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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

Thu, 22 Oct 2020 1:24PM

Final User Trial of NAG Missile

Final user trial of 3rd generation Anti Tank Guided Missile (ATGM) NAG was carried out today on 22 Oct 2020 at 0645 hrs from Pokhran range. The missile was integrated with the actual warhead and a tank target was kept at designated range. This was launched from NAG Missile Carrier NAMICA. The missile hit the target accurately defeating the armour.

ATGM NAG has been developed by DRDO to engage highly fortified enemy tanks in day and night conditions. The missile has “Fire & Forget” “Top Attack” capabilities with passive homing guidance to defeat all MBTs equipped with composite and reactive armour.

The NAG missile carrier NAMICA is a BMP II based system with amphibious capability. With this final user trial, NAG will enter into production phase. The missile will be produced by Defence PSU Bharat Dynamics Limited (BDL), whereas Ordnance Factory Medak will produce the NAMICA.

Raksha Mantri Shri Rajnath Singh congratulated DRDO and Indian Army for the successful trial of NAG Missile.

Secretary DDR&D & Chairman DRDO, Dr G Satheesh Reddy appreciated the efforts of DRDO, Indian Army and Industry in bringing the missile up to the production phase.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1666723>



Press Information Bureau
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रक्षा मंत्रालय

Thu, 22 Oct 2020 1:24PM

नाग प्रक्षेपास्त्र का प्रयोक्ता द्वारा अंतिम परीक्षण

तीसरी पीढ़ी के टैंकरोधी निर्देशित प्रक्षेपास्त्र (एटीजीएम) नाग का आज 22 अक्टूबर, 2020 को सुबह 06.45 पर पोखरण परीक्षण अड्डे पर प्रयोक्ता द्वारा अंतिम परीक्षण किया गया। यह प्रक्षेपास्त्र वास्तविक आयुध से लैस था और परीक्षण के लिए निर्धारित दूरी पर एक टैंक को लक्ष्य के तौर पर रखा गया था। प्रक्षेपास्त्र को नाग प्रक्षेपास्त्र वाहक एनएएमआईसीए द्वारा दागा गया। प्रक्षेपास्त्र ने कवच को हटाकर लक्ष्य को सटीक तौर पर भेद दिया।

एटीजीएम नाग को रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) द्वारा दिन और रात की स्थितियों में अत्यधिक सुदृढ़ दुश्मन टैंकों को निशाना बनाने के लिए विकसित किया गया है। प्रक्षेपास्त्र, समग्र और प्रतिक्रियाशील

कच से लैस सभी एमबीटी को नष्ट करने के लिए एक पैसिव होमिंग गाइडेंस उपकरण के साथ-साथ 'मारो और भूल जाओ' तथा 'उच्च हमले' की क्षमताओं से लैस है।

नाग प्रक्षेपास्त्र वाहक एनएएमआईसीए एक बीएमपी-॥ आधारित प्रणाली है जिसमें जल एवं जमीन दोनों पर चलने की क्षमता है। इस अंतिम प्रयोक्ता परीक्षण के बाद, अब नाग उत्पादन के चरण में प्रवेश करेगा। प्रक्षेपास्त्र का उत्पादन रक्षा क्षेत्र के सार्वजनिक उपक्रम भारत डायनामिक्स लिमिटेड (बीडीएल) द्वारा किया जाएगा, जबकि मेडक स्थित आयुध निर्माणी एनएएमआईसीए का उत्पादन करेगी।

रक्षा मंत्री श्री राजनाथ सिंह ने रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) और भारतीय सेना को नाग प्रक्षेपास्त्र के सफल परीक्षण के लिए बधाई दी।

सचिव डीडीआर एंड डी और डीआरडीओ के अध्यक्ष डॉ. जी. सतीश रेड्डी ने प्रक्षेपास्त्र को उत्पादन चरण तक लाने में डीआरडीओ, भारतीय सेना और उद्योग के प्रयासों की सराहना की।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1666756>



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రక్షణ మంత్రిత్వ శాఖ

Thu, 22 Oct 2020 1:24PM

నాగ క్షిపణి అంతిమ వినియోగ పరీక్ష

యాంటీ ట్యాంక్ గైడ్డ్ మిస్సైల్ (ఎటిజిఎం) నాగ అంతిమ వినియోగ పరీక్ష గురువారం ఉదయం 6.45 నిమిషాలకు పోఖ్రాన్ శ్రేణుల వద్ద జరిగింది. క్షిపణిలో వాస్తవ అస్త్రాన్ని సమగ్రం చేసి, నియమిత దూరంలో ఒక ట్యాంక్‌ను లక్ష్యంగా ఉంచి ఈ పరీక్ష జరిపారు. ఈ ప్రయోగాన్ని నాగ క్షిపణి వాహకమైన నామికా (NAMICA) నుంచి ప్రారంభించారు. కవచాన్ని చేదించి లక్ష్యాన్ని క్షిపణి కచ్చితంగా చేదించింది. నాగ ప్రయోగ పరీక్షను విజయవంతంగా నిర్వహించినందుకు డిఆర్ డిఓ, భారతీయ సైన్యానికి రక్షణ మంత్రి రాజనాథ్ సింగ్ అభినందనలు తెలిపారు.

ఆయుధాలలో బలంగా ఉన్న శత్రు ట్యాంకులపై పగలు, రాత్రి పరిస్థితులలో పోరాటం చేసేందుకు డిఆర్ డిఓ ఎటిజిఎమ్ నాగను అభివృద్ధి చేసింది. ప్రతిక్రియాశీల, మిశ్రమ ఆయుధాలతో సన్నద్ధంగా ఉండే ఎంబిఐలను ధ్వంసం చేసేందుకు పైర్ అండ్ పర్ఫెక్ట్, టాప్ ఎటాక్ సామర్థ్యాలతో, శత్రు క్షిపణులలో ఉన్న ఆయుధాలతో తనంతట తానుగా క్రియాశీలం అయ్యే లక్షణం ఈ మిస్సైల్‌లో పొందుపరిచారు.

