदान कर दी थी जिसे अब 10 लाख ग्रेनेड की आपूर्ति करनी है। इस ग्रेनेड ने परीक्षण में 99 प्रतिशत सुरक्षा और विश्वसनीयता हासिल की है। यह आत्मनिर्भर भारत की एक दिशा में एक अहम उपलब्धि मानी जा रहा है।

<https://hindi.news18.com/news/knowledge/indian-army-to-go-for-multi-mode-hand-grenades-know-significance-viks-3709591.html>



Wed, 25 Aug 2021

## IAF Chief RKS Bhadauria flies Tejas MK 1 FOC fighter in Bengaluru

Bengaluru: Indian Air Force chief Air Chief Marshal RKS Bhadauria flew a Tejas single-seater light combat aircraft MK1 FOC fighter during his visit to IAF and flight test establishments and facilities of Defence Research and Development Organisation (DRDO) and Hindustan Aeronautics Limited (HAL) here.

During his two-day visit on August 23-24, the Chief of the Air Staff (CAS) also visited the Software Development Institute (SDI), the unit tasked with undertaking the development of avionics software.

He noted that the sustained focus on critical projects by the Institute had contributed significantly to increasing the operational and functional capability of IAF, according to an official release.

Air Chief Marshal Bhadauria outlined his vision for SDI to move towards software indigenisation for integration of various weapons on IAF aircraft and achieving self-reliance in enhancing combat potential.

As part of the visit, the CAS met and interacted with the test crew and engineers of Aeronautical Development Agency (ADA), DRDO, and HAL. He underscored the crucial role of both the establishments in furthering the shared goal of building an indigenous aviation industry capability of meeting our future requirements, read the release.

On arrival, Bhadauria was received by AVM Jeetendra Mishra VSM, Commandant Aircraft and Systems Testing Establishment (ASTE).

During his visit to ASTE, the CAS was given an overview of ongoing projects and briefed on the progress of operational trials. During his interaction with personnel, Air Chief Marshal Bhadauria spoke of the unique and challenging role of ASTE, noted its laudable achievements, and re-emphasised on the need for staying ahead of the curve in order to leverage its expertise in delivering the requirements of IAF Operational units. (ANI)

<https://in.news.yahoo.com/iaf-chief-rks-bhadauria-flies-044408106.html>



Visua of CAS Rakesh Bhadauria on Tejas MK1 FOC fighter (Photo/ANI)



## IAF Chief RKS Bhadauria reviews progress of air power projects in Bengaluru

*He visited Air Force units and flight test establishments and facilities of DRDO and HAL on Aug 23 and Aug 24, officials said*

Indian Air Force (IAF) Chief, Air Chief Marshal RKS Bhadauria has reviewed the progress of the ongoing manned and unmanned air power projects and operational trials in Bengaluru during his two day visit to various defence establishments.

He visited Air Force units and flight test establishments and facilities of Defence Research and Development Organisation and Hindustan Aeronautical Limited at Bengaluru on August 23 and August 24, officials said.

During his visit to Aircraft and Systems Testing Establishment (ASTE), Air Chief Marshal RKS Bhadauria was given an overview of ongoing projects and briefed on progress of operational trials.

During his interaction with personnel, the IAF chief spoke of the unique and challenging role of ASTE, noted its laudable achievements and re-emphasised the need for staying ahead of the curve in order to leverage its expertise in delivering the requirements of IAF operational units.

He also visited Software Development Institute (SDI), the unit tasked for undertaking development of avionics software.

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Air Chief Marshal Bhadauria outlined his vision for SDI to move towards software indigenisation for integration of various weapons on IAF aircraft and achieving self-reliance in enhancing combat potential, officials said.

As part of the visit, he met and interacted with the test crew and engineers of Aeronautical Development Agency (ADA), DRDO and Hindustan Aeronautics Limited (HAL).

Bhadauria also underscored the crucial role of both the establishments in furthering the shared goal of building an indigenous aviation industry capability of meeting our future requirements.

During his visit to Bengaluru, the IAF chief flew a sortie in a Tejas MK1 final operational clearance fighter. Last year, the air force had inducted the first final operational clearance (FOC)-standard Tejas light combat aircraft into squadron service.

<https://www.indiatvnews.com/news/india/iaf-chief-rks-bhadauria-reviews-progress-air-power-projects-bengaluru-latest-national-news-updates-728884>



IAF Chief RKS Bhadauria reviews progress of air power projects. Image Source: PTI/REPRESENTATIONAL.

## **DRDO to produce BrahMos missiles in Lucknow**

Lucknow: India's premier defence establishment, Defence Research and Development Organisation, will be producing next generation missile BrahMos in Lucknow node of Uttar Pradesh Defence Industrial Corridor in the near future.

This was stated by Chief Executive Officer and Managing Director of BrahMos Aerospace, Dr. Sudhir Kumar Mishra, after meeting Chief Minister Yogi Adityanath at the latter's official residence in Lucknow on Tuesday.

Mishra briefed the chief minister about the current activities of the BrahMos project and shared his plan of producing next generation missiles of BrahMos in the Lucknow node of Uttar Pradesh Defence Industrial Corridor.

Welcoming the DRDO initiative, the chief minister expressed his gratitude to Prime Minister Narendra Modi and Defence Minister Rajnath Singh and assured Mishra that the state government would provide all other facilities, including the land required for this project in Lucknow.

Additional Chief Secretary (Home) and Chief Executive Officer of UP Expressways Industrial Development Authority, Awanish Kumar Awasthi, Principal Secretary to Chief Minister and Information, Sanjay Prasad and District Magistrate of Lucknow Abhishek Prakash were present on the occasion.

The BrahMos supersonic cruise missile is being designed, developed and produced by BrahMos Aerospace, a joint venture of DRDO, Government of India and NPOM, Government of Russia. It is currently being used by the Indian Army, Navy and Air Force.

About 200 acres of land would be required for the production of BrahMos next generation missile and about Rs 300 crore will be invested to complete the project. Civil construction work will start within three months after the required land is made available.

Through this project, about 500 engineers and technicians will get direct employment and 5,000 people will get indirect employment. Ancillary units will also be set up to plan the production of the next generation missile which will provide employment to around 10,000 people.

A UP government spokesman said, "With the manufacturing of BrahMos missile in Lucknow, Uttar Pradesh will move fast towards becoming the country's aerospace and defence hub. More than 200 industrial units involved in manufacturing of various systems and sub-systems of BrahMos missile will also move towards setting up their production units near the project."

<https://www.dailypioneer.com/2021/state-editions/drdo-to-produce---brahmos-missiles---in-lucknow.html>

## Uttar Pradesh to start manufacturing BrahMos missiles soon

By *Rajiv Srivastava*

Lucknow: In a major development that could turn out to be a trendsetter uplifting the scenario of the state both economically and socially, UP could soon start manufacturing the Next-Gen state of the art BrahMos missile. Chief Minister Yogi Adityanath has given his consent to the project, sources confirmed to TOI.

The BrahMos Aerospace's director general Dr Sudhir Kumar Misra in a letter (a copy of which is with TOI) sent on Tuesday to UPEIDA CEO and additional chief secretary (home) Awanish Awasthi has sought 200 acre land for the project at the Defence Corridor.

