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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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Press Information Bureau  
Government of India

Ministry of Defence

*Mon, 02 Aug 2021 3:00PM*

### **Latest technology to the Armed Forces**

DRDO has developed state-of-the-art platforms, weapon systems and sensors in the country which in turn have led to improving the combat capabilities and providing technological edge to Armed Forces.

DRDO has taken projects, for development of Products/Systems, in various technology domains. Some of them are as follows:

- Missiles Systems
- Airborne Early Warning & Surveillance
- Fighter Aircrafts
- Armoured Fighting Vehicles
- Bridging and Mining Systems
- Guided Munitions
- Artillery Guns & Rockets,
- Small Arms & Ammunitions
- Advanced Torpedoes &Advanced Sonar Suite
- Electronic Warfare (EW)
- Long Range Radars
- Artificial Intelligence based Systems etc.

An amount of Rs. 1,11,463.21 crore has been allocated under Capital Acquisition Head(Modernisation) of Defence Services in BE 2021-22. This is an increase of Rs21, 415.41crore (23.78%) over BE 2020-21 allocations.

The modernization projects are being progressed as per approved capital acquisition plan and in terms of extant Defence Procurement Procedure.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Smt Kanta Kardam in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741476>



## **Equipment produced under “Make-in-India” scheme**

Many significant projects including 155mm Artillery Gun system ‘Dhanush’, Bridge Laying Tank, Light Combat Aircraft ‘Tejas’, ‘Akash’ Surface to Air Missile system, Submarine ‘INS Kalvari’, Inshore Patrol Vessel, Offshore Surveillance Ship, ‘INS Chennai’, Anti-Submarine Warfare Corvette (ASWC), Arjun Armoured Repair and Recovery Vehicle, Landing Craft Utility, Bridge Laying Tank, Bi-Modular Charge System (BMCS) for 155mm Ammunition, Thermal Imaging Sight Mark-II for T-72 tank, 25 T Tugs, Water Jet Fast Attack Craft, Offshore Patrol Vessel, Fast Interceptor Boat, INS Kalvari, INS Khanderi, Medium Bullet Proof Vehicle (MBPV), Lakshya Parachute for Pilotless Target Aircraft, etc. have been produced in the country under ‘Make in India’ initiative of the Government in last few years.

The Government has taken several policy initiatives and brought reforms to promote self-reliance in defence manufacturing. These policy initiatives are aimed at encouraging indigenous design, development and manufacture of defence equipment in the country, thereby reducing dependency on imports in long run. Important policy initiatives and reforms are as under: -

- DPP-2016 has been revised as Defence Acquisition Procedure (DAP)- 2020, which is driven by the tenets of Defence Reforms announced as part of ‘Aatmanirbhar Bharat Abhiyan’.
- In order to promote indigenous design and development of defence equipment ‘Buy {Indian-IDDM (Indigenously Designed, Developed and Manufactured)}’ category has been accorded top most priority for procurement of capital equipment.
- Ministry of Defence has notified two ‘Positive indigenisation lists’ of 209 items for which there would be an embargo on the import beyond the timeline indicated against them. This would offer a great opportunity to the Indian defence industry to manufacture listed items using their own design and development capabilities to meet the requirements of the Indian Armed Forces.
- The ‘Make’ Procedure of capital procurement has been simplified. There is a provision for funding upto 70% of development cost by the Government to Indian industry under Make-I category. In addition, there are specific reservations for MSMEs under the ‘Make’ procedure.
- Procedure for ‘Make-II’ category (Industry funded), introduced in DPP-2016 to encourage indigenous development and manufacture of defence equipment has number of industry friendly provisions such as relaxation of eligibility criterion, minimal documentation, provision for considering proposals suggested by industry /individual etc. So far, 58 projects relating to Army, Navy & Air Force, have been accorded ‘Approval in Principle’.
- The Government has approved enhanced delegation of Financial Powers under Capital Procurement to levels below Vice-Chief of Armed Forces in February, 2021. The Government has also approved enhanced delegation of Financial Powers in the Make-I category under which Government funding up to 70% of the prototype development cost is available for Design & Development of equipment, systems, major platforms or upgrades thereof.
- The Government of India has enhanced FDI in Defence Sector up to 74% through the Automatic Route and up to 100% by Government Route wherever it is likely to result in access to modern technology or for other reasons to be recorded.
- An innovation ecosystem for Defence titled Innovations for Defence Excellence (iDEX) has been launched in April, 2018. iDEX is aimed at creation of an ecosystem to foster innovation and technology development in Defence and Aerospace by engaging Industries including MSMEs, Start-ups, Individual Innovators, R&D institutes and Academia and provide them

grants/funding and other support to carry out R&D which has potential for future adoption for Indian defence and aerospace needs.

- An indigenization portal namely SRIJAN has been launched in August, 2020 for DPSUs/OFB/Services with an industry interface to provide development support to MSMEs/Startups/Industry for import substitution.
- Reforms in Offset policy have been included in DAP-2020, with thrust on attracting investment and Transfer of Technology for Defence manufacturing, by assigning higher multipliers to them.
- Government has notified the ‘Strategic Partnership (SP)’ Model in May 2017, which envisages establishment of long-term strategic partnerships with Indian entities through a transparent and competitive process, wherein they may tie up with global Original Equipment Manufacturers (OEMs) to seek technology transfers to set up domestic manufacturing infrastructure and supply chains.
- Government has notified a ‘Policy for indigenisation of components and spares used in Defence Platforms’ in March, 2019 with the objective to create an industry ecosystem which is able to indigenize the imported components (including alloys & special materials) and sub-assemblies for defence equipment and platform manufactured in India.
- Government has established two Defence Industrial Corridors, one each in Uttar Pradesh and Tamil Nadu. The investments of Rs 20,000 Cr are planned in Defence corridors of Uttar Pradesh and Tamil Nadu by year 2024. So far, investment of approx. Rs 3342 Cr have been made in both the corridors by public as well private sector companies. Moreover, the respective State Governments have also published their Aerospace & Defence Policies to attract private players as well as foreign companies including Original Equipment Manufacturers (OEMs) in these two corridors.
- An Inter-Governmental Agreement (IGA) on “Mutual Cooperation in Joint Manufacturing of Spares, Components, Aggregates and other material related to Russian/Soviet Origin Arms and Defence Equipment” was signed in September, 2019. The objective of the IGA is to enhance the “After Sales Support” and operational availability of Russian origin equipment currently in service in Indian Armed Forces by organizing production of spares and components in the territory of India by Indian Industry by way of creation of Joint Ventures/Partnership with Russian Original Equipment Manufacturers (OEMs) under the framework of the “Make in India” initiative.
- Defence Products list requiring Industrial Licences has been rationalised and manufacture of most of parts or components does not require Industrial License. The initial validity of the Industrial Licence granted under the IDR Act has been increased from 03 years to 15 years with a provision to further extend it by 03 years on a case-to-case basis.
- Department of Defence Production has notified 46 items under the latest Public Procurement Order 2017 notified by Department for Promotion of Industry and Internal Trade (DPIIT), for which there is sufficient local capacity and competition and procurement of these items shall be done from local suppliers only irrespective of the purchase value.
- Defence Investor Cell (DIC) has been created in Feb-2018 in the Ministry to provide all necessary information including addressing queries related to investment opportunities, procedures and regulatory requirements for investment in the sector. So far, 1182 queries have been addressed by DIC.