నాగ క్షిపణి వాహకమైన నామికా అనేది బిఎంపి 2 ఆధారిత వ్యవస్థపై అటు నీరు, ఇటు భూమిపై పనిచేయగల సామర్థ్యాన్ని కలిగి ఉంది. ఈ అంతిమ వినియోగ పరీక్షతో, నాగ ఉత్పత్తి దశలో ప్రవేశిస్తోంది. రక్షణ రంగ ప్రభుత్వ సంస్థ అయిన భారత్ డైనమిక్స్ లిమిటెడ్ (బిడిఎల్) ఈ క్షిపణిని ఉత్పత్తి చేస్తుండగా, మెదక్‌లోని ఆర్డినెన్స్ ఫ్యాక్టరీ నామికాను తయారు చేస్తాయి.

క్షిపణిని ఉత్పత్తి దశకు తీసుకువచ్చినందుకు డిఆర్ డిఓ, భారతీయ సైన్యం, పరిశ్రమలను ఈ కార్యక్రమంలో పాల్గొన్న డిడిఆర్&డి కార్యదర్శి, డిఆర్ డిఓ చైర్మన్ డాక్టర్ జి. సతీష్ రెడ్డి అభినందించారు.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1666791>

India's anti-tank missile Nag test-fired in Pokhran, ready for Ladakh deployment

The Nag anti-tank missile is ready for deployment by the military, ending the need for India to import this weapon from either Israel or the US for the range of four kilometers

By Shishir Gupta

New Delhi: The Defence Research and Development Organization (DRDO) successfully completed the final trial of Nag anti-tank missile using a live warhead on a dud tank at Pokhran army ranges at 6.45 am on Wednesday. The shoulder launched four-kilometre range missile with imaging infrared seeker will now be inducted in Indian Army.

The Nag trial comes after the DRDO tested the helicopter launched Stand-off Anti-Tank Missile (SANT) with beyond 10 km range from Balasore testing range in Odisha on October 19. Although the missile will ultimately be integrated with attack helicopters in future, the test was conducted from ground and was successful.

According to senior government officials, the Nag anti-tank missile is now ready for induction at locations such as the East Ladakh sector as it has completed 10 successful user trials with the weapon finding and then hitting the target.

The DRDO has been on a missile testing spree for a little over a month with only the 1,000 km range sub-sonic cruise missile Nirbhay, developing a snag during a test earlier this month. The missile is now expected to be test-fired in the coming months as the technical snag in the booster has been identified and rectified by the missile team.

The final trial of Nag anti-tank missile means that the Indian Army will no longer have to import this weapon from either Israel or the US for the range of four kilometres. It was due to unavailability of a credible anti-tank weapon, that India had to buy around 200 pieces of Spike anti-tank missiles from Israel as emergency purchases after the aggression by People's Liberation Army in Ladakh. The Spike missiles were purchased after the Galwan flare-up on June 15 after which both India and China have deployed troops all along the 1597 km Line of Actual Control (LAC) in Ladakh.

The need for anti-tank missile was sorely felt after PLA amassed artillery, rockets and tanks in occupied Aksai Chin to deter India.

<https://www.hindustantimes.com/india-news/nag-anti-tank-missile-ready-to-be-inducted-sant-missile-tested-fired-from-balasore/story-TXGqJQ1rko16xWuqga2Z5K.html>



The Nag anti-tank missile, test-fired with a live warhead, destroys an old tank at Pokhran army range on Thursday morning (DRDO)

Anti-Tank missile Nag test-fired in Pokhran, know how it will strengthen India's military capability

Anti-tank Missile Nag: With the successful trial of the weapon, Army will no longer be dependent on import from either Israel or the US for the range of four kilometres

It's a proud moment for India as the Defence Research and Development Organization (DRDO) completed the final trial of Nag anti-tank missile after which the weapon system is all set to be inducted into the Indian Army. The trial of shoulder-launched four-kilometer range missile was completed using a live warhead on a dud tank at Pokhran army ranges at 6.45 am on Wednesday. As per the *Hindustan Times* report, the Nag anti-tank missile is now ready for induction at locations such as the East Ladakh sector after it has completed 10 successful user trials with the weapon finding and then hitting the target.

How it will benefit India?

As per the report in the *Hindustan Times*, the Army will no longer be dependent on the import of this weapon from either Israel or the US for the range of four kilometres. As a result of the unavailability of a credible anti-tank weapon, India had to purchase around 200 pieces of Spike anti-tank missiles from Israel as emergency purchases. This happened after the intense situation in Ladakh.

The Spike missiles were purchased after the Galwan incident on June 15 after which both India and China deployed troops all along the 1597 km Line of Actual Control in Ladakh.

The need for an anti-tank missile was sorely felt after PLA amassed artillery, rockets, and tanks in occupied Aksai Chin to deter India.

What are the highlights of the system?

The Nag Missile system fired from a Nag Missile Carrier (NAMICA) can take our targets at ranges of 4 to 7 kilometres and is fitted with an advanced seeker to home on to its target. It is a third-generation anti-tank guided missile, aided with attack capabilities that can destroy all known enemy tanks during day and night.

The Army needs third-generation ATGMs with a strike range of over 2.5km with fire and forget capabilities. It needs them to equip its mechanised infantry units to carry them on their Russian BMP vehicles.

What type of system Army's currently possessed?

The army is currently using second-generation Milan 2T and Konkur ATGMs and has been looking for about third-generation missiles, which are important for stopping advancing enemy tanks.

The Defence Ministry in 2018 had cleared the acquisition of 300 Nag missiles and 25 NAMICAs for the Indian Army.

What were the stages of trial?

The DRDO has been conducting a missile testing spree with only the 1,000 km range sub-sonic cruise missile Nirbhay, developing a snag during a test earlier this month.

The Nag trial comes after the DRDO tested the helicopter launched Stand-off Anti-Tank Missile (SANT) with beyond 10 km range from the Balasore testing range in Odisha on October 19. The



Representative Image

missile will be integrated with attack helicopters in the future, the test was conducted from the ground and was successful.

The missile is now expected to test fired in the coming months as the technical snag in the booster has been identified and rectified by the missile team.