Awasthi confirmed to TOI: "We have decided to provide land to BrahMos Aerospace. The delegation from aerospace also met the CM today."

BrahMos Supersonic Cruise Missile is the only unique, precise and state-of-the-art cruise missile in the world. The missile has been designed, developed and produced by BrahMos Aerospace, a joint venture of DRDO, Government of India and NPOM, Government of Russia, Misra stated in the letter.

At present, all three services of Indian defence forces have this weapon system, he further stated and added that Defence Minister Rajnath Singh has already given consent to go ahead with the project.

The DRDO, Ministry of Defence which is the major shareholder of joint venture proposed to establish production facility for BRAHMOS-NG in UP Defence Corridor, the letter stated and added that being project of national importance, there is a requirement of establishing such a facility in location having strategic depth as also connectivity to air, rail and road. The requirement of land would be approximately 200 acres.

As per the project proposal, the BrahMos Aerospace has production facilities at Hyderabad, Nagpur and Bilani and has order value of Rs 35,000 crore placed by Indian Army, Navy and Air Force. The proposal also states that Indian Airforce has confirmed interest in BRAHMOS-NG missiles for 400 in numbers costing around Rs 8,000 crore to be delivered in next five years. Similarly, discussions are on with the Indian Army and Navy for such orders. The venture is also seeing the possibility of additional export orders worth Rs 10,000 crore in the next five years. The anticipated order would amount to about Rs 42,000 crore. The proposal also intends to manufacture the above order in Uttar Pradesh itself.

According to the project proposal estimate, Rs 300 crore would be invested for civil infrastructure and the construction work would begin within three months of getting possession of land. The project is expected to generate huge employment. As per the proposal, around 10,000 personnel including skilled, semi-skilled non-skilled workers would be required directly and indirectly. The unit alone would be needing around 500 engineers and technicians while the rest others would be at ancillary units.

The project is expected to produce 300 missiles by the third year and the same is expected to produce GST worth Rs 360 crore each year totalling to Rs 1440 crore during 4 years. The research and development activity would get completed is estimated to begin by 3rd year, the proposal



BrahMos Supersonic Cruise Missile is the only unique, precise and state-of-the-art cruise missile in the world (File photo)

report stated. Sources said that the letter of approval from the Chief minister Yogi Adityanath is expected soon.

<https://timesofindia.indiatimes.com/india/uttar-pradesh-to-start-manufacturing-brahmos-missiles-soon/articleshow/85592222.cms>

# अमर उजाला

Wed, 25 Aug 2021

## लखनऊ में बनेगी ब्रह्मोस मिसाइल: प्रोडक्शन सेंटर के लिए आवंटित होगी 200 एकड़ जमीन, 15 हजार लोगों को मिलेगा रोजगार

सार

ब्रह्मोस एयरोस्पेस के सीईओ सुधीर कुमार मिश्रा ने यूपीडा के सीईओ अवनीश अवस्थी के साथ हुई बातचीत में बताया कि लखनऊ नोड में ब्रह्मोस प्रोडक्शन सेंटर की स्थापना के लिए 300 करोड़ रुपये का निवेश किया जाएगा।

विस्तार

लखनऊ: उत्तर प्रदेश डिफेंस इंडस्ट्रियल कॉरिडोर के लखनऊ नोड में ब्रह्मोस मिसाइल का निर्माण किया जाएगा। ब्रह्मोस एयरोस्पेस के सीईओ सुधीर कुमार मिश्रा और मुख्यमंत्री योगी आदित्यनाथ के बीच मंगलवार को हुई मुलाकात में डिफेंस कॉरिडोर के लखनऊ नोड में ब्रह्मोस प्रोडक्शन सेंटर स्थापित करने के लिए 200 एकड़ जमीन आवंटित करने पर सहमति बनी। ब्रह्मोस मिसाइल का उत्पादन शुरू होने के बाद यूपी रक्षा उत्पाद निर्माण का हब बनने की दिशा में एक कदम आगे बढ़ेगा। ब्रह्मोस एयरोस्पेस के सीईओ ने अवस्थापना एवं औद्योगिक विकास मंत्री सतीश महाना से भी मुलाकात की।



ब्रह्मोस मिसाइल (फाइल फोटो) - फोटो : PTI

ब्रह्मोस एयरोस्पेस के सीईओ सुधीर कुमार मिश्रा ने यूपीडा के सीईओ अवनीश अवस्थी के साथ हुई बातचीत में बताया कि लखनऊ नोड में ब्रह्मोस प्रोडक्शन सेंटर की स्थापना के लिए 300 करोड़ रुपये का निवेश किया जाएगा। ब्रह्मोस प्रोडक्शन सेंटर बनाने का कार्य जल्दी ही शुरू होगा। इन सेंटर में रिसर्च और डेवलपमेंट का कार्य भी होगा। 100 से अधिक ब्रह्मोस मिसाइल अगले तीन वर्षों में बनाए जाने की योजना है। ब्रह्मोस प्रोडक्शन सेंटर में उसमें करीब पांच सौ इंजीनियर तथा टेक्नीकल लोगों को सीधे रोजगार मिलेगा। इसके अलावा करीब पांच हजार लोगों को अप्रत्यक्ष रोजगार मिलेगा और 10 हजार लोगों को इस प्रोडक्शन सेंटर से काम मिलेगा। अधिकारियों का मानना है कि ब्रह्मोस प्रोडक्शन सेंटर के चलते अब यूपी डिफेंस कॉरिडोर में डिफेंस सेक्टर में कार्य करने वाले कई अन्य नामी कंपनियां राज्य में आएंगी।

क्या है ब्रह्मोस

ब्रह्मोस एक कम दूरी की रैमजेट, सुपरसॉनिक क्रूज मिसाइल है। इसे पनडुब्बी से, पानी के जहाज से, विमान से या जमीन से भी छोड़ा जा सकता है। यह 10 मीटर की ऊंचाई पर उड़ान भर सकती है और रडार की पकड़ में नहीं आती। ब्रह्मोस अमेरिका की टॉम हॉक से लगभग दुगनी अधिक तेजी से वार कर सकती है। इसकी प्रहार क्षमता भी टॉम हॉक से अधिक है। रूस की एनपीओ मशीनोस्ट्रॉयेनिया तथा भारत

के रक्षा अनुसंधान एवं विकास संगठन ने संयुक्त रूप से इसका विकास किया है। यह रूस की पी-800 ऑक्सिज क्लूज मिसाइल की प्रौद्योगिकी पर आधारित है।

<https://www.amarujala.com/lucknow/brahmos-missile-will-be-made-in-lucknow-15-thousand-people-will-get-employment-in-uttar-pradesh-defense-industrial-corridor>



Wed, 25 Aug 2021

## MBDA to invest in Indian missile development unit

By Inder Singh Bisht

Bharat Dynamics Limited (BDL) has signed an agreement with MBDA to assemble, integrate, and test the Advanced Short Range Air-to-Air Missile (ASRAAM) in India.

Under the agreement, MBDA will assist the state-owned Indian defense manufacturer in setting up a facility within its existing manufacturing complex in Bhanur, Telangana.

The facility will provide maintenance, repair, and overhaul of the missiles, adaptable to assembly, integration, and testing of the MBDA's CAMM missile.