Defence Sector is now opened for participation by private sector through licensing anywhere in the country. Currently, there is an Ordnance Factory located in Nalanda (Bihar).

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri Akhilesh Prasad Singh in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741477>

## Reforms afoot to promote self-reliance in defence sector: Minister

By Aksheev Thakur

### Highlights

**Bengaluru: Minister of State for Defence Ajay Bhatt in a written reply to Akhilesh Prasad Singh in Rajya Sabha apprised that several significant projects...**

Bengaluru: Minister of State for Defence Ajay Bhatt in a written reply to Akhilesh Prasad Singh in Rajya Sabha apprised that several significant projects including 155mm Artillery Gun system 'Dhanush', Bridge Laying Tank, Light Combat Aircraft 'Tejas', 'Akash' Surface to Air Missile system, Submarine 'INS Kalvari', Inshore Patrol Vessel, Offshore Surveillance Ship, 'INS Chennai', Anti-Submarine Warfare Corvette (ASWC), Arjun Armoured Repair and Recovery Vehicle, Landing Craft Utility, Bridge Laying Tank, Bi-Modular Charge System (BMCS) for 155mm Ammunition, Thermal Imaging Sight Mark-II for T-72 tank, 25 T Tugs, Water Jet Fast Attack Craft, Offshore Patrol Vessel, Fast Interceptor Boat, INS Kalvari, INS Khanderi, Medium Bullet Proof Vehicle (MBPV), Lakshya Parachute for Pilotless Target Aircraft, etc. have been produced in the country under the 'Make in India' initiative of the Government in the last few years.



Reforms afoot to promote self-reliance in defence sector: Minister

Bhatt said, the government has taken several policy initiatives and brought reforms to promote self-reliance in defence manufacturing. These policy initiatives are aimed at encouraging indigenous design, development and manufacture of defence equipment in the country, thereby reducing dependency on imports in long run.

Important policy initiatives and reforms are as under: DPP-2016 has been revised as Defence Acquisition Procedure (DAP)- 2020, which is driven by the tenets of Defence Reforms announced as part of 'Aatmanirbhar Bharat Abhiyan'.

He responded saying that in order to promote indigenous design and development of defence equipment 'Buy {Indian-IDD (Indigenously Designed, Developed and Manufactured)}' category has been accorded top most priority for procurement of capital equipment.

Ministry of Defence has notified two 'Positive indigenisation lists' of 209 items for which there would be an embargo on the import beyond the timeline indicated against them. "This would offer a great opportunity to the Indian defence industry to manufacture listed items using their own design and development capabilities to meet the requirements of the Indian Armed Forces.

The 'Make' Procedure of capital procurement has been simplified. There is a provision for funding up to 70 per cent of development cost by the Government to Indian industry under Make-I category. In addition, there are specific reservations for MSMEs under the 'Make' procedure," Bhatt gave a detailed response.

It was also notified that the procedure for 'Make-II' category (Industry funded), introduced in DPP-2016 to encourage indigenous development and manufacture of defence equipment has number of industry friendly provisions such as relaxation of eligibility criterion, minimal documentation, provision for considering proposals suggested by industry /individual etc.

So far, 58 projects relating to Army, Navy & Air Force, have been accorded 'Approval in Principle'.

The government has approved enhanced delegation of Financial Powers under Capital Procurement to levels below the Vice-Chief of Armed Forces in February. It has also approved enhanced delegation of Financial Powers in the Make-I category under which Government funding up to 70% of the prototype development cost is available for Design & Development of equipment, systems, major platforms or upgrades thereof.

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"Defence Products list requiring Industrial Licences has been rationalised and manufacture of most of parts or components does not require Industrial License. The initial validity of the Industrial Licence granted under the IDR Act has been increased from 03 years to 15 years with a provision to further extend it by 03 years on a case-to-case basis," Bhatt responded.

Department of Defence Production has notified 46 items under the latest Public Procurement Order 2017 notified by Department for Promotion of Industry and Internal Trade (DPIIT), for which there is sufficient local capacity and competition and procurement of these items shall be done from local suppliers only irrespective of the purchase value.

Defence Investor Cell (DIC) has been created in Feb-2018 in the Ministry to provide all necessary information including addressing queries related to investment opportunities, procedures and regulatory requirements for investment in the sector. So far, 1182 queries have been addressed by DIC.

<https://www.thehansindia.com/karnataka/reforms-afoot-to-promote-self-reliance-in-defence-sector-minister-699522>

## वन अनुसंधान केंद्र के परिसर में घिंघारू के पेड़ पर

### आए फल-फूल, जलवायु परिवर्तन का असर

ज्योलीकोट से ऊपर वाले क्षेत्र में मिलने वाला घिंघारू का फल अब हल्द्वानी में भी तैयार हो गया है। रामपुर रोड स्थित वन अनुसंधान केंद्र की नर्सरी में इसे तैयार कर लिया गया है। मौसम के हिसाब से फल और फूल दोनों आ चुके हैं।

By Skand Shukla

हल्द्वानी: ज्योलीकोट से ऊपर वाले क्षेत्र में मिलने वाला घिंघारू का फल अब हल्द्वानी में भी तैयार हो गया है। रामपुर रोड स्थित वन अनुसंधान केंद्र की नर्सरी में इसे तैयार कर लिया गया है। मौसम के हिसाब से फल और फूल दोनों आ चुके हैं। यह एक तरह से जलवायु परिवर्तन का मामला है।

घिंघारू को लेकर माना जाता है कि यह 1500 मीटर से ज्यादा की ऊंचाई पर मिलता है। इसमें औषधीय गुण भी होते हैं। घिंघारू एक झाड़ीनुमा प्रजाति है। इसकी लकड़ी को काफी मजबूत माना जाता है। इसके अलावा भू-कटाव रोकने में भी घिंघारू की अहम भूमिका होती है। रेंजर अनुसंधान मदन बिष्ट के मुताबिक परिसर में लगे पेड़ पर फल पक चुके हैं। बरसात के वक्त ही यह फल देता है।



आर्मी के लिए बनता है जैम

वन अनुसंधान केंद्र हल्द्वानी के रेंजर मदन बिष्ट ने बताया कि उत्तराखंड में डीआरडीओ द्वारा घिंघारू का जैम बनाया जाता है। इसे आर्मी के जवानों के लिए बेहतर माना जाता है। खासकर ऊंचाई वाले क्षेत्रों में तैनात जवानों के लिए। फॉरेस्ट के मुताबिक घिंघारू में प्रोटीन की मात्रा काफी ज्यादा होती है।

बद्री तुलसी लालकुआं में तैयार हो चुकी

भगवान बदरीनाथ की पूजा थाली में बद्री तुलसी का खासा महत्व है। खास तरह की यह तुलसी बद्रीनाथ क्षेत्र में पाई जाती है। क्योंकि, वो ऊंचाई वाला इलाका है। हालांकि, लगातार इस्तेमाल की वजह से इसके अस्तित्व पर भविष्य में संकट पैदा होने का डर था। ऐसे में वन अनुसंधान ने बद्री तुलसी के संरक्षण की दिशा में कदम बढ़ाने के बाद लालकुआं में इसकी पौध भी तैयार कर ली।