<https://news.abplive.com/news/india/nag-anti-tank-missile-testing-successful-final-trial-of-nag-anti-tank-guided-missile-conducted-earlier-today-at-pokhran-field-firing-ranges-in-rajasthan-1370721>



Fri, 23 Oct 2020

Final trial of DRDO-developed Nag missile successful, ready for induction into Army

India on Thursday successfully carried out the final trial of the DRDO-developed Nag anti-tank guided missile with a warhead

Edited By Ritesh K Srivastava

Highlights:

- ***The final trial of DRDO-developed Nag missile was carried out successful***
- ***The test was carried out at 6:45 AM at the Pokhran field firing ranges in Rajasthan.***
- ***The NAG missile system is now ready for induction into the Indian Army***

New Delhi: India on Thursday successfully carried out the final trial of the Defence Research and Development Organisation (DRDO)-developed Nag anti-tank guided missile with a warhead.

The test was carried out at 6:45 AM at the Pokhran field firing ranges in Rajasthan. "India today successfully carried out the final trial of the DRDO-developed Nag anti-tank guided missile with a warhead. The test was carried out at 6:45 am at the Pokhran field firing ranges in Rajasthan," Defence Research and Development Organisation officials said in a release.

The Missile system is now ready for induction into the Indian Army which has been looking for such a missile system to take down the enemy tanks and other armoured vehicles.

The Nag Missile System fired from a Nag Missile Carrier (NAMICA) can take our targets at ranges of 4 to 7 kilometres and is fitted with an advanced seeker to home on to its target.

The NAG missile is a third-generation anti-tank guided missile, which has top attack capabilities that can effectively engage and destroy all known enemy tanks during day and night.

The Army needs third-generation ATGMs with a strike range of over 2.5km with fire and forget capabilities. It needs them to equip its mechanised infantry units to carry them on their Russian BMP vehicles.

The army is currently using second-generation Milan 2T and Konkur ATGMs and has been looking for about third-generation missiles, which are important for stopping advancing enemy tanks.

The Defence Ministry in 2018 had cleared the acquisition of 300 Nag missiles and 25 NAMICAs for the Indian Army.



PM Narendra Modi, who has given a call for making India 'Aatmanirbhar,' and his cabinet colleague and Defence Minister Rajnath Singh, have lauded DRDO's efforts towards strengthening India's defence capabilities.

Developed indigenously by the Defence Research and Development Organisation (DRDO), the Nag ATGM can be launched from both- land as well as air-based platforms.

With a range of 4-7 km, the missile is fitted with home-developed infrared seeker and avionics, the capabilities possessed by only a few nations in the world.

<https://zeenews.india.com/india/final-trial-of-drdo-developed-nag-missile-successful-ready-for-induction-into-army-2319293.html>



Fri, 23 Oct 2020

India conducts successful final trial of Nag anti-tank guided missile

The Nag missile is an Indian third-generation, all-weather, fire-and-forget, lock-on after launch, anti-tank guided missile (ATGM)

By Sangeeta Nair

India on October 22, 2020 successfully carried out the final trial of the Nag anti-tank guided missile with a warhead. The missile has been developed by the Defence Research and Development Organisation (DRDO).

The test was carried out at 6:45 am from the Pokhran firing ranges in Rajasthan. The Nag anti-tank guided missile successfully hit the prescribed target. The missile is now ready for induction into the armed forces.



Following is the picture of the target hit by Nag anti-tank guided missile in its final trial conducted this morning.

Nag Missile: All you need to Know!

- The Nag missile is an Indian third-generation, all-weather, fire-and-forget, lock-on after launch, anti-tank guided missile (ATGM).
- It has an operational range of 500 m to 20 km. It has a single-shot hit probability of 90 percent. Its shelf life is roughly 10 years.

The Nag missile has five variants under development:

1. A land version, for a mast-mounted system
2. **HELINA:** The helicopter-launched Nag missile with extended range. It is launched from wing-mounted launchers onboard HAL Rudra helicopters and HAL Light Combat Helicopters.
3. **MPATGM:** The Man-Portable Anti-tank Guided Missile (MP-ATGM) is a third-generation anti-tank guided missile derived from the Nag missile.
4. An air-launched version
5. **NAMICA:** Nag Missile Carrier tankbuster
 - The Nag missile is being indigenously developed as a part of the Integrated Guided Missile Development Program (IGMDP) run by the DRDO. It is manufactured by Bharat Dynamics Limited.

• The Union Ministry of Defence had announced on July 19, 2019 that the missile was ready for production.

Significance

The Nag Missile system can take out targets at ranges of 4- 7 km. It has top attack capabilities that can effectively destroy all known enemy tanks either during the day or night. The missile system is extremely crucial for the Indian Army, which needs third-generation ATGMs with a strike range of over 2.5km with fire and forget capabilities.

The Army needs these missiles to equip its mechanised infantry units to carry them on their Russian BMP vehicles. The army has been till now using second-generation Milan 2T and Konkur ATGMs. The third-generation missiles are important for stopping advancing enemy tanks.

Background

The final trial of Nag anti-tank guided missile comes just ahead of several other missile tests by the DRDO. Recently on October 19, 2020, the DRDO tested the helicopter launched Stand-off Anti-Tank Missile (SANT) with a range beyond 10 km from the Balasore testing range in Odisha.

SANT or Standoff Anti-tank Guided Missile is a fourth-generation upgraded variant of HELINA missile developed for the long-distance airborne anti-armour role. The test was conducted from the ground and was successful.

<https://m.jagranjosh.com/current-affairs/india-conducts-successful-final-trial-of-nag-antitank-guided-missile-1603352680-1>

INDIA
TODAY

Fri, 23 Oct 2020

India's anti-tank missile Nag ready for induction in Indian Army

The final trial of 3rd generation Anti-Tank Guided Missile (ATGM)

Nag was carried out today on Thursday at 06:45 am from the Pokhran range

By Abhishek Bhalla

New Delhi: The indigenous anti-tank missile 'Nag' is ready for use with the final trial conducted in Pokhran. The final trial of 3rd generation Anti-Tank Guided Missile (ATGM) Nag was carried out today on Thursday at 06:45 am from the Pokhran range, the Defence Research and Development Organisation (DRDO) said.

The missile was integrated with the actual warhead and a tank target was kept at a designated range. This was launched from Nag Missile Carrier, NAMICA.

The Nag missile can be fitted on the Indian Army's infantry combat vehicles to boost the capabilities of the mechanised forces. The missile hit the target accurately defeating the armour, a statement from DRDO said.