ASRAAM first firings from F-35 aircraft. Image: MBDA

The CAMM is a short-range surface-to-air missile used for anti-aircraft and anti-missile response. The weapon is part of MBDA's Sea Ceptor naval air defense system, which the European arms manufacturer has offered to India.

According to BDL, facility construction is "due to start immediately," while operations will commence in 2022-23. MBDA will export the assembled missiles while supplying them for India's domestic use.

### ASRAAM

ASRAAM is a within-visual-range, infrared homing missile that tracks targets by locking on to their heat signature. The 88 kg (194 pounds), 2.9-meter (9.51 feet) missile has a range of over 25 km (15.5 miles).

The missile has been integrated onto the Eurofighter Typhoon, Tornado, F/A-18, and F-35 Lightning II fighter aircraft. Currently, the Royal Air Force and Royal Australian Air Force use munition. India has also ordered them for its air force.

### To Help Indian Missile Manufacture

**Tushar M**, a defense analyst at *GlobalData*, offered his opinion that the partnership between the two firms will help to further develop an indigenous missile manufacturing ecosystem in India.

"Partnerships between Indian companies and global OEMs (original equipment manufacturers) will play a pivotal role in achieving self-reliance and incremental enhancement of defense equipment manufacturing capability," Tushar M. said.

"The technological know-how and manufacturing knowledge obtained from the ASRAAM project is anticipated to benefit the Defence Research and Development Organisation's (DRDO) Next-Generation Close Combat Missile (NGCCM) project," he added.



### Integration with Added IAF Aircraft

Under the NGCCM project, the DRDO, India's premier state-owned defense research, and development firm, wants to develop an advanced short-range infrared homing missile for India's fifth-generation aircraft.

India signed a £250 million (\$343 million) contract with MBDA in 2014 to supply ASRAMs for the Indian Air Force (IAF) fleet of SEPECAT Jaguar aircraft. Later, the IAF reportedly elicited interest in integrating the missiles onto its Su-30MKIs and the indigenous Light Combat Aircraft (LCA).

According to Tushar M, "the current inventory of [384] missiles may be sufficient for Rafale, Mirage and Jaguar aircraft; additional missiles may be required if the air force decides to equip its entire fleet of around 270 Su-30MKI with ASRAAMs."

<https://www.thedefensepost.com/2021/08/24/mbda-asraam-facility-india/>

## DRDO on Twitter





रक्षा मंत्री कार्यालय/ RMO India @DefenceMinIndia · 21h  
ऐसे में सरकार द्वारा महत्वपूर्ण technologies का transfer अपने आप में एक बड़ी बात है। निजी क्षेत्र की कंपनियों के लिए, incubator की भूमिका निभाते हुए DRDO ने निःशुल्क technologies का transfer, testing facilities का access तथा 450 से अधिक patents का free access प्रदान किया है: RM

रक्षा मंत्री कार्यालय/ RMO India @DefenceMinIndia · 21h  
न केवल निःशुल्क technologies का transfer, बल्कि Technology के विकास के लिए 'Technology Development Fund' के तहत 10 करोड़ रुपये तक की upfront funding का भी प्रावधान भी DRDO द्वारा किया गया है: रक्षा मंत्री

रक्षा मंत्री कार्यालय/ RMO India @DefenceMinIndia · 21h  
Multi-Mode Grenade की तरह ही, 'Arjun-Mark-1' tank हो, 'Unmanned Surface Vehicle' हो, 'See Through Armour' हो, या इसी तरह के अनेक products हैं जिनका हमारी industries पूरी तरह स्वदेशी उत्पादन करने लगी है: रक्षा मंत्री

रक्षा मंत्री कार्यालय/ RMO India @DefenceMinIndia · 22h  
आज, DRDO के 'Terminal Ballistic Research Laboratory' की सहायता से, M/s Economic Explosive Limited द्वारा पहली बार निर्मित 'Multi-Mode Hand Grenade', भारतीय सेना को सौंपा गया है। यह Public और Private Sector की साझेदारी का एक बड़ा उदाहरण है: रक्षा मंत्री



**A. Bharat Bhushan Babu** @SpokespersonMoD · 13m  
#CAS Air Chief Marshal RKS Bhaduria visited IAF units and flight test establishments/ facilities of @DRDO\_India & @HALHQBLR on 23 & 24 Aug 21. He was received by Cmdt Aircraft and Systems Testing Establishment #ASTE AVM Jeetendra Mishra, upon arrival. [pib.gov.in/PressReleasePa...](http://pib.gov.in/PressReleasePa...)



A. Bharat Bhushan Babu Retweeted



**Indian Air Force** @IAF\_MCC · 3h  
As part of the visit, CAS flew a sortie in a Tejas MK1 aircraft.





## Business Standard

Wed, 25 Aug 2021

### Lockheed Martin gets \$329-million contract to maintain C-130J fleet

*The arrangement, announced on Tuesday, is called a "Follow On Support-II" (FOS-II) contract*

*By Ajai Shukla*

New Delhi: The Indian Air Force (IAF) has awarded US aerospace giant Lockheed Martin a \$328.8 million, five-year contract to provide comprehensive maintenance support for India's fleet of 12 C-130J Super Hercules tactical airlifter aircraft.

Lockheed Martin manufactures the highly regarded Super Hercules transport aircraft, which is flown by 26 operators in 22 nations.

The arrangement, announced on Tuesday, is called a "Follow On Support-II" (FOS-II) contract. The IAF will pay the US aerospace and defence giant — the world's biggest arms supplier — just under \$5.5 million per C-130J, per year, in order to obtain a specified level of operational readiness across the fleet. This is an extension of the initial FOS-I contract.

The new contract also requires the firm to provide additional services that include "supporting the C-130J airframe, contractor furnished equipment, peculiar and common spares, engines, propellers, software, publication services, ground handling equipment, ground support equipment and test equipment," stated a Lockheed Martin release on Tuesday.

Such "performance-based logistics" (PBL) contracts, which bind aerospace vendors to specified fleet availability levels, are becoming the norm for the IAF.

#### **C-17 Globemaster III**

When the IAF bought its fleet of 11 C-17 Globemaster III heavy lift aircraft, it ensured they were covered by a comprehensive PBL and training contract.

"Boeing provides onsite and multi-function support, with Boeing team members working closely with IAF operators and maintainers to ensure a high level of aircraft availability while reducing cost per flight hour," Boeing told Business Standard.

Boeing also supports the C-17 fleet with worldwide recovery support, emergency in-flight technical assistance and 24X7 aircraft-on-ground parts response.

#### **P-8I Poseidon**

Similarly, Boeing also supports the Indian Navy's fleet of P-8I Poseidon multi-mission maritime aircraft by providing PBL, spares, ground support equipment, field service representatives and on-



Lockheed Martin manufactures the highly regarded Super Hercules transport aircraft, which is flown by 26 operators in 22 nations.

site engineering support. “Since induction, the Indian Navy P-8I fleet has surpassed 30,000 flight hours,” says Boeing.

### **Rafale fighters**

The IAF ensured that its fleet of 36 Rafale fighter aircraft was contracted with PBL provisions that require the manufacturers, Dassault and Thales, to ensure a minimum of 75 per cent fleet availability — or an average of 27 fighters available at all times from the 36-Rafale fleet.