<https://www.jagran.com/uttarakhand/nainital-flowers-and-fruit-came-on-gingharu-tree-in-the-premises-of-forest-research-center-21887948.html>



# COVID 19: DRDO's Contribution



Press Information Bureau  
Government of India

Ministry of Defence

Mon, 02 Aug 2021 2:58PM

## Efforts by DRDO to deal with Covid-19 pandemic

Some of efforts made by DRDO to deal with COVID-19 pandemic at National level are as follows:-

- DRDO developed Sanitizers, Masks and PPE kits etc. when there was scarcity and no Knowhow of technology available in India. DRDO undertook fast-tracked the design and development of N95, N99 mask and many other technologies for disinfection and protection from COVID. These technologies were transferred to many industries at 'Nil' charges for all COVID related technologies.
- DRDO carried out PPE testing at Gwalior for PPE imported from foreign countries. The same facility was later shifted to Delhi for cutting short the transit time. Later DRDO established a BS certified N95 mask testing facility at DRDE Gwalior.
- Makeshift COVID-19 hospitals were established by DRDO at Delhi, Patna (Bihar), Muzaffarpur (Bihar), Rishikesh (UK), Jammu (UT of J&K), Srinagar (UT of J&K), Ahmedabad and Varanasi (UP). DRDO is providing complete administrative support by deploying Doctors/Scientists and also providing various consumables like PPE kits and other facilities at these Hospitals.
- Modern RTPCR facilities were created or repurposed at Delhi (02 Labs), Gwalior (01 Lab), Leh (01 Lab), Tejpur (01 Lab), Bangalore (01 Lab) and DRDO also provided manpower and resources to Govt. Medical college Mysore and to Susheela Tiwari Govt. Hospital, Haldwani for augmenting national effort on COVID-19 testing.
- An anti-COVID-19 therapeutic application of the drug 2-DG (2-deoxy-D-Glucose) has been developed by DRDO to benefit the people suffering from COVID-19.
- Guidebooks and apps like 'MANOKAVACH' have been developed by (DIPR) DRDO to aid our Armed Forces as well as civilian against this pandemic situation and to address the emotional and psychological state of the citizen of the country. Several Yoga and audio lectures were also designed for immunity boosting.
- Sanitization and testing facilities have been extended at various Armed Forces locations, government offices all over the country including Parliament of India.
- DRDO made state of the art Mobile BSL-III Containment Laboratory for COVID-19 testing and deployed for COVID testing.
- Under PMCARES 866 nos. of Medical Oxygen Plants based on DRDO technologies are being set up by DRDO's industry partners across the country to make medical oxygen production capability available in every district of the country.
- DRDO has developed a unique system, "Oxycare" which sense the individual's SPO2 level and accordingly supply oxygen from a cylinder. This help optimize the quantity of oxygen used by patient, 1.5 lakhs such systems are being procured through PMCARES by Govt. of India.
- DRDO developed indigenous ventilator through Indian Industries and help them indigenize many critical parts which were not available during very first spell of lockdown, 30000 such ventilators were procured by Min. of Health under PMCARES to be utilized across the nation.

- Government of India has roped in tertiary care hospitals under other ministries to supplement the hospital facilities. Further, many large temporary treatment facilities were established by DRDO to manage surge in COVID-19 cases in the country. The isolation bed capacity and ICU bed capacity was also enhanced continuously.
- To generate oxygen at the health facility level, PSA plants are being established in each district hospitals to reduce the burden on the medical oxygen supply grid across the country.

The extent of relief provided to common people through these efforts are as follows:

- More than 7,000 beds in multiple hospitals were established in various locations across the country, which helps in saving the life of COVID-19 patients.
- 1,50,000 Oxycare Cylinders through PMCARES have been provided, which gave immense relief to common people
- 2-DG (2-deoxy-D-Glucose) is provided as adjuvant therapy for treatment of COVID-19 patients.

Makeshift COVID-19 hospitals were established by DRDO at various locations in India and with special reference to Uttar Pradesh; two hospitals were established one in Varanasi and other in Lucknow. Installation and commissioning of 866 Medical Oxygen Plants (MOP) through PMCARES for various hospitals; ensuring setting up at least one plant in each district across the country. As per MOHFW's instructions, 96 sites across Uttar Pradesh have been allotted to DRDO for the installation of Medical Oxygen Plants.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Dr Ashok Bajpai in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741474>

## कोरोना महामारी की दूसरी लहर से निपटने में डीआरडीओ की भूमिका अहम रही

नयी दिल्ली: कोविड-19 महामारी की दूसरी लहर के दौरान रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) ने देश के विभिन्न अस्पतालों में 7,000 से अधिक बिस्तरों की व्यवस्था की और डेढ़ लाख से अधिक ऑक्सीजन सिलेंडर मुहैया कराए।

रक्षा राज्य मंत्री अजय भट्ट ने राज्यसभा को एक प्रश्न के लिखित उत्तर में सोमवार को यह भी बताया कि डीआरडीओ ने यह ऑक्सीजन सिलेंडर प्रधानमंत्री नागरिक सहायता और राहत कोष (पीएम केयर्स) के माध्यम से मुहैया कराए। उन्होंने बताया कि पीएम केयर्स के माध्यम से डीआरडीओ ने विभिन्न अस्पतालों के लिए 866 ऑक्सीजन संयंत्रों की स्थापना की या इनकी शुरुआत की ताकि देश के लगभग हर जिले में एक संयंत्र की उपलब्धता सुनिश्चित हो सके।

उन्होंने कोविड-19 महामारी की दूसरी लहर से निपटने में डीआरडीओ के प्रयासों के बारे में पूछे गए प्रश्न के लिखित जवाब में बताया कि डीआरडीओ ने इस महामारी के इलाज के लिए 2-डीजी नामक दवा भी तैयार की। इसके अलावा उसकी ओर से देश के विभिन्न स्थानों पर अस्थायी अस्पताल की व्यवस्था भी की गई। मंत्री ने इस संबंध में उत्तर प्रदेश के वाराणसी और लखनऊ का उदाहरण दिया जहां संस्थान ने एक एक अस्थायी अस्पताल स्थापित किए।

भट्ट ने बताया कि जब देश में सैनिटाइजर, मास्क और पीपीई किट की कमी थी तब डीआरडीओ ने ये उत्पाद तैयार भी किए, वह भी तब जब देश में इनकी प्रौद्योगिकी नहीं थी। डीआरडीओ ने एन95 तथा एन99 के डिजाइन भी तैयार किए।

<https://navbharattimes.indiatimes.com/india/drds-role-was-important-in-dealing-with-the-second-wave-of-corona-epidemic/articleshow/84975603.cms>