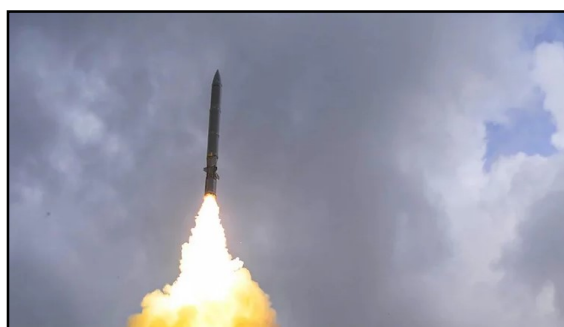


Image used for representation

With the final user trial, Nag will enter into the production phase. The missile will be produced by Defence PSU Bharat Dynamics Limited (BDL), whereas Ordnance Factory Medak will produce the NAMICA.

ATGM Nag has been developed by DRDO to engage highly fortified enemy tanks in day and night conditions.

The missile has "Fire and Forget", "Top Attack" capabilities with passive homing guidance to defeat all MBTs equipped with composite and reactive armour.

The Nag missile carrier, NAMICA, is a BMP II-based system with amphibious capability.

Defence Minister Rajnath Singh congratulated the DRDO and the Indian Army for the successful trial of the Nag missile.

DRDO Chairman Dr G Satheesh Reddy appreciated the efforts of the DRDO, the Indian Army and industry in bringing the missile up to the production phase.

<https://www.indiatoday.in/india/story/india-s-anti-tank-missile-nag-ready-for-induction-in-indian-army-1734082-2020-10-22>



Fri, 23 Oct 2020

दुश्मन की नींद उड़ाएगी 'नाग' एंटी टैंक गाइडेड मिसाइल, पोखरण में सफल परीक्षण

मिसाइल परीक्षण में भारत की एक और बड़ी उपलब्धि। नाग एंटी टैंक गाइडेड
मिसाइल के अंतिम चरण का सफलतापूर्वक परीक्षण कर दिया गया है।

खास बातें

- नाग एंटी टैंक गाइडेड मिसाइल का सफल परीक्षण
- राजस्थान पोखरण फील्ड फायरिंग रेंज में हुआ परीक्षण
- रक्षा अनुसंधान एवं विकास संगठन ने किया है विकसित

नई दिल्ली: भारत (India) की सैन्य क्षमता में और इजाफा हुआ है। मिसाइल परीक्षण (Missile test) में लगातार आगे बढ़ रहे भारत ने गुरुवार को वारहेड के साथ नाग एंटी टैंक गाइडेड मिसाइल (Nag anti-tank guided missile) के अंतिम चरण का सफलतापूर्वक परीक्षण कर दिया है। मिसाइल का परीक्षण सुबह 6:45 बजे राजस्थान के पोखरण फील्ड फायरिंग रेंज (Pokhran field firing ranges Rajasthan) में किया गया है।

डीआरडीओ ने की विकसित

नाग एंटी टैंक गाइडेड मिसाइल को रक्षा अनुसंधान एवं विकास संगठन (DRDO) ने विकसित किया है। पिछले डेढ़ महीने के दौरान डीआरडीओ का यह 12वीं मिसाइल का सफल सिस्टम परीक्षण है। बीते दिनों डीआरडीओ प्रमुख जी सतीश रेड्डी (DRDO Chief G. Satish Reddy) ने इस बारे में आगे के इरादे भी जाहिर कर दिए थे। उन्होंने एक बयान में कहा ता कि डीआरडीओ स्वदेशी मिसाइलों को तैयार करने में जुटा हुआ है। जल्द ही मिसाइल क्षेत्र में भारत को आत्मनिर्भर बनाया जाएगा।



फाइल फोटो.

चीन को लगातार संदेश

बता दें कि इन मिसाइल परीक्षणों की टाइमिंग बेहद अहम है। ऐसे में सीमा पार चीन (China) से तनाव जारी है उसी बीच भारत की ताकत भी हर रोज बढ़ रही है। इसी क्रम में आज बारूदी सुरंग रोधी प्रणाली से लैस स्वदेशी स्टील्थ युद्धपोत आईएनएस कवराती (INS Kavaratti) भी नौसेना (Indian Navy) के बेड़े में शामिल किया जाएगा। भारत की बढ़ती सैन्य ताकत से चीन बेहद परेशान है।

<https://zeenews.lindia.com/hindi/india/drdo-developed-nag-anti-tank-guided-missile-final-trial-successful-in-pokhran-field-firing-ranges-rajasthan/770652>

चीन के साथ जारी तनाव के बीच डीआरडीओ बना रहा एयर-लॉन्च मिसाइल, ये होगी खासियत

नई दिल्ली: चीन के साथ पूर्वी लद्दाख में जारी तनाव के बीच भारत एक नई एयर-लॉन्च मिसाइल विकसित कर रहा है, जो 10 किमी से अधिक की स्टैंड-ऑफ दूरी से दुश्मन के टैंक को मार गिराने में सक्षम होगी। इसका आने वाले दो महीने में परीक्षण किया जाएगा। इस मिसाइल को रक्षा अनुसंधान विकास संगठन (डीआरडीओ) विकसित कर रहा है। इसकी जानकारी बुधवार को घटनाक्रम से संबंधित उच्च अधिकारियों ने दी।

हफ्ते की शुरुआत में ही भारत ने स्वदेशी स्टैंड ऑफ एंटी-टैंक मिसाइल (सैंट) का सफल परीक्षण किया है। डीआरडीओ ने इस मिसाइल को भारतीय वायुसेना के लिए विकसित किया है। मीडिया रिपोर्ट के अनुसार, माना जा रहा है कि विकसित की जाने वाली नई एयर-लॉन्च मिसाइल को रूसी मूल के एमआई-35 हेलिकॉप्टर में जोड़ा जाएगा जिसमें एक बेहतर स्टैंड-ऑफ रेंज से दुश्मन को नष्ट करने की क्षमता होगी। यह जानकारी एक अधिकारी ने दी।



मिसाइल (फाइल फोटो) - फोटो : ANI

एमआई-35 पर मौजूदा रूसी मूल की शटर्म (Shturm) मिसाइल पांच किमी की रेंज में टैंकों को निशाना बना सकती है। गनशिप के अन्य हथियारों में अलग-अलग कैलिबर के रॉकेट, 500 किलोग्राम के बम, 12.7 एमएम की बंदूकें और 23 एमएम की तोप शामिल हैं। इसे दिसंबर में पहली बार एमआई-35 हेलिकॉप्टर के गनशिप से लॉन्च किया जाएगा।