For this package, which covers the Rafale’s first five years of service, the IAF paid Euro 350 million (\$410 million), or an annual average of \$2.25 million per Rafale fighter.

### **Lockheed Martin’s obligations**

To fulfil its obligations, eight employees from Lockheed Martin (aircraft manufacturer), General Electric (propeller manufacturer) and Rolls-Royce (engine manufacturer) will be present as on-site technical support for the duration of the contract.

[https://www.business-standard.com/article/companies/lockheed-martin-gets-329-million-contract-to-maintain-c-130j-fleet-121082401482\\_1.html](https://www.business-standard.com/article/companies/lockheed-martin-gets-329-million-contract-to-maintain-c-130j-fleet-121082401482_1.html)



Wed, 25 Aug 2021

## **India-Russia defence trade worth \$15 billion in three years: Russian official**

*He downplays threat of U.S. sanctions against India under CAATSA*

*By Dinakar Peri*

Moscow: In the last three years, since 2018, the defence trade between India and Russia was \$15 billion because of some big ticket defence deals, said Victor N. Kladov, Head of International Cooperation and Regional Policy of Rostec state corporation.

The S-400 air defence systems deal, for which deliveries are scheduled to begin in a few months, was on schedule, Mr. Kladov said, while downplaying the threat of U.S. sanctions under CAATSA (Countering America’s Adversaries Through Sanctions Act).



“Indian government stands very firm in protecting national interests... Since getting S-400 is very important to enhance national air defence, definitely India will continue implementing this contract,” Mr. Kladov said in a conversation with *The Hindu* at the ongoing Army 2021 exhibition.

Stating that CAATSA was not targeted against Russia but against third countries cooperating with Russia, Mr. Kladov said it was for the Indian side to decide “how to protect itself”.

“When it comes to our side, we are very helpful. For instance, we protect our banking systems by doing payments in national currencies,” he said.

Mr. Kladov said they had no problems as far as payments are concerned. “At every stage of the contract, there is an instalment payment. We are moving smoothly because we are getting instalment payments.”

As reported by *The Hindu* earlier, deliveries of S-400 long range air defence systems are scheduled to begin by November. “One team of Indian Air Force (IAF) officials has been trained in Russia to operate the system and a second team is being trained now,” said Vyacheslav K. Dzirkaln, Deputy Director General for foreign economic activities of Almaz Antey, which manufactures the S-400, on the sidelines of Army 2021.



In October 2018, India and Russia signed a \$5.43 bn deal for five S-400 regiments despite objections from the United States. U.S. officials have on several occasions raised concerns over the deal as India deepens its defence cooperation with the U.S. and has acquired several frontline military platforms like transport aircraft, helicopters, artillery and drones.

Responding to questions on the issue of possible sanctions against India during his recent visit to the country, U.S. Secretary of State Anthony Blinken said: “Well, we have... we have our laws. We’ll... we apply our laws, but we shared our concerns with India about this. But I’m not going to get ahead of myself. We’ll see how things evolve in the coming months.”

For the IAF, the high end technology S-400 will give a fillip and make up for its falling fighter aircraft squadrons in the medium term.

Russia had been undertaking joint projects and technology transfer much before India announced the Make in India initiative, Mr. Kladov said, while acknowledging that competition was getting “very much stronger” in the last few years from countries like the U.S., France and Israel among others. So Russia had taken several measures like improving quality of equipment, setting up joint ventures (JV), undertaking technology transfer, and spares and support among others, he stated.

A few JVs were set up long before the Government of India announced the Make in India initiative like BrahMos, and more were being set up for the manufacture of Ka-226T helicopters and Ak-203 assault rifles, Mr. Kladov said.

Russia was ready to kick start production once the deal for Ka-226T utility helicopters was signed, he said. “We lost a few years on localisation issues... By concluding this deal we can further supply to third countries.

<https://www.thehindu.com/news/national/india-russia-defence-trade-worth-15bn-in-3-years-russian-official/article36087445.ece>



Press Information Bureau  
Government of India

Ministry of Science & Technology

Tue, 24 Aug 2021 5:15PM

## Indigenously developed powders from unused scrape materials to be used for the repair of aero-engine components made of Ni-based super alloy

Indian Scientists have for the first time repaired aero-engine components through emerging additive manufacturing or 3D printing technique called Directed Energy Deposition process that can significantly reduce repair costs and overhaul time. They indigenously made powders suitable for the additive manufacturing process called the Directed Energy Deposition process.

Ni-based superalloys are widely used in aero-engine components. Despite having exceptional properties, they are prone to damage due to extreme operational

conditions. Manufacturing defects during the casting or machining process are another major cause of rejection, and tons of such unused components are scrapped due to minor defects.

A team of scientists from the International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI), an autonomous R&D Centre of Department of Science & Technology, Govt. of India, indigenously developed powders suitable for additive manufacturing using inert gas atomizer available at ARCI by melting unused scrap material. Utilising this, ARCI is developing the Laser-DED process for the repair of aero-engine components made of Ni-based superalloy.

Furthermore, the ARCI team developed a technology to refurbish pinion housing assembly (critical component in helicopters used for power transmission to the main fan) by machining out the damaged layer and rebuilding it using laser cladding process followed by final machining. Laser cladding and Laser-DED (both processes) are the same. In general, for two-dimensional deposition (surface coating), the term laser cladding is used, and for the manufacture of three-dimensional parts, the term laser-DED is used. A patent (201911007994) has been filed for the same.

A post-clad heat treatment method was also designed to minimize microstructural inhomogeneity and ensure minimal substrate properties variation. These laser-clad repaired prototypes were found to be free from distortion and exhibited excellent performance. The team has also developed repair and refurbishment technologies for other industrial sectors, such as



Fig 1: (a) Aero-engine components made of Ni-based superalloys for repair and (b) powder developed indigenously at ARCI

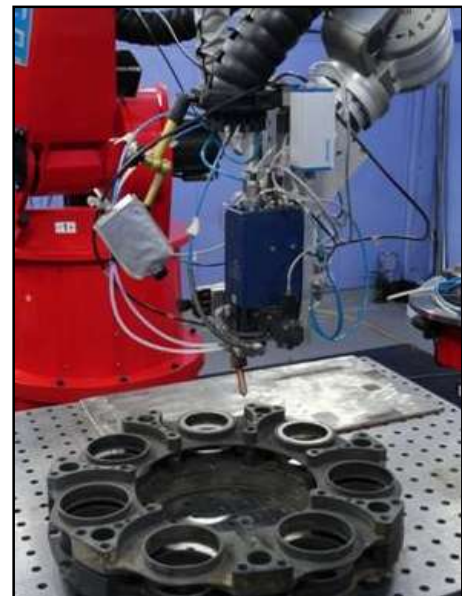


Fig 2: Pinion housing with robotic unit at ARCI

refurbishing diesel engine cylinder heads made of grey cast iron and refurbishing shafts used in the refinery. This work has been published in the journal 'Transactions of The Indian Institute of Metals'.

Thus the impact of repair and refurbishment technology developed by ARCI can be best realized in the aerospace sector due to expensive materials, manufacturing costs, and stringent quality checks.