# Defence Strategic: National/International



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Ministry of Defence

*Mon, 02 Aug 2021 2:59PM*

## Efforts to encourage domestic manufacturing

The Government has taken several policy initiatives and brought reforms to promote self-reliance in defence manufacturing. These policy initiatives are aimed at encouraging indigenous design, development and manufacture of defence equipment in the country, thereby reducing dependency on imports in long run. Important policy initiatives and reforms are as under: -

- DPP-2016 has been revised as Defence Acquisition Procedure (DAP) - 2020, which is driven by the tenets of Defence Reforms announced as part of 'Aatmanirbhar Bharat Abhiyan'.
- In order to promote indigenous design and development of defence equipment 'Buy {Indian-IDDM (Indigenously Designed, Developed and Manufactured)}' category has been accorded top most priority for procurement of capital equipment.
- Ministry of Defence has notified two 'Positive indigenisation lists' of 209 items for which there would be an embargo on the import beyond the timeline indicated against them. This would offer a great opportunity to the Indian defence industry to manufacture listed items using their own design and development capabilities to meet the requirements of the Indian Armed Forces.
- The 'Make' Procedure of capital procurement has been simplified. There is a provision for funding upto 70% of development cost by the Government to Indian industry under Make-I category. In addition, there are specific reservations for MSMEs under the 'Make' procedure.
- Procedure for 'Make-II' category (Industry funded), introduced in DPP-2016 to encourage indigenous development and manufacture of defence equipment has number of industry friendly provisions such as relaxation of eligibility criterion, minimal documentation, provision for considering proposals suggested by industry/ individual etc. So far, 58 projects relating to Army, Navy & Air Force, have been accorded 'Approval in Principle'.
- The Government has approved enhanced delegation of Financial Powers under Capital Procurement to levels below Vice-Chief of Armed Forces in February, 2021. The Government has also approved enhanced delegation of Financial Powers in the Make-I category under which Government funding up to 70% of the prototype development cost is available for Design & Development of equipment, systems, major platforms or upgrades thereof.
- The Government of India has enhanced FDI in Defence Sector up to 74% through the Automatic Route and up to 100% by Government Route wherever it is likely to result in access to modern technology or for other reasons to be recorded.
- An innovation ecosystem for Defence titled Innovations for Defence Excellence (iDEX) has been launched in April, 2018. iDEX is aimed at creation of an ecosystem to foster innovation and technology development in Defence and Aerospace by engaging Industries including MSMEs, Start-ups, Individual Innovators, R&D institutes and Academia and provide them grants/funding and other support to carry out R&D which has potential for future adoption for Indian defence and aerospace needs.

- An indigenization portal namely SRIJAN has been launched in August, 2020 for DPSUs/OFB/Services with an industry interface to provide development support to MSMEs/Startups/Industry for import substitution.
- Reforms in Offset policy have been included in DAP-2020, with thrust on attracting investment and Transfer of Technology for Defence manufacturing, by assigning higher multipliers to them.
- Government has notified the ‘Strategic Partnership (SP)’ Model in May 2017, which envisages establishment of long-term strategic partnerships with Indian entities through a transparent and competitive process, wherein they may tie up with global Original Equipment Manufacturers (OEMs) to seek technology transfers to set up domestic manufacturing infrastructure and supply chains.
- Government has notified a ‘Policy for indigenisation of components and spares used in Defence Platforms’ in March, 2019 with the objective to create an industry ecosystem which is able to indigenize the imported components (including alloys & special materials) and sub-assemblies for defence equipment and platform manufactured in India.
- Government has established two Defence Industrial Corridors, one each in Uttar Pradesh and Tamil Nadu. The investments of Rs 20,000 crore are planned in Defence corridors of Uttar Pradesh and Tamil Nadu by year 2024. So far, investment of approx. Rs 3342 crore has been made in both the corridors by public as well private sector companies. Moreover, the respective State Governments have also published their Aerospace & Defence Policies to attract private players as well as foreign companies including Original Equipment Manufacturers (OEMs) in these two corridors.
- An Inter-Governmental Agreement (IGA) on “Mutual Cooperation in Joint Manufacturing of Spares, Components, Aggregates and other material related to Russian/Soviet Origin Arms and Defence Equipment” was signed in September, 2019. The objective of the IGA is to enhance the “After Sales Support” and operational availability of Russian origin equipment currently in service in Indian Armed Forces by organizing production of spares and components in the territory of India by Indian Industry by way of creation of Joint Ventures/Partnership with Russian Original Equipment Manufacturers (OEMs) under the framework of the “Make in India” initiative.
- Defence Products list requiring Industrial Licences has been rationalised and manufacture of most of parts or components does not require Industrial License. The initial validity of the Industrial Licence granted under the IDR Act has been increased from 03 years to 15 years with a provision to further extend it by 03 years on a case-to-case basis.
- Department of Defence Production has notified 46 items under the latest Public Procurement Order 2017 notified by Department for Promotion of Industry and Internal Trade (DPIIT), for which there is sufficient local capacity and competition and procurement of these items shall be done from local suppliers only irrespective of the purchase value.
- Defence Investor Cell (DIC) has been created in Feb-2018 in the Ministry to provide all necessary information including addressing queries related to investment opportunities, procedures and regulatory requirements for investment in the sector. So far, 1182 queries have been addressed by DIC.

It has been decided to earmark an amount of Rs. 71,438.36 crore for domestic capital procurement out of the total allocation of Rs. 1,11,463.21 crore. for Capital Acquisition for the current financial year, with the objective to boost capital procurements from domestic sources including private sector.

The ‘First Positive Indigenisation list (erstwhile Negative list)’ of 101 items was notified on 21 August, 2020 and the ‘2nd Positive Indigenisation list’ of 108 items was notified on 31 May, 2021 by the Government for which there would be an embargo on the import beyond the timeline indicated against them. The aim of the Positive Indigenisation list is to give boost to indigenous

manufacturing, development of Intellectual Property besides acquiring ‘know-how’ of advanced technologies.

During the last five financial years (2016-17 to 2020-21) and current financial year 2021-22 (upto June 2021), 264 contracts have been signed, out of which 159 contracts have been signed with Indian Vendors for capital procurement of defence equipment for Armed Forces, which is approximately 60% of the total contracts signed.

The year-wise details of contracts are as below:

<b>Year</b>	<b>Number of Total Capital Contracts signed</b>	<b>Number of Capital Contracts signed with Indian Vendors</b>
2016-17	46	23
2017-18	50	32
2018-19	47	30
2019-20	70	38
2020-21	44	34
2021-22 (upto June 2021)	07	02
<b>Total</b>	<b>264</b>	<b>159</b>

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri Prabhakar Reddy Vemireddy in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741475>



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*Mon, 02 Aug 2021 2:58PM*

## **Production of defence products in the country**

Two Positive Indigenisation lists (erstwhile Negative lists) have been notified by the Government on 21st August, 2020 and 31st May, 2021 comprising of 101 and 108 items respectively for which there would be an embargo on the import beyond the timeline indicated against them. The lists provide opportunities to the Indian Defence Industry to manufacture listed items by using indigenous design and development capabilities to meet the requirements of the Indian Armed Forces. The two positive Indigenisation lists comprising 101 and 108 items are available in public domain on the website of Ministry of Defence <http://www.mod.gov.in>

The timelines for embargo on imports has been spread from December, 2020 to December, 2025 and design & development of prototypes take two or more years, so the assessments of savings on foreign exchange and opportunities for employment can not be done at this stage.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Dr Ashok Bajpai in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741472>



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*Mon, 02 Aug 2021 2:57PM*

## **Modernisation of Airforce**

Modernisation of Airforce is being undertaken following a multi-pronged approach involving indigenization, upgradation and integration. There has been induction of new weapon systems/platforms, advanced aircraft, air defence systems and modern technology.