एक अधिकारी ने बताया, एमआई-35 गनशिप से मिसाइल के पहले परीक्षण को लेकर तैयारी की जा रही है। अगले साल श्रृंखलाबद्ध तरीके से मिसाइल का एयर-लॉन्च परीक्षण किया जाएगा। इसके बाद यह इंडक्शन (शामिल किए जाने) के लिए तैयार हो जाएगी। अधिकारी ने बताया कि प्रक्षेपण के बाद मिसाइल में लॉक-ऑन होगा और लॉन्च से पहले भी लॉक-ऑन होने की क्षमता होगी।

लॉक-ऑन का मतलब है लक्ष्य का पता लगाना और लक्ष्य की स्थिति में किसी भी तरह के बदलाव के बावजूद मिसाइल द्वारा उसे निशाना बनाना। एक अधिकारी ने बताया कि 2021 के अंत तक परिचालन से पहले हेलिकॉप्टर से नई मिसाइल का आठ से 10 बार परीक्षण किए जाने की योजना है। डीआरडीओ द्वारा विकसित मौजूदा एंटी-टैंक मिसाइलें- नाग और हेलिना की मारक क्षमता पांच किमी है।

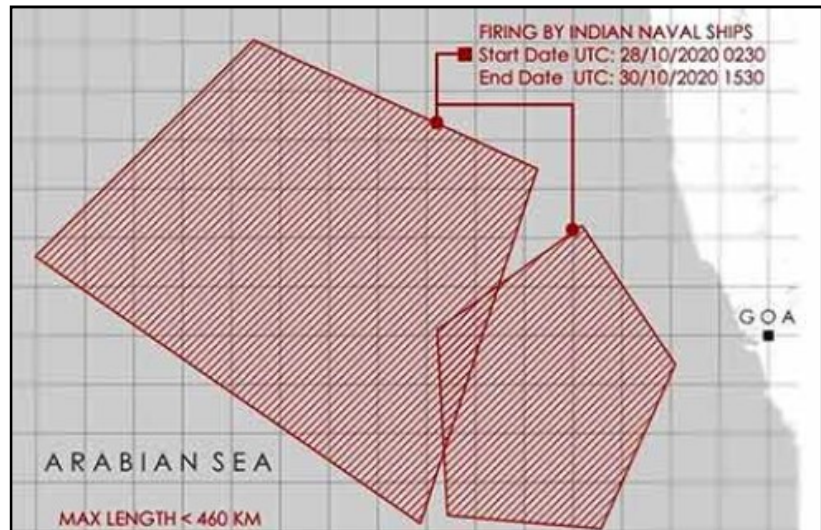
<https://www.amarujala.com/india-news/india-developing-air-launch-missile-capable-of-knocking-out-enemy-tanks-from-more-than-10km-amid-border-tension>

More missile tests this month? India issues area warning notifications for weapons tests in Arabian Sea, Bay of Bengal

India has issued an area warning notification for firing by Indian Navy warships in the Arabian Sea between 28 and 30 October. Another notification has been issued for a known air to air firing range and a target towing range in the Bay of Bengal for a window starting 27 October and ending 10 November.

A notice to airmen and marines is issued by countries when they intend to test weapons. These warnings notify “closure areas” because of a hazard due to weapons testing to navigation or aircraft in flight.

The Arabian Sea notification, issued for an area near Goa and parts of Maharashtra and Karnataka, covers an area of 25,220 square nautical miles. The Bay of Bengal notification covers two separate areas near Odisha.



This development comes just days after India tested BrahMos supersonic cruise missile from INS Chennai, an indigenously built stealth warship of the Indian Navy. The missile was tested in the Arabian Sea on 18 October.

Over the last six weeks, India has conducted at least 12 missile tests.

These tests, coming at a time when tensions in Ladakh are worsening, may have been aimed at China, experts have said.

The missiles tested by India include the nuclear-capable Prithvi-II (tested twice), BrahMos cruise missile (tested twice), an anti-tank guided missile (tested twice) and a Hypersonic Technology Demonstrator Vehicle.

Supersonic Missile Assisted Release of Torpedo (a new long-range anti-submarine warfare system), a New Generation Anti-Radiation Missile, a Standoff Anti-Tank Missile and Nirbhay cruise missile have also been test-fired.

<https://www.defencenews.in/article/More-Missile-Tests-This-Month-India-Issues-Area-Warning-Notifications-For-Weapons-Tests-In-Arabian-Sea,-Bay-Of-Bengal-982703>



Fri, 23 Oct 2020

INS Kavaratti's commissioning significant step in securing country's maritime goals: Army Chief

Indian Army Chief General Manoj Mukund Naravane on Thursday said that the commissioning of INS Kavaratti into the Indian Navy is a significant step in securing the country's maritime goals. General Manoj Mukund Naravane said these words in Visakhapatnam

Edited By Ritesh K Srivastava

- *Anti-Submarine Warfare Corvette "INS Kavaratti" was commissioned into the Indian Navy on Thursday*
- *It was commissioned by Indian Army Chief MM Naravane at Naval Dockyard, Visakhapatnam on Thursday*
- *Kavaratti has state-of-the-art weapons and sensor suite capable of detecting and prosecuting submarines.*

Visakhapatnam: Indian Army Chief General Manoj Mukund Naravane on Thursday said that the commissioning of INS Kavaratti into the Indian Navy is a significant step in securing the country's maritime goals. General Manoj Mukund Naravane said these words in Visakhapatnam.

"The commissioning of INS Kavaratti marks yet another significant step in securing our country's maritime goals. I congratulate and extend my best wishes to Team Kavaratti," Gen Naravane said. The ship derives the name from the beautiful capital of the Lakshadweep island, Kavaratti.

Anti-Submarine Warfare Corvette "INS Kavaratti" was commissioned into the Indian Navy by Army Chief General Manoj Mukund Naravane at Naval Dockyard, Visakhapatnam earlier on Thursday.



"This indigenously built Anti-Submarine Warfare (ASW) vessel is equipped with advanced weapons, composite superstructure and stealth features is a beauty by itself. It has been constructed with numerous novel design features and indigenous equipment fit is demonstrative of collective abilities in realising the aim of making India Atmanirbhar Bharat," he added.