Publication link: <https://doi.org/10.1007/s12666-020-02150-0>  
<https://pib.gov.in/PressReleasePage.aspx?PRID=1748582>



पत्र सूचना कार्यालय  
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 24 Aug 2021 5:15PM

## एयरक्राफ्ट इंजन के निकेल आधारित सुपर अलॉय से बने पुरजों की मरम्मत में उपयोग के लिए अप्रयुक्त स्क्रेप मटेरियल से स्वदेश में पाउडर विकसित

भारतीय वैज्ञानिकों ने पहली बार नई एडिटिव मैनुफैक्चरिंग या 3डी प्रिंटिंग तकनीक जिसे डायरेक्टेड एनर्जी डिपोजिशन प्रक्रिया कहते हैं, के माध्यम से एयरो-इंजन कंपोनेंट्स की मरम्मत की है, जिससे मरम्मत की लागत और ओवरहाल के समय में काफी कमी आ सकती है। उन्होंने स्वदेशी स्तर पर एडिटिव विनिर्माण प्रक्रिया जिसे डायरेक्टेड एनर्जी डिपोजिशन प्रक्रिया कहा जाता है, के लिए उपयुक्त पाउडर बनाए हैं।

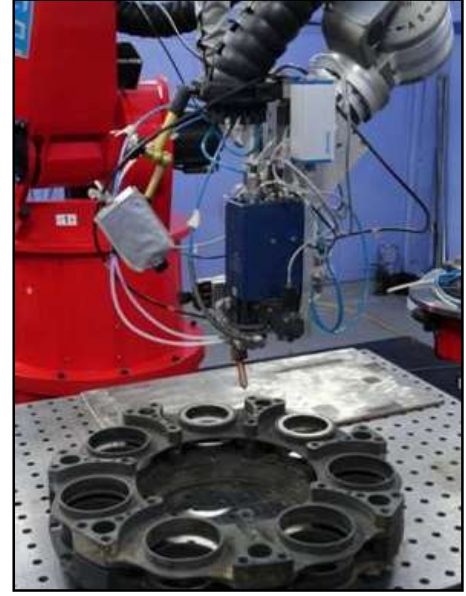
निकेल आधारित सुपर अलॉयज को एयरो-इंजन कंपोनेंट्स में व्यापक रूप से इस्तेमाल किया जाता है। असाधारण खूबियां होने के बावजूद, दुर्गम परिचालन स्थितियों के कारण इनके क्षतिग्रस्त होने की ज्यादा संभावना होती है। ढलाई या मशीन से गुजारे जाने की प्रक्रिया के दौरान विनिर्माण से जुड़ी गलती इनकी अस्वीकृति की एक अन्य मुख्य वजह है और मामूली खामियों के कारण टनों अप्रयुक्त कम्पोनेंट कबाड़ हो जाते हैं।



चित्र 1 : एआरसीआई में स्वदेशी स्तर पर (क) मरम्मत के लिए विकसित निकेल-आधारित सुपर अलॉयज से बनाए गए एयरो-इंजन कम्पोनेंट्स और (ख) पाउडर।

विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार के स्वायत्त शोध एवं विकास केंद्र इंटरनेशनल एडवांस्ड रिसर्च सेंटर फॉर पाउडर मेटलर्जी एंड न्यू मटेरियल्स (एआरसीआई) के वैज्ञानिकों के दल ने बिना इस्तेमाल हुई स्क्रेप सामग्री को पिघलाकर एआरसीआई में उपलब्ध अक्रिय गैस एटमाइजर के इस्तेमाल से एडिटिव मैनुफैक्चरिंग के लिए उपयुक्त पाउडर को स्वदेशी स्तर पर विकसित किया है। इसका इस्तेमाल करते हुए, एआरसीआई द्वारा निकेल आधारित सुपरअलॉय से बने एयरो-इंजन कम्पोनेंट्स की मरम्मत के लिए लेजर-डीईडी प्रक्रिया विकसित की जा रही है।

इसके अलावा, एआरसीआई टीम ने पिनियन हाउसिंग असंबली (हेलिकॉप्टरों में मुख्य पंखे में विद्युत ट्रांसमिशन के लिए इस्तेमाल होने वाला अहम कम्पोनेंट) के नवीनीकरण की एक तकनीक विकसित की है जिसमें क्षतिग्रस्त परत को हटा कर लेजर क्लैडिंग प्रक्रिया के उपयोग से इसका पुनर्निर्माण किया है। लेजर क्लैडिंग और लेजर डीईडी (दोनों प्रक्रियाएं) समान हैं। सामान्य रूप से, दो-आयामी डिपोजिशन (सरफेस कोटिंग) के लिए लेजर क्लैडिंग शब्द का इस्तेमाल किया जाता है और तीन-आयामी भागों के विनिर्माण के लिए लेजर-डीईडी शब्द का उपयोग किया जाता है। इसके लिए एक पेटेंट (201911007994) आवेदन किया गया है।



चित्र 2 : एआरसीआई में रोबोटिक इकाई के साथ पिनियन हाउसिंग

माइक्रोस्ट्रक्चरल इनहोमोजेनिटी न्यूनतम करने और मामूली सबस्ट्रेट प्रॉपर्टीज वैरिएशन सुनिश्चित करने के लिए पोस्ट-क्लैड हीट ट्रीटमेंट विधि तैयार की गई है। लेजर-क्लैड के जरिये मरम्मत किये गये ये प्रोटोटाइप टूट-फूट से मुक्त पाये गये थे और उनका प्रदर्शन शानदार रहा है। टीम ने ग्रे कास्ट आयरन से डीजल इंजन सिलिंडर हेड्स के नवीनीकरण और रिफाइनरी में उपयोग किए जाने वाले शाफ्ट के नवीनीकरण जैसे अन्य औद्योगिक क्षेत्रों के लिए मरम्मत और नवीनीकरण तकनीक भी विकसित की हैं। यह कार्य 'ट्रांजैक्शंस ऑफ द इंडियन इंस्टीट्यूट ऑफ मेटल्स' पत्रिका में प्रकाशित हुआ है।

इस प्रकार, महंगे मटिरियल, विनिर्माण लागत और सख्त गुणवत्ता जांच के कारण एयरोस्पेस सेक्टर पर एआरसीआई द्वारा विकसित मरम्मत और नवीनीकरण तकनीक का बेहतर प्रभाव पड़ सकता है।

प्रकाशन लिंक : <https://doi.org/10.1007/s12666-020-02150-0>

<https://pib.gov.in/PressReleasePage.aspx?PRID=1748672>

## THE TIMES OF INDIA

Wed, 25 Aug 2021

### ISRO calls for proposals to study Chandrayaan-2 data

By Chethan Kumar

Bengaluru: The Indian Space Research Organisation on Tuesday issued an 'announcement of opportunity' (AO) for the scientific community to analyse data from all the payloads of the Chandrayaan-2 orbiter.

Seeking proposals for scientific analysis and utilisation of data from Chandrayaan-2, the space agency said Indian researchers have already used data from Chandrayaan-1 that has enabled a better understanding of lunar morphology, composition of the lunar surface, possible presence of magmatic as well as exogenic water.

Studies from Chandrayaan-1, Isro said, have provided enhanced thoughtful views regarding lunar evolutionary processes, and that such studies have considerably expanded the Indian lunar science community.