Many weapon systems and platforms have already been inducted and operationalised. This carefully planned approach has transformed IAF into a modern network centric force capable of sustained multirole operations along entire spectrum of conflict.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Dr Sasmit Patra in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741471>



Mon, 02 Aug 2021 7:46PM

## Eastern fleet ships on overseas operational deployment

In pursuit of India's 'Act East' policy and to enhance military cooperation with friendly countries, a Task Force of Indian Navy's Eastern Fleet is scheduled to proceed on an Overseas Deployment to South East Asia, the South China Sea and Western Pacific from early Aug 2021 for over two months. The deployment of the Indian Navy ships seeks to underscore the operational reach, peaceful presence and solidarity with friendly countries towards ensuring good order in the maritime domain and to strengthen existing bonds between India and countries of the Indo Pacific.

The Indian Naval task group comprises Guided Missile Destroyer Ranvijay, Guided Missile Frigate Shivalik, Anti-Submarine Corvette Kadmat and Guided Missile Corvette Kora. The latter three ships are indigenously designed and are equipped with a versatile array of weapons and sensors, and are Made in India by Defence Shipyards.

During the deployment in the Indo Pacific, the ships are scheduled to participate in bilateral exercises with Vietnamese Peoples' Navy, Republic of Philippines Navy, Republic of Singapore Navy (SIMBEX), Indonesian Navy (Samudra Shakti) and Royal Australian Navy (AUS-INDEX). Further, they would also participate in multilateral exercise MALABAR-21 alongside the Japanese Maritime Self Defence Force, Royal Australian Navy and the United States Navy in Western Pacific.

The Indian Navy undertakes regular deployments to friendly foreign countries and Indian and the Pacific Ocean regions in furtherance of the Prime Minister's initiative of 'Security and Growth for All in the Region – SAGAR'. Further, such engagements build 'Bridges of Friendship' and strengthen international cooperation. These maritime initiatives enhance synergy and coordination between the Indian Navy and friendly countries, based on common maritime interests and commitment towards Freedom of Navigation at sea. Besides regular port calls, the task group will operate in conjunction with friendly navies, to build military relations and develop interoperability in the conduct of maritime operations.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1741640>





Press Information Bureau  
Government of India

Ministry of Defence

Mon, 02 Aug 2021 5:34PM

## Joint press release of the 12th round of India-China Corps Commander level meeting

The 12th round of India-China Corps Commander Level Meeting was held at the Chushul-Moldo border meeting point on the Indian side. This round of meeting was held following the meeting of the Foreign Ministers of India and People's Republic of China on 14th July in Dushanbe and the 22nd meeting of the Working Mechanism for Consultation and Coordination on India-China Border Affairs (WMCC) held on 25th June.

The two sides had a candid and in-depth exchange of views on resolution of remaining areas related to disengagement along the Line of Actual Control in the Western Sector of India-China border areas. The two sides noted that this round of meeting was constructive, which further enhanced mutual understanding. They agreed to resolve these remaining issues in an expeditious manner in accordance with the existing agreements and protocols and maintain the momentum of dialogue and negotiations.

The two sides also agreed that in the interim they will continue their effective efforts in ensuring stability along the LAC in the Western Sector and jointly maintain peace and tranquility.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741570>



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Mon, 02 Aug 2021 5:34PM

## भारत-चीन कोर कमांडर स्तरीय बैठक के 12वें दौर पर जारी संयुक्त प्रेस वक्तव्य

भारत और चीन के बीच कोर कमांडर स्तरीय बैठक का 12वां दौर भारत की ओर चुशुल-मोल्दो सीमा स्थल पर आयोजित किया गया। बैठक का यह दौर दिनांक 14 जुलाई को दुशांबे में भारत और चीन जनवादी गणराज्य के विदेश मंत्रियों की बैठक और 25 जून को आयोजित भारत-चीन सीमा मामलों (डब्ल्यूएमसीसी) पर परामर्श और समन्वय के लिए निर्मित कार्यतंत्र की 22वीं बैठक के बाद आयोजित किया गया।

दोनों पक्षों ने भारत-चीन सीमा क्षेत्रों के पश्चिमी क्षेत्र में वास्तविक नियंत्रण रेखा पर सैन्य वापसी से जुड़े बचे हुए क्षेत्रों के समाधान के विषय पर विचारों का स्पष्ट और गहन आदान-प्रदान किया। दोनों पक्षों ने यह नोट किया कि बैठक का यह दौर रचनात्मक था जिसने आपसी समझ को और बढ़ाया। वे दोनों देशों के बीच मौजूदा समझौतों और प्रोटोकॉल के अनुसार इन शेष मुद्दों को शीघ्रता से हल करने और बातचीत और वार्ता की गति को बनाए रखने पर सहमत हुए। दोनों पक्ष इस बात पर भी सहमत हुए कि आखिरकार वो पश्चिमी क्षेत्र में वास्तविक नियंत्रण रेखा के साथ स्थिरता सुनिश्चित करने के लिए अपने प्रभावी प्रयास जारी रखेंगे और साझा तौर पर शांति बनाए रखेंगे।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1741646>

## IAF Chief Bhadauria speaks to UAE counterpart on ways to strengthen ties between two forces

*Air Chief Marshal Bhadauria's two-day 'goodwill visit' to the middle-eastern country comes nearly 8 months after the Chief of Army Staff General Naravane travelled to the country*

New Delhi: Indian Air Force (IAF) chief RKS Bhadauria met his UAE counterpart Ibrahim Nasser M Al Alawi and held wide-ranging talks to identify avenues and measures for further strengthening the robust relationship between the two forces, according to an official statement on Monday.

Air Chief Marshal Bhadauria's visit to the UAE comes nearly eight months after Chief of Army Staff Gen MM Naravane travelled to that country.

In December last year, Gen Naravane paid a six-day visit to the UAE and Saudi Arabia in a first-ever trip by a head of the Indian Army to the two important Gulf countries.

“Air Chief Marshal RKS Bhadauria, Chief of the Air Staff (CAS), called on Major General Ibrahim Nasser M Al Alawi, Commander, UAE Air Force and Air Defence (UAE AF & AD), on August 1, 2021,” the IAF tweeted.

“They noted the rapid progress made in bilateral engagements and had wide-ranging talks to identify avenues and measures for further strengthening the robust relationship between the two Air Forces. CAS also visited major UAE AF&AD units during the two-day goodwill visit,” it added.

The IAF had said on Saturday that it and the UAE's Air Force have had significant professional interactions in the past few years and this visit by the IAF chief will further strengthen the defence cooperation and air force-level exchanges, as part of the comprehensive strategic partnership between the two sides.

In the last few years, India's ties with the UAE have witnessed a major upswing.