The Army Chief continued by saying, the Indian Navy has always been a strong force, defends our maritime borders, territories, exclusive economic zone along our vast coastline.

Anti-Submarine Warfare Corvette "INS Kavaratti" was commissioned into the Indian Navy by Indian Army Chief General Manoj Mukund Naravane at Naval Dockyard, Visakhapatnam on Thursday.

Kavaratti has state-of-the-art weapons and sensor suite capable of detecting and prosecuting submarines. In addition to its anti-submarine warfare capability, the ship also has a credible self-defence capability and good endurance for long-range deployments.

According to the Indian Navy, touted as a potent Stealth ASW Corvette, Kavaratti is indigenously designed by the Indian Navy's in-house organisation, Directorate of Naval Design (DND).

It has been built by Garden Reach Shipbuilders and Engineers (GRSE), Kolkata, and portrays the growing capability of the Indian Navy, GRSE and the nation in becoming self-reliant through indigenisation, thus, accentuating the national objective of "Atmanirbhar Bharat".

The ship has up to 90 per cent indigenous content and the use of carbon composites for the superstructure is a commendable feat achieved in Indian shipbuilding. The ship's weapons and sensors suite are predominantly indigenous and showcases the nation's growing capability in this niche area.

Kavaratti takes her name from erstwhile INS Kavaratti which was an Arnala class missile corvette. The older Kavaratti distinguished herself by operating in support of was Bangladesh's liberation in 1971.

<https://zeenews.india.com/india/ins-kavarattis-commissioning-significant-step-in-securing-countrys-maritime-goals-army-chief-2319374.html>



Fri, 23 Oct 2020

More manpower, smart border fence: Army prepares new blue print to stop infiltration along LoC

The new type of hybrid model of the Smart fence will cost around Rs 10 lakh per km as compared to Rs 10 crore for 2.4 km

By Mayank Singh

Srinagar: Indian Army has put its focus on stopping the entry of the terrorists right at the Line of Control (LoC) and for they the force has not just beefed up the presence of manpower but has also integrated the use of technology to make the plan success.

Lt Gen BS Raju said, "The manpower has been increased along the LoC in such a way that it not only helps in mitigating the infiltration but also raise a warning to the next layer of security in case some one succeeds in infiltrating across."

The anti-infiltration grid is multilayered and apart from using manpower in layered deployments, equipments aimed to detect the movements early and keeping round the clock surveillance have also been integrated at the 343 km long LoC falling under the area of responsibility of 15 Corps Commanded by Lt Gen BS Raju.

Army till recently was working on concept of 'Smart Fence' having sensors and warning equipment integrated together. However, incurring high cost has forced a rethink on converting the entire 740 km stretch of the LoC into a Smart one. A hybrid model pegged to cost less is being under trial.

The new type of hybrid model of the Smart fence will cost around Rs 10 lakh per km as compared to Rs 10 crore for 2.4 km but in this case the smartisation will be rudimentary which is expected to be made up with beef up of manpower. The fence will be integrated with LIDAR (Light Detection and Ranging) sensors, Infrared Sensors and cameras among others.

“A stretch of 60 kms is being attempted this year” told an officer on ground. The old Smart fence was being tried in the area of Army’s 19 Division and it has been shunned for the time being, informed the officer.

Use of drones, both big and small, has also been increased for better monitoring on ground. The old fence called the Anti-Infiltration Obstacle System (AIOS) along the LoC continues to exist. This fence consists of double row of concertina wire and was constructed between 2003 and 2005.

“The AIOS is fine but the geography along the LoC makes it difficult and during the winters while snow fall reaches 10-15 feet high the fence collapses every year under the weight of snow.” told the officer

Every year 60-70% of the fence has to be repaired and this major exercise lasts over four months from march to June, told the officer and added by the time its ready the next cycle of snowfall begins.

Assistance of technology is being taken to track militant movements along the LoC, day and night and to stop them from sneaking in, whenever the need comes.

<https://www.newindianexpress.com/nation/2020/oct/22/more-manpower-smart-border-fence-army-prepares-new-blue-print-to-stop-infiltration-along-loc-2213618.html>

TIMESNOWNEWS.COM

Fri, 23 Oct 2020

Indian Army has more operating experience at higher altitudes than Chinese Army: Lt Gen (Retd) Deependra Hooda

The tense situation at Indo-China border in Eastern Ladakh will continue and will not ease-off as Chinese Army (PLA) has adopted to a stubborn stance and is not ready to disengage on-ground.

New Delhi: The tense situation at Indo-China border in Eastern Ladakh will continue and will not ease-off as Chinese Army (PLA) has adopted to a stubborn stance and is not ready to disengage on-ground, said Lt Gen (Retd) Deependra Singh Hooda, Former General Officer Commanding-in-Chief Northern Command.

The veteran army general was speaking during the Virtual Meet on 'The Future of Indo-China Relations', organized by Chandigarh University, Gharuan. The Virtual Meet was attended by former Indian Army General, former Indian Navy Chief, National Security Experts and Senior Administration Officials of Government of Punjab who interacted with the students to apprise them about the on-ground situation between the two Asian powers.



Amongst other dignitaries who took part in the Virtual Meet on Indo-China relations included Admiral (Retd) Sunil Lanba, former Indian Navy Chief and Ex-Chairman of Chiefs of Staff Committee, Lt Gen (Retd) Parveen Bakshi, former General Officer Commanding-in-Chief Eastern Command, Indian Army, Bharat Karnad, National Security Expert and Emeritus Professor, Centre for Policy Research and Rahul Bhandari (IAS), Secretary Higher Education, Water Resources, Mines & Geology, Government of Punjab.

"Although a series of military level, diplomatic level and ministerial-level talks have taken place between the two countries over the period of last months, yet the Chinese (PLA) has refused to disengage at ground level and maintain status-quo at line-of-actual control (LAC). There might be

some local incidents at LAC but both nuclear powers India & China cannot afford to have a full-fledged war," said Lt Gen (Retd) Hooda, while giving details about the current border situation.

"Both India and China have deployed a huge number of army personnel who have prepared themselves for long term eyeball to eyeball situation, but Indian Army has a tactical advantage over Chinese (PLA), as the Indian Security Forces have operating experience at higher altitudes & hilly terrains in harsh winters," Gen Hooda further added.