To further strengthen the Indian research community for lunar science studies, Chandrayaan-2 orbiter payloads data are made available to the public and scientific proposals are solicited for scientific analysis," Isro said.



The Chandrayaan-2 orbiter is in a 100 km x 100 km circular polar orbit around Moon and has onboard eight experiments for studies ranging from surface geology and composition to exospheric measurements that would continue to build upon the understanding from previous lunar missions.

Isro first released the orbiter data to the public in the last week of December 2020, and in July 2021, the next sets of data were released from payloads.

“A few science results by payload science teams are already published in international peer-reviewed journals. The Chandrayaan-2 orbiter payloads are generating high-quality data, which are made available on <https://pradan.issdc.gov.in> for scientific analysis,” Isro added.

The space agency added that more datasets will be added to this as acquired by various payloads. The AO is open to all researchers from recognised academic institutions, universities, colleges, planetaria and government organisations of India.

<https://timesofindia.indiatimes.com/india/isro-calls-for-proposals-to-study-chandrayaan-2-data/articleshow/85595527.cms>



Wed, 25 Aug 2021

## New technology lays groundwork for large-scale, high-resolution 3D displays

Researchers have developed a prototype display that uses projection to create large-scale 3D images with ultra-high definition. The new approach helps overcome the limitations of light-field projection, which can create natural-looking 3D images that don't require special 3D glasses for viewing.

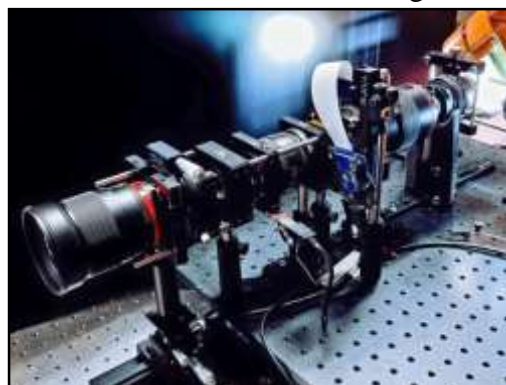
"Our optical design could make it practical to replace 2D flat panel displays with 3D images for digital signs, entertainment, education and other applications where 3D images provide a significant enhancement," said research team leader ByoungHo Lee from Seoul National University in Korea. "Our design could also be modified to provide immersive experiences in movie theaters, for example."

In The Optical Society (OSA) journal *Optics Letters*, the researchers describe how they combine two different light-field display technologies to project large-scale 3D images with almost diffraction-limited resolution. The new display is autostereoscopic, which means that it produces different 3D images so that the image can be viewed from various angles.

"We developed a way to carry out all the display processes optically without any digital processing," said Lee. "This compensates for the limitations of each display technology to allow the creation of high-resolution 3D images on a large screen."

### Combining technologies

Light-field displays work by reproducing light that is reflected from an object in a way that corresponds to the actual visible position. Because autostereoscopic light field displays produce different images for different viewing angles, they require a huge amount of information to be



Researchers combined two different light field display technologies to project large-scale 3D images with almost diffraction-limited resolution. Their optical setup is shown. Credit: ByoungHo Lee, Seoul National University

processed. This demand creates a tradeoff between resolution and the size of the displayed image because the hardware of the display gets overwhelmed by the amount of information required.

To overcome this limitation, the researchers designed a new optical configuration that combines a multifocal display with integral imaging. Typically, a multifocal display can generate a high-quality volumetric image, but it is technically difficult to implement on a large-screen system. On the other hand, integral imaging is better at enlarging images.

In the new design, the multifocal display generates a high-resolution 3D, or volumetric, scene while the integral imaging technology enlarges it for viewing on a large screen. The information conversion between the multifocal display and integral imaging is all performed optically without any digital processing.

"Our method goes beyond merely combining two existing methods to achieving an ultrahigh-definition volumetric light-field display with almost diffraction-limited resolution," said Lee. "We also found a way to effectively resolve the difficulty of enlarging a volumetric scene and overcame problems with information loss that tend to affect integral imaging."

### **Large and high-resolution 3D images**

After verifying the resolution of their prototype system, the researchers qualitatively confirmed that a volumetric image was reconstructed. The tests showed that the prototype can synthesize a volumetric image of 21.4 cm x 21.4 cm x 32 cm, which is equivalent to 28.6 megapixels and 36 times higher resolution than the original image.

"Our approach is very efficient at processing information, which enables a low computing cost as well as simple, high-quality, real-time system configuration," said Lee. "The optical design can also be seamlessly integrated with various techniques used in existing light-field displays."

The researchers are now working to optimize the optics and further reduce the complexity of the multifocal display to make the projector more compact. They note that because the system is a fusion of two different technologies, the performance of their proposed system will likely improve as each technology develops.

**More information:** Youngjin Jo et al, Ultrahigh-definition volumetric light field projection, *Optics Letters* (2021). DOI: [10.1364/OL.431156](https://doi.org/10.1364/OL.431156)

**Journal information:** *Optics Letters*

<https://phys.org/news/2021-08-technology-groundwork-large-scale-high-resolution-3d.html>

# Physicists find room-temperature, 2D-to-1D topological transition

By Jade Boyd

A Rice University team and its collaborators have discovered a room-temperature transition between 1D and 2D electrical conduction states in topological crystals of bismuth and iodine.

Researchers found they could toggle the material, crystalline chains of bismuth iodide ( $\text{Bi}_4\text{I}_4$ ), between low- and high-order conduction states at a transition temperature around 80 degrees Fahrenheit. The research is available online this week in the American Physical Society journal *Physical Review X* and was conducted by physicists from Rice; the University of Texas at Dallas; the University of California, Berkeley; Ohio State University; and other institutions.

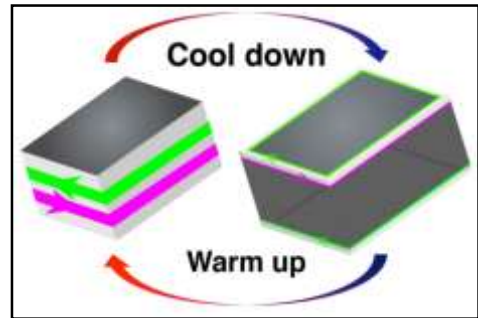
$\text{Bi}_4\text{I}_4$  is a topological insulator, a material that's conductive on its surface or edges but not its interior. The crystal lattice of  $\text{Bi}_4\text{I}_4$  undergoes a subtle shift at the transition temperature. The shift changes the material's electronic behavior, and the study showed this change, or "phase transition," is the boundary between 1D and 2D topological conduction states.

The high-temperature 2D state features electrical conduction around four sides of the rectangular crystals. Rice physicists Ming Yi, Jianwei Huang and their collaborators discovered conduction transitioned to 1D edges as the material was cooled below 80 degrees.