The UAE Air Force had provided mid-air refuelling to a number of Rafale fighter jets on their journey from France to India. India is procuring 36 Rafale jets from France out of which 24 have already been delivered.

<https://theprint.in/defence/iaf-chief-bhadauria-speaks-to-uae-counterpart-on-ways-to-strengthen-ties-between-two-forces/708050/>



IAF chief RKS Bhadauria called on his UAE counterpart Ibrahim Nasser M Al Alawi during his visit to UAE, on 1 August 2021 | Twitter | @IAF\_MCC

## Project Cheetah set to take off, India to get upgraded & armed drones from Israel

*Under the project, the Medium Altitude Long Endurance (MALE) Israeli Herons will be upgraded to undertake specialised and longer surveillance missions & precision strikes*

*By Snehesh Alex Philip*

New Delhi: After several rounds of discussions, Project Cheetah, under which India's Heron drones are to be upgraded and armed with Israel's help, is finally set to take off, ThePrint has learnt.

Sources in the defence and security establishment said cost negotiations for the nearly Rs 5,000 crore project involving Herons that are in service with the Indian Air Force (IAF), Army, and the Navy, has been completed and is in the last stage of decision making.

The Indian Air Force, which is the end agency for this project, is looking at a timeline within this fiscal to sign the contract, sources said.

Under the project, the Medium Altitude Long Endurance (MALE) Israeli Herons, used by all three Services, will be upgraded.

This upgrade will include enabling the Herons with the capability of satellite navigation and specialised sensors.

But the icing on the cake is the plan to arm them. Under the contract, the Israelis will upgrade the Herons with the ability to not only undertake more specialised and longer surveillance missions but also precision strikes.

The Herons will have the capability to carry and launch air-to-ground precision missiles, sources said.

The development comes at a time when the Indian defence forces have also decided to jointly procure 30 High Altitude Long Endurance armed drones, MQ-9B, from the US.

Sources explained that both systems are different in capability and use. Hence, there is no overlap.

Sources said that after the Rafale fighter jet contract, the priority was 83 LCA Mk 1 A deal which was inked earlier this year. Other priorities included certain missile systems among others.

### **Project first initiated by IAF**

Sources said that Project Cheetah was first initiated by the IAF in 2013. At that time the IAF was planning to upgrade the Herons in use with them.

Subsequently, a decision was taken to upgrade the Herons in service with the Army and the Navy as well.

There was also a plan to buy armed predator drones in larger numbers from the US, but it was shelved as the systems were proving to be very expensive.

Sources explained that the upgrade of the Herons serves the purpose it is intended for since the idea is to equip these systems with anti-personnel and anti-armour missiles, which will be smaller than the traditional ones.

"The drones will operate in a contested airspace. Because it will eventually have its own sensors and armament, it reduces the time from spotting a target and launching a strike from elsewhere.



[A Heron 1 UAV in flight | Representational image | Commons](#)

The idea of having such systems is that it reduces the risk against pilots flying the fighters,” a former senior IAF officer explained.

The officer explained that the other Israeli surveillance drone in use with the Indian forces, Searcher, cannot be armed because they are smaller in size.

<https://theprint.in/defence/project-cheetah-set-to-take-off-india-to-get-upgraded-armed-drones-from-israel/708122/>

**TIMESNOWNEWS.COM**

*Tue, 03 Aug 2021*

## **[Exclusive] Pakistan, China sign multi-million deal for delivery of additional 140 FN-16 missiles**

*Here is more evidence of China's help to Pakistan's armed forces*

*By Srinjoy Chowdhury*

New Delhi: Pakistan's Directorate General, Munitions Production, Ministry of Defence Production and China's Aerospace Long March International Trade or ALIT have just signed a multi-million deal for the delivery of an additional 140 FN-16 shoulder-fired air-defence missiles. The deal involves the supply of FN-16 missiles, battery and cooling units and launch mechanisms.

These will be purchased by Pakistan in knocked down condition and assembled by the Munitions Production Directorate. The missile is considered effective against ground attack fighter aircraft, cruise missiles, UAVs or drones and attack helicopters. They have an effective altitude of 4,000 metres and a range of 6,000 metres.



*(Representational Image)*

This is a follow-on contract. Earlier, Long March had supplied Pakistan armed forces with about 300 FN-16 missiles. Shoulder-fired missiles for air-defence were used with great effect by the Mujahideen against the Soviet forces in Afghanistan in the early 1980s.

At that time, the American government had sent stingers via Pakistan. Whether Pakistan will now arm the Taliban with SAMs remains to be seen.

<https://www.timesnownews.com/international/article/pakistan-china-sign-multi-million-deal-for-delivery-of-additional-140-fn-16-missiles/793817>

## **ISRO to expand reach of navigation system globally: New draft policy**

*All navigation constellations use the same radio frequency bands for broadcasting their navigation signals*

*By Anonna Dutt*

Indian Space Research Organisation plans to expand the reach of its regional satellite-based navigation system globally, and make it interoperable with other systems such as the GPS (global positioning system), according to its new draft policy.

“ISRO/DOS (Department of Space) shall work towards expanding the coverage from regional to global to ensure availability of NavIC standalone signal in any part of the world without relying on other GNSS and aid in wide utilisation of Indian navigation system across the globe,” read the policy document.

It also said, “ISRO/DOS shall put continuous efforts towards ensuring the Indian navigation and augmentation signals are interoperable with other free-to-air navigation.”

All navigation constellations use the same radio frequency bands for broadcasting their navigation signals. The International Telecommunication Union regulated the allocation of frequencies so that there is no interference between signals from different systems. The interoperability of the systems allows a user to seamlessly switch from one constellation system to another and results in improved navigation signal, especially in a situation where an area is obscured from one satellite system.

“The interoperability is an important step, and it is the right time to do it. It took several years for ISRO to complete the navigation constellation. Now chipsets have also started coming in; this was the logical next step. ISRO will have to ensure that the signal and data provided is better than the already existing system so that users have an incentive to switch to NavIC,” said Ajay Lele, senior fellow working on space security and strategic technologies at the Institute for Defence Studies and Analyses.

The Indian Regional Navigation Satellite System (IRNSS), also known as Navigation with Indian Constellation (NavIC), is a constellation of seven satellites that together provide navigation support over India and 1,500km around it. The first of the seven satellites was launched in 2013, and the constellation was completed in 2018. New smartphones in India running on Qualcomm chipsets released in 2020 can use IRNSS signals for navigation.

<https://www.hindustantimes.com/india-news/isro-to-expand-reach-of-navigation-system-globally-new-draft-policy-101627930648368.html>

# Machine learning provides a shortcut to simulate interactions in materials for solar energy harvesting

By Viktor Rozsa

Scientists are using machine learning to speed up development of materials that can harness energy from sunlight.

Harnessing sunlight holds promise as a means to cleanly generate renewable energy for next-generation technologies, from solar fuel cells to water treatment systems. Such technologies require an understanding of what happens when materials and molecules absorb sunlight.