"Currently there is a huge trade imbalance between India and China which can be ascertained from the fact that Chinese products have 2.7 per cent penetration in Indian markets while Indian goods have merely 0.1 per cent penetration in Chinese markets. India's 68 per cent of pharmaceutical formulations and 90 per cent of antibiotic medicines are currently coming from China," said Rahul Bhandari, Secretary, Higher Education, Water Resources, Mines & Geology, Government of Punjab, while talking about the economic front.

"Banning of social apps by Indian Government has not greatly impacted the Chinese Economy, as we are currently importing a large number of goods like solar components, electronic goods, IT Hardware, Telecom Components, mobile phones, fertilizers and it will take India 5-10 years to be either self-reliant or search for new partners who can meet our technology needs," Bhandari further added.

Replying on the question of the possible threat of cyber-attack by China, Admiral (Retd) Sunil Lanba said, "Indian Government is conscious about the fact that China has intruded deep into our technology and communication eco-system through the supply of components by the Chinese firms and that the threat of cyber-attack from our hostile neighbour is real. Although the government is taking preemptive steps by increasing a nationwide alert and stepped up monitoring by intelligence agencies, a lot has to be done in terms of hardware & technology installation."

"India should not rely on the USA as it has not been a reliable ally which can be ascertained from the cases of Japan and South Korea. We should include South Asian countries like Vietnam, Taiwan as the fourth pillar of the Quadilateral Security Dialogue (QUAD) who understands the ecosystem in Indo-Pacific region," said Bharat Karnad, National Security Expert and Emeritus Professor, Centre for Policy Research. "India needs to speed-up its defense spending as the gap between China's Defense Budget and Indian Defense Budget will touch US\$ 500 billion by 2030 which create a regional imbalance between the two Asian countries," he further said.

<https://www.timesnownews.com/india/article/indian-army-has-more-operating-experience-at-higher-altitudes-than-chinese-army-lt-gen-retd-deependra-hooda/671481>

Indian Navy Chief inspects firing drills, operational readiness onboard Vikramaditya

Addressing Carrier Battle Group from aircraft carrier Vikramaditya, Indian Navy Chief Admiral Karambir Singh complemented combatants for accurate and effective weapon firings which he said demonstrated the navy's operational readiness.

By Abhishek Bhalla

New Delhi: Indian Navy chief Admiral Karambir Singh inspected firing weapons, air-to-air combat operations, anti-submarine drills and fleet maneuvers on Thursday. As part of a complete review of the navy's operational preparedness, Admiral Karambir Singh also embarked on the aircraft carrier Vikramaditya.

A real-time battle scenario was demonstrated to the Indian Navy chief at the Karwar naval base in the Arabian Sea.

Navy chief Admiral Karambir Singh also embarked on the Carrier Battle Group, comprising Vikramaditya, destroyers, frigates, corvettes, fleet support ships and integral swing-role fighters and helicopters.

Addressing combatants of the Carrier Battle Group over broadcast from Vikramaditya, Admiral Karambir Singh complimented them for continuously maintaining peak combat-readiness and high tempo of operations over the last few months despite Covid-related challenges.

Navy has remained mission-deployed and combat-ready across the Indian Ocean Region, even through rough seas during the monsoon period, towards maintaining the maritime security of the nation, the Indian Navy said in a statement.

The Indian Navy's anti-submarine warfare was further augmented with the induction of INS Kavaratti on Thursday.

Chief of Naval Staff Admiral Karambir Singh arrived at Karwar Naval Base where he interacted with personnel and discussed key issues such as repairs, maintenance, spares support and logistics for afloat units to sharpen their war-fighting capabilities. He was accompanied by Commander-in-Chief Western Naval Command, Flag Officer Vice Admiral Ajit Kumar.

Admiral Singh also reiterated aspects of cyber-security, force protection against terrorist attacks, and asymmetric warfare while exhorting all personnel to maintain the highest level of alertness.

On Thursday, CNS Admiral Karambir Singh was also given an operational readiness briefing regarding the indigenous guided-missile destroyer by the Fleet Commander in Chennai. He then embarked on fleet support ship Deepak and interacted with the crew before making his way to aircraft carrier Vikramaditya.

It was on aircraft carrier Vikramaditya where Admiral Singh witnessed the Carrier Battle Group's capabilities for integral fleet air defence and strike.

"Giving an overview of the prevailing security situation, he stated that the Navy would continue maintaining a high-tempo of operations in the coming months. He also complimented the Carrier Battle Group and its combatants for accurate and effective weapon firings, which left no doubt



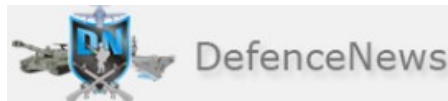
Admiral Karambir Singh onboard aircraft carrier Vikramaditya on Thursday (Photo Credits: Abhishek Bhalla/India Today)

about the Navy's readiness to meet any emergent contingencies," a statement by the Indian Navy read.

The statement went on to add, "CNS highlighted that tri-service synergy and coordination has peaked with the establishment of the Department of Military Affairs as was visibly demonstrated in the joint response of the three Services to recent events."

Chief of Naval Staff Admiral Karambir Singh also advised continued compliance of protocols by naval personnel and their families, in regard to the Covid-19 pandemic.

<https://www.indiatoday.in/india/story/indian-navy-chief-inspects-firing-drills-operational-readiness-onboard-vikramaditya-1734222-2020-10-22>



Fri, 23 Oct 2020

India, Kazakhstan explore co-production and co-development of defence products

India and Central Asia's biggest state Kazakhstan are exploring widening defence partnership including joint production as well as opening a new chapter in the heavy engineering sector.

Indian companies are in talks with Kazakhstan defence industries for co-production and co-development in defence production, according to a Ministry of Defence official. Sanjay Jaju, Joint Secretary (DIP), Ministry of Defence, said both India and Kazakhstan are looking at exploring opportunities that provide win-win solutions to the industries on both sides.

Speaking at the inaugural of the India-Kazakhstan Defence Cooperation Expo, a two-day virtual expo jointly organized by FICCI and Ministry of Defence last week, Jaju said several Indian companies are already in talks with Kazakh defence industries for co-production and co-development in defence production.