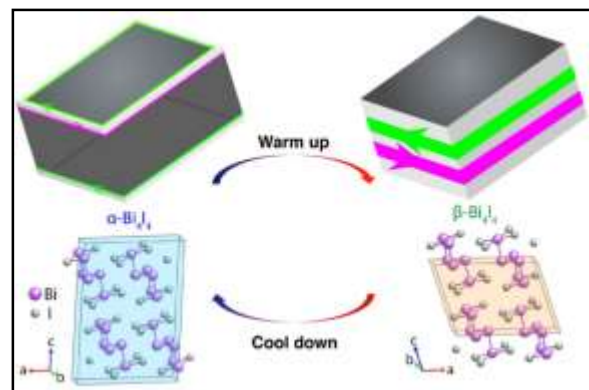
"This is the first evidence suggesting that the low-temperature state is actually a higher order topological insulator where conduction is happening on the crystal hinges as opposed to the surfaces," said Yi, an assistant professor of physics and astronomy and co-corresponding author of the PRX study. "Imagine starting in the high-temperature state, where you have an insulating bulk and conduction surfaces around the sides of the material. As soon as you go through this structural distortion, the conduction is confined to the one-dimensional hinges where these sides meet."

In most materials, the differences between phases—like solid ice or liquid water—arise from different organizational symmetries of their constituent parts. In the 1980s, physicists discovered phases of matter with identical symmetries. These were eventually shown to arise from topological properties, "protected" quantum states that are of growing interest for quantum computation.

Yi said the dimensional change in electrical conduction mediated by  $\text{Bi}_4\text{I}_4$ 's phase transition could potentially be used for engineering an electrical switch operated by changing temperature.



Electrical conduction on the surface of the topological insulator bismuth iodide (pink and green arrows) transitions from the 2D sides (left) to the 1D edges of those sides (right) when the material is cooled to a critical temperature around 80 degrees Fahrenheit. Credit: Jianwei Huang/Rice University



Electrical conduction on the surface of rectangular crystals of the topological insulator bismuth iodide ( $\text{Bi}_4\text{I}_4$ ) is depicted by pink and green arrows. Rice University physicists discovered conduction transitions from a 2D surface on four sides of the crystals (upper right) to 1D edges of those sides (upper left) due to a subtle shift in the material's crystal lattice (bottom, right to left) when the material is cooled to a critical temperature around 80 degrees Fahrenheit. Credit: Jianwei Huang/Rice University

"This transition happens at room temperature," Yi said. "It's a first-order phase transition, which means the change happens very suddenly. It's a tiny shift of the crystal lattice that directly impacts the electrical conduction on the crystal boundaries."

Huang, a Rice postdoctoral research associate and the study's lead author, said labs worldwide are racing to find and catalog topological materials, and physicists have only recently begun classifying them into subfamilies.

While Bi<sub>4</sub>I<sub>4</sub>'s combination of properties is unique, Huang said this week's discovery could aid the search for similar topological materials.

"Our findings are consistent with recent theoretical predictions of higher-order topological insulators that are beyond the scope of the established topological materials databases," he said.

Yi's lab and collaborators in the lab of UC Berkeley co-corresponding author Robert Birgeneau used an experimental technique called angle-resolved photoemission spectroscopy (ARPES) to map Bi<sub>4</sub>I<sub>4</sub>'s electronic band features.

"ARPES is the best probe for looking at topological materials because there's a very distinct signature that will tell if materials are topological or not," she said.

To distinguish between the 1D and 2D conduction states, her team had "to look at different surfaces, and that is extremely difficult to do," Yi said.

Yi said critical contributions came from UT Dallas co-corresponding authors Fan Zhang, who provided theoretical guidance and prediction, and Bing Lv, whose lab synthesized Bi<sub>4</sub>I<sub>4</sub> crystals that were as much as a centimeter long, a millimeter wide and hundreds of microns thick. The size of the crystals allowed Huang to make crucial ARPES measurements on both the tops and sides of the materials.

**More information:** Jianwei Huang et al, Room-Temperature Topological Phase Transition in Quasi-One-Dimensional Material Bi<sub>4</sub>I<sub>4</sub>, *Physical Review X* (2021). DOI: [10.1103/PhysRevX.11.031042](https://doi.org/10.1103/PhysRevX.11.031042)

**Journal information:** [Physical Review X](https://phys.org/news/2021-08-physicists-room-temperature-2d-to-1d-topological-transition.html)  
<https://phys.org/news/2021-08-physicists-room-temperature-2d-to-1d-topological-transition.html>



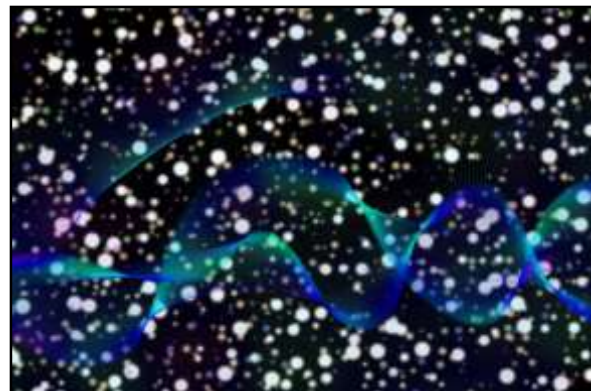
Wed, 25 Aug 2021

## New quantum 'stopwatch' can improve imaging technologies

Researchers at the University of Colorado Boulder have designed one of the most precise stopwatches yet—not for timing Olympic sprinters and swimmers, but for counting single photons, or the tiny packets of energy that make up light.

The team's invention could lead to big improvements in a range of imaging technologies—from sensors that map out entire forests and mountain ranges to more detailed devices that can diagnose human diseases like Alzheimer's and cancer. The group published its results this week in the journal *Optica*.

Bowen Li, lead author of the new study, said that the research focuses on a widely applied technology called time-correlated single photon counting (TCSPC). It works a bit like the timers you see at the Olympics: Scientists first shine a laser light at a sample of their choice, from individual proteins all the way up to a massive geologic formation, then record the photons that



Credit: CC0 Public Domain



bounce back to them. The more photons researchers collect, the more they can learn about that object.

"TCSPC gives you the total number of photons. It also times when each photon hits your detector," said Li, a postdoctoral researcher in the Department of Electrical, Computer and Energy Engineering (ECEE) at CU Boulder. "It works like a stopwatch."

Now, that stopwatch has gotten better than ever. Using an ultrafast optics tool called a "time lens," Li and his colleagues show that they can measure the arrival of photons with a precision that's more than 100 times better than existing tools.

Shu-Wei Huang, corresponding author of the new study, added that the group's quantum time lens works with even the cheapest TCSPC devices available on the market.

"We can add this modification to almost any TCSPC system to improve its single-photon timing resolution," said Huang, assistant professor of ECEE.

The research is part of the newly-launched, \$25 million Quantum Systems through Entangled Science and Engineering (Q-SEnSE) center led by CU Boulder.

### **Photo finish**

TCSPC may not be a household name, Huang said. But the technology, which was first developed in 1960, has revolutionized how humans see the world. These photon counters are important components of lidar (or light detection and ranging) sensors, which researchers use to create geologic maps. They also show up in a more small-scale imaging approach called fluorescence lifetime microscopy. Doctors employ the technique to diagnose some illnesses like macular degeneration, Alzheimer's disease and cancer.

"People shine a pulse of light on their sample then measure how long it takes to emit a photon," Li said. "That timing tells you the property of the material, such as the metabolism of a cell."

Traditional TCSPC tools, however, can only measure that timing down to a certain level of precision: If two photons arrive at your device too close together—say, 100 trillionths of a second or less apart—the detector records them as a single photon. It's a bit like two sprinters coming to a photo finish during a 100-meter dash.