Machine learning can circumvent explicit calculation of certain material behavior to accelerate simulations of optical properties of complex materials at finite temperature. Credit: Argonne National Laboratory

Computer simulations can help us better understand light-matter interactions. However, modeling materials featuring multiple types of structures, such as solid/water interfaces, is a complex task. But now, a research team at the U.S. Department of Energy's (DOE) Argonne National Laboratory has found a way to simplify these modeling tasks.

Using a data-driven approach based on machine learning, the team was able to simplify the solution of the quantum mechanical equations that describe how light is absorbed by a solid, liquid or molecule. Results of the research were recently published in *Chemical Sciences*.

"It is certainly not intuitive at first, but it turns out that machine learning techniques can be used for purposes much different than recognizing images or predicting consumer needs," said Marco Govoni, co-author of the study and assistant scientist in Argonne's Materials Science division.

The trick? Recognizing that not all terms of the quantum mechanical equations need be computed in the same way. In fact, some terms could be calculated—or learned—from simpler quantities, remarkably speeding up the overall simulation.

"An important realization of our work was to understand that we could reuse information obtained for a given solid or liquid without repeating calculations for similar systems. In essence, we came up with a sort of recycling protocol to reduce the complexity of calculations required to simulate absorption of light by materials and molecules," said Sijia Dong, who was a postdoctoral fellow at Argonne when the research was conducted and is now assistant professor at Northeastern University.

These protocols can lead to big savings when it comes to simulations that may take many hours or even days on high-performance computing architectures.

In fact, the technique the team devised allowed simulations of absorption spectra of complex systems to run between 10 and 200 times faster. These systems include solid/liquid interfaces such as those found between water and a photoelectrode (a material that can turn sunlight into electricity).

"Our study also gave insight into how to improve and modify the underlying theory used in the simulations," said Giulia Galli, senior scientist in Argonne's Materials Science division and deputy director for strategy at Argonne's Advanced Materials for Energy-Water Systems (AMEWS) Center. Galli is also Liew Family Professor of Molecular Engineering and professor of chemistry at

the University of Chicago and the director of the Midwest Integrated Center for Computational Materials (MICCoM) headquartered at Argonne.

"The impact of our machine learning exercise turned out to be further reaching than expected; the data-driven approach we adopted indicated to us new ways to study light-matter interaction in even more realistic and more complex systems than the one we started out studying," Galli added.

The team is now looking at applying these shortcuts and recycling protocols to electronic structure problems not only related to light absorption, but also to light manipulation for quantum sensing applications.

**More information:** Sijia S. Dong et al, Machine learning dielectric screening for the simulation of excited state properties of molecules and materials, *Chemical Science* (2021). [DOI: 10.1039/D1SC00503K](https://doi.org/10.1039/D1SC00503K)

**Journal information:** [Chemical Science](https://chemsci.royalsocietypublishing.org/)  
<https://phys.org/news/2021-08-machine-shortcut-simulate-interactions-materials.html>



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## Finding new types of 2D material defects could enable better electronics

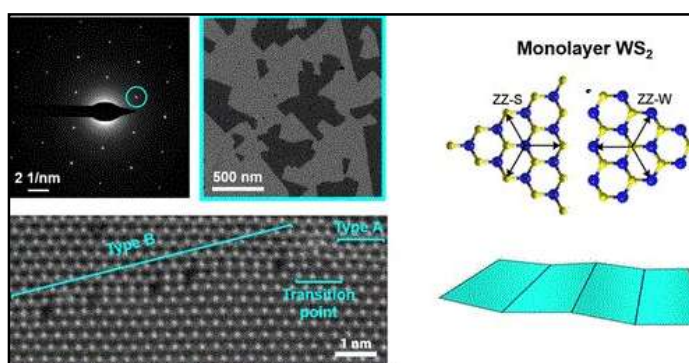
By Jamie Oberdick

Two-dimensional materials are essential for developing new ultra-compact electronic devices, but producing defect-free 2D materials is a challenge. However, discovery of new types of defects in these 2D materials may give insight into how to create materials without such imperfections, according to a group of Penn State researchers.

"2D materials are exciting new materials for electronics, and because they are so thin, they make it possible to shrink devices to very small sizes," said Danielle Reifsnnyder Hickey, Penn State assistant research professor of materials science and engineering. "This is critical for making electronics more powerful so that they can handle more data. However, it is a huge challenge to grow perfect 2D materials over areas large enough to be able to make large arrays of high-quality devices."

Reifsnnyder Hickey and the team of Penn State researchers have discovered new types of defects that provide clues for a way to create defect-free 2D materials. The study recently appeared in *Nano Letters*.

"We found new defects that are on the Angstrom scale, at one-tenth of a nanometer, and we were able to correlate the atomic structure to very large scales, at several microns," said Nasim Alem, Penn State associate professor of materials science and engineering and the study's corresponding author. The team studied defects in monolayer films of tungsten disulfide grown by the research group of Joan Redwing, professor of materials science and engineering, Penn State. Tungsten disulfide belongs to a class of 2D crystals known as transition metal dichalcogenides,



Three images of tungsten disulfide (WS<sub>2</sub>) monolayer on the left show results from several complementary transmission electron microscopy techniques that show evidence of nearly single-crystalline films with translational grain boundary defect arrays. The crystal structure model of a WS<sub>2</sub> monolayer on the right shows how two similarly oriented crystal edges approach each other during growth, inducing out-of-plane tilts at the grain boundaries. Credit: Pennsylvania State University

which are three-atom-thick crystals that have properties that make them ideal for the development of future electronics.

"2D material monolayers have different properties than bulk crystals," Reifsnnyder Hickey said. "For example, they have direct band gaps and can therefore be used as very small transistor materials, and their crystal symmetry enables new types of devices based on increased degrees of freedom relative to their bulk counterparts."

A direct band gap is an ideal feature for exciting an electron into a conducting energy state to allow the flow of electricity. Semiconductor technology, for example, is reliant on the manipulation of electronic charge in this way. Recently, spin and valley degrees of freedom have also shown promise in 2D materials and can be manipulated to enable new types of devices. For instance, orienting multiple spins in a material can lead to magnetism, and distributing electrons among different local minimum and maximum energy states—valleys—that possess the same energy but occur with different momentum values can enable new ways to process and store information. A key to unlocking the potential of these properties is growing defect-free films, which can be achieved only by identifying and understanding atomic defects, as was achieved in this work.

The defects the team discovered are known as translational grain boundaries, which occur at the interface between two crystallites that have the same orientation but a translational offset. Typically, grain boundaries connect grains with dissimilar orientations and can affect the materials properties such as thermal and electrical conductivity, lessening their value for electronics. To investigate the unusual translational grain boundaries, the team used a combination of scanning transmission electron microscopy imaging and a ReaxFF reactive force field simulation. ReaxFF was developed by Adri van Duin, a Penn State distinguished professor of mechanical engineering who also participated in the study.

The research found that the translational grain boundaries identified exist as subtle but widespread imperfections in the monolayer films.

"Through a synergistic approach, we were able to explain our experimental findings using simulations and uncover the growth mechanism that leads to such microstructure," Alem said. "This is an important step, because by learning the underlying physics of growth and defect formation, we can learn to modify and control them, and this will have a profound effect of the electronic properties of the crystal."