Such tiny inconsistencies may sound like a quibble, but Li noted that they can make a big difference when trying to get a detailed look at incredibly small molecules.

### **Time lenses**

So he and his colleagues decided to try to solve the problem using what scientists call a "time lens."

"In a microscope, we use optical lenses to magnify a small object into a big image," Li said. "Our time lens works in a similar way but for time."

To understand how that time distortion works, picture two photons as two runners racing neck-and-neck—so close that the Olympics timekeeper can't tell them apart. Li and his colleagues pass both of those photons through their time lens, which is made up of loops of silica fibers. In the process, one of the photons slows down, while the other speeds up. Instead of a close race, there's now a large gap between the runners, one that a detector can record.

"The separation between the two photons will be magnified," Li said.

And, the team discovered, the strategy works: TCSPC devices with built-in time lenses can distinguish between photons that arrive at a detector with a gap of several hundred quadrillionths of a second—orders of magnitude better than what normal devices can achieve.

The researchers still have some work to do before time lenses become common in scientific labs. But they hope that their tool will one day allow humans to view objects, from the very small to the very large—all with a clarity that was previously impossible.

**More information:** Bowen Li et al, Time-magnified photon counting with 550-fs resolution, *Optica* (2021). DOI: [10.1364/OPTICA.420816](https://doi.org/10.1364/OPTICA.420816)

**Journal information:** *Optica*

<https://phys.org/news/2021-08-quantum-stopwatch-imaging-technologies.html>

### 'Shredder' enzyme might tear cells apart in severe COVID-19

By Nicoletta Lanese

An enzyme that can tear cell membranes to shreds may contribute to the organ damage that ultimately kills some people with severe COVID-19, a new study hints.

The enzyme, called "secreted phospholipase A2 Group IIA" (sPLA2-IIA), normally protects the body from invaders, such as bacteria, by grabbing hold of specific fats in the microbes' membranes and tearing them apart, said senior author Floyd Chilton, a biochemist and director of the Precision Nutrition and Wellness Initiative at the University of Arizona. Human cells also contain these fats, but unlike bacteria, human cells carry these fat molecules on the inner lining of their cell membranes, rather than on the outer surface.

This arrangement usually hides the molecules from sPLA2-IIA and prevents the enzyme from attacking human cells, but it's not a fool-proof system, Chilton said.

Cells need energy to maintain the structure of their cell membranes, but when cells begin to die due to infection or stress, the fatty molecules that sPLA2-IIA targets can become exposed, leaving human cells vulnerable to attack. In addition, damaged cells release their mitochondria, the so-called powerhouse of the cell; mitochondria resemble bacteria in terms of their membrane structure, so sPLA2-IIA rushes in to shred the free-floating mitochondria to bits and spill their contents out into the body, Chilton said. This, in turn, can call the immune system into action and set off a wave of intense inflammation, according to a 2020 report in the journal EMBO Reports.

"Once that begins to happen, you're going down a slippery slope," Chilton told Live Science.

The new research from Chilton and his colleagues hints that this disastrous chain of events may unfold in patients with severe COVID-19 infections — although we'll need more research to know for sure. For now, the study only shows a strong correlation between sPLA2-IIA and the risk of severe illness and death from COVID-19; it cannot prove that the enzyme directly causes the observed damage, Chilton said.

In the study, published Tuesday (Aug. 24) in the Journal of Clinical Investigation, the researchers analyzed blood samples from 127 patients who had been hospitalized between January and July 2020. Of those patients, 30 died of COVID-19; 30 experienced a severe case but survived; and 30 patients experienced mild COVID-19 infections, meaning they didn't require supplemental oxygen. The remaining 37 people did not have COVID-19 and served as a comparison group.

The team measured the levels of more than 1,000 enzymes and metabolites in the patients' blood plasma, and then used a computer algorithm to see what patterns emerged. Strikingly, they found that circulating levels of sPLA2-IIA reflected the severity of patients' disease, "particularly in deceased COVID-19 patients." In other words, a person's sPLA2-IIA levels hinted at whether or not they died from COVID-19 infection.



(Image credit: Getty / ADRIAN DENNIS / AFP)

For context, the plasma of healthy people contains relatively low concentrations of sPLA2-IIA — at most, a few nanograms per 0.03 ounces (1 milliliter) of blood, the authors wrote in the study. "sPLA2 is normally very low, increases as the result of the viral trigger and decreases again when the inflammation resolves," Frans Kuypers, director of the Red Blood Cell Laboratory at the University of California, San Francisco, who was not involved in the study, told Live Science in an email.

Studies suggest that in severe inflammatory conditions like sepsis, sPLA2-IIA levels can skyrocket to hundreds of nanograms per milliliter. And in the new study, some of the patients who died of COVID-19 showed sPLA2-IIA levels as high as 1,020 nanograms per milliliter (ng/ml) of blood, the team reported.

Overall, the patients who died of COVID-19 had fivefold higher sPLA2-IIA levels than those who had a severe case but survived; and those who died had nearly 10-fold higher sPLA2-IIA levels than those with mild COVID-19 infections or non-COVID-related illnesses.

In addition to sPLA2-IIA, a marker of kidney function called "blood urea nitrogen" (BUN) was also linked to patients' disease severity, the team found. BUN, a waste product of protein digestion, normally gets filtered from the blood by the kidneys, but when the kidneys get damaged, BUN quickly accumulates. As COVID-19 infection damages the kidneys, high levels of sPLA2-IIA likely further damage the organ, thus raising the levels of BUN in circulation, Chilton said.

The researchers then created an index to predict the risk of COVID-19 mortality based on both BUN and sPLA2-IIA levels. They tested out the index on a group of 154 patients, separate from their original study cohort, who had been hospitalized between January and November 2020; these patients had either mild, severe or fatal COVID-19. The team found that they could predict "with reasonably high accuracy" which patients died of COVID-19 based on their sPLA2-IIA and BUN levels, and that they could also pinpoint which had severe disease but survived.

Again, the current study only identifies a correlation between sPLA2-IIA and severe COVID-19, but the results suggest that the enzyme may often be a critical factor in fatal cases, Chilton said.

"Their finding underpins the importance of this good guy [sPLA2-IIA] going bad," Kuypers told Live Science. That said, the current study has a few limitations, namely that the sample size is fairly small and the team was unable to track sPLA2-IIA levels through time, he noted. Looking forward, an ideal study would include a large number of patients whose sPLA2-IIA levels are checked daily. This would provide clearer evidence as to which patients accrue high concentrations of the enzyme, how the enzyme causes damage and whether any treatments reduce that harm, Kuypers said.

When it comes to possible treatments, drugs that work against sPLA2-IIA already exist, although none have made it all the way through clinical trials. Especially as new variants of SARS-CoV-2 emerge, it's important to identify drugs that can protect against death, regardless of which version of the virus a person catches. In this respect, targeting sPLA2-IIA may be a good idea, but we need trials to know for sure, Chilton said.

One such trial is already underway. According to ClinicalTrials.gov, investigators are currently recruiting people with severe COVID-19 for a trial of varespladib, a potent inhibitor of sPLA2 enzymes. *Originally published on Live Science.*

<https://www.livescience.com/shredder-enzyme-linked-to-covid19.html>