Improving the material would lead to better electronics, according to Reifsnnyder Hickey.

"This investigation experimentally discovered the structures and used theory and simulation to correlate their formation with the growth conditions," Reifsnnyder Hickey said. "Now, we would like to implement what we have learned, so that these offsets in grains can be eliminated to form truly single-crystalline films large enough for excellent electronics. We would also like to explore the properties of these and related atomic defects."

Being able to produce improved electronics based on tungsten disulfide monolayer films with minimal defects is good news for an increasingly visual society, according to Reifsnnyder Hickey.

"A couple decades ago, it was unheard of to watch a video on a telephone," Reifsnnyder Hickey said. "But now, we consume a lot of information visually, especially with videos, including news, communication and entertainment. Because electronics have become so powerful, we are able to easily carry in our pockets the devices that enable this. Our findings could lead to a new generation of such devices." Other Penn State researchers involved in the study include Nadire Nayir, Mikhail Chubarov, Tanushree H. Choudhury, Saiphaneendra Bachu, Leixin Miao, Yuanxi Wang, Chenhao Qian and Vincent H. Crespi.

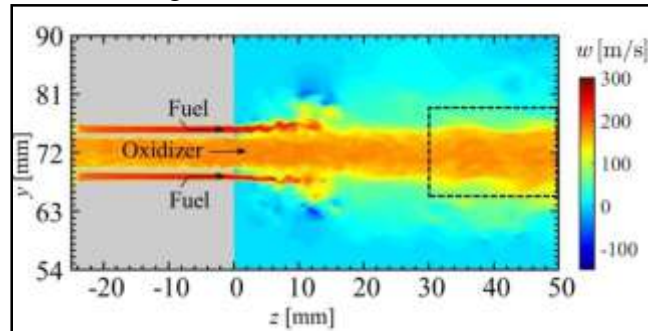
Provided by [Pennsylvania State University](https://phys.org/news/2021-08-2d-material-defects-enable-electronics.html)

<https://phys.org/news/2021-08-2d-material-defects-enable-electronics.html>



## Finding the cause of a fatal problem in rocket engine combustors

Rocket engines contain confined combustion systems, which are essentially combustion chambers. In these chambers, nonlinear interactions among turbulent fuel and oxidizer flows, sound waves, and heat produced from chemical reactions cause an unstable phenomenon called "combustion oscillations." The force of these oscillations on the body of the combustion chamber—the mechanical stress on the chamber—is high enough to threaten catastrophic failure of the engine. What causes these oscillations? The answer remains to be found.



This figure shows that large-scale vortex rings are produced from the injector rim during combustion oscillations. Credit: Satomi Shima, Kosuke Nakamura, Hiroshi Gotoda, Yuya Ohmichi, and Shingo Matsuyama

Now, in a breakthrough, published in *Physics of Fluids*, a team including Prof. Hiroshi Gotoda, Ms. Satomi Shima, and Mr. Kosuke Nakamura from Tokyo University of Science (TUS), in collaboration with Dr. Shingo Matsuyama and Dr. Yuya Ohmichi from the Japan Aerospace Exploration Agency (JAXA), have used advanced time-series analyses based on complex systems to find out.

Explaining their work, Prof. Gotoda says, "Our main purpose was to reveal the physical mechanism behind the formation and sustenance of high-frequency combustion oscillations in a cylindrical combustor using sophisticated analytical methods inspired by symbolic dynamics and complex networks."

The combustor the scientists picked to simulate is one of model rocket engines. They were able to pinpoint the moment of transition from the stable combustion state to combustion oscillations and visualize it. They found that significant periodic flow velocity fluctuations in fuel injector affect the ignition process, resulting in changes to the heat release rate. The heat release rate fluctuations synchronize with the pressure fluctuations inside the combustor, and the whole cycle continues in a series of feedback loops that sustain combustion oscillations.

Additionally, by considering a spatial network of pressure and heat release rate fluctuations, the researchers found that clusters of acoustic power sources periodically form and collapse in the shear layer of the combustor near the injection pipe's rim, further helping drive the combustion oscillations.

These findings provide reasonable answers for why combustion oscillations occur, albeit specific to liquid rocket engines. Prof. Gotoda explains, "Combustion oscillations can cause fatal damage to combustors in rocket engines, aero engines, and gas turbines for power generation. Therefore, understanding the formation mechanism of combustion oscillations is an important research subject. Our results will greatly contribute to our understanding of the mechanism of combustion oscillations generated in liquid rocket engines."

Indeed, these findings are significant and can be expected to open doors to novel routes of exploration to prevent combustion oscillations in critical engines.

**More information:** Satomi Shima et al, Formation mechanism of high-frequency combustion oscillations in a model rocket engine combustor, *Physics of Fluids* (2021). DOI: [10.1063/5.0048785](https://doi.org/10.1063/5.0048785)

**Journal information:** *Physics of Fluids*

<https://phys.org/news/2021-08-fatal-problem-rocket-combustors.html>

## Covaxin effective against Delta Plus variant of Covid-19: ICMR study

*A study by the Indian Council of Medical and Research (ICMR) has found that Bharat Biotech's Covaxin is effective against the Delta Plus variant of the Covid-19*

New Delhi: Bharat Biotech's Covid-19 vaccine Covaxin (BBV152) is effective against Delta Plus (AY.1) variant of coronavirus, according to a study by the Indian Council of Medical and Research (ICMR).

"ICMR study shows #Covaxin is effective in Delta, Delta AY.1 and B.1.617.3 variants," the apex health research body said in a tweet.

"Here, we have evaluated the IgG antibody titer and neutralizing potential of sera of Covid-19 naive individuals full doses of BBV152 vaccine, Covid-19 recovered cases with full dose vaccines and breakthrough cases post-immunisation BBV152 vaccines against Delta, Delta AY.1 and B.1.617.3.," the study said.

The recent emergence of the SARS-CoV-2 Variant B.1.617.2 (Delta) variant with its high transmissibility has led to the second wave in India.

Covaxin, a whole-virion inactivated SARS-CoV-2 vaccine used for mass immunization in the country, showed a 65.2 per cent protection against the Delta variant in a double-blind, randomized, multicentre, phase 3 clinical trial.

Subsequently, Delta has further mutated to Delta AY.1, AY.2, and AY.3.

Of these, AY.1 variant was first detected in India in April 2021 and subsequently reported from 20 other countries as well, the study said.

"The results of the study reveal covaxin neutralises the Delta, Delta AY.1 and B.1.617.3 variants effectively," the ICMR stated.

The study has been published on biorxiv, a pre-print server, and has not been peer reviewed.

Covaxin demonstrated 77.8 per cent effectiveness against symptomatic Covid-19 and 65.2 per cent protection against the B.1.617.2 Delta variant, Bharat Biotech had said while concluding the final analysis of Covaxin efficacy from Phase-3 trials on July 3.

<https://www.indiatoday.in/coronavirus-outbreak/vaccine-updates/story/covaxin-bharat-biotech-delta-plus-variant-covid-icmr-1835964-2021-08-03>



ICMR study shows Bharat Biotech's Covaxin is effective against Delta and Delta Plus variants of Covid-19. (Representative File Image)