"India has come a long way in defence manufacturing. From a very paltry base, we now manufacture the entire range of equipment for all three verticals of the forces. These items range in the best in class artillery guns to battle tanks to bulletproof jackets to combat aircraft and the entire range of ships and submarines, missiles, and everything that is required in maintaining the sovereignty and defence of a nation," Jaju said.

Jaju said that the one important factor is not only to manufacture in India for India but also manufacture for all our friendly foreign nations. "We need to leverage opportunities on both sides and create opportunities not just for co-development and co-production but to also meet each other's requirements," he said.

"I'm aware that some companies are in an active dialogue stage with the Kazakh establishment. With India's strengths in software coupled with strengths in hardware manufacturing, India is poised to be one of the major electronics manufacturing hubs in the world. The defence military complex that we have in India has participation from both public and private sector companies," he further added.

Speaking at the event, Yerbol Bulakpaev, Head of Directorate, Department of Defence Production, Ministry of Industry and Infrastructure Development, Kazakhstan said that the number of priority areas highlighted by the two countries was recorded in the joint group meeting in 2018.



“We hope to discuss the range of issues in the repair, maintenance and upgrade of the Military equipment, R&D and look to establish joint ventures. The country is interested in the joint production of aerospace equipment,” he said.

On the roadmap for Development of Defence Industrial Cooperation and Indo-Kazakh military bilateral cooperation Bulakpaev said, “We are interested in cooperation in developing the robotised complex and land surveillance, and reconnaissance systems.”

Addressing the inaugural session of the defence cooperation expo, Prabhat Kumar, Ambassador of India to Kazakhstan said, “As the Ambassador to the Republic of Kazakhstan, nothing gives me more pleasure than to see our bilateral cooperation progressing rapidly signifying the strong bonds of strategic partnerships that have been forged.”

“The new agreement includes conduct of joint training, exercises, military-technical cooperation, UN Peacekeeping and exchange of intelligence. The strength of our robust bilateral defence cooperation can be gauged from the fact that a total of 246 officers from the Kazakh armed forces have been trained in India till date under the I-Tech defence program and we have a company level joint military exercise between both which is only done with select strategic partners,” Kumar said.

Yerlan Alimbayev, Ambassador of Kazakhstan to India said that the bilateral relationship between the two countries is very stable. There are positive dynamics which once again confirm the status of strategic partnership between the two countries.

“Striking example of high political trust between our countries is the joint peacekeeping activities within the framework of the UN mission in Lebanon which have additional impetus to the strengthening of the bilateral military cooperation,” Alimbayev said.

Both countries have the potential for further development in the military-technical development field. In this context, the existing joint working group on military-technical cooperation is an effective platform for establishing joint projects in military-industrial enterprises. “I am hopeful for the active participation of the Indian defence companies in the next defence expo in Kazakhstan,” he added.

Meanwhile on October 20 the Minister of Industry and Infrastructure Development of the Republic of Kazakhstan Beibut Atankulov had a meeting with Indian delegation led by industrialist Sandeep Jajodia, Chairman and Founder of the Monnet Group.

The Indian company plans to build a metallurgical plant for the production of ferrosilicon in the Pavlodar region of Kazakhstan, with a capacity of up to 15 thousand tons per year, with a subsequent increase in capacity to 50 thousand tons. The preliminary value of the investment is \$50 million and is supposed to grow up to \$200 million.

The main products of the plant are export-oriented. The investment operator of the company is the “Kazakh Invest” National Company of the Ministry of Foreign Affairs of the Republic of Kazakhstan.

Monnet Group was established in 1994 and the company’s business interests encompass setting up and operations of steel plants, manufacturing of sponge iron, pig iron and ferroalloys.

<https://www.defencenews.in/article/India,-Kazakhstan-explore-co-production-and-co-development-of-defence-products-982702>

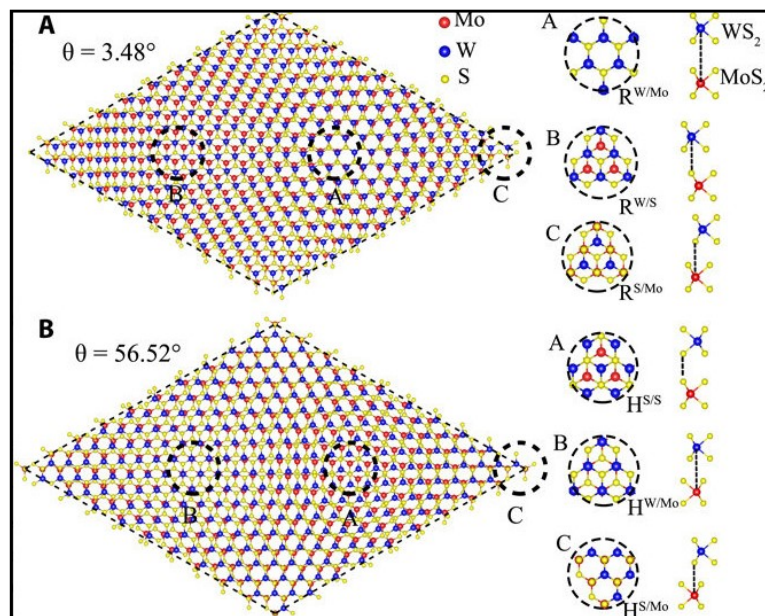
Shedding light on moiré excitons: A first-principles perspective

By Thamarasee Jeewandara

Moiré superlattices that are located within van der Waals (vdW) heterostructures can trap long-lived interlayer excitons to form ordered quantum dot arrays, paving the way for unprecedented optoelectronic and quantum information applications. Excitons are an electrically neutral quasiparticle that can transport energy without transporting net electric charge. They form when a material absorbs a photon of higher energy than its bandgap and the concept can be represented as the bound state of an electron and an electron hole that are attracted to each other by an electrostatic Coulomb force.

In a new report now published on *Science Advances*, Hongli Guo and a team of scientists in the department of physics and astronomy at the California State University, Northridge, U.S., performed first-principles simulations to shed light on moiré excitons in twisted molybdenum disulfide/ tungsten disulfide (MoS_2/WS_2) heterostructures. The team showed direct evidence of localized interlayer moiré excitons in vdW heterostructures and mapped out the interlayer and intralayer moiré potentials based on energy gaps. They noted nearly flat valence bands in the heterostructures while exploring how the vertical field could be tuned to control the position, polarity, emission energy and hybridization strength of the moiré excitons. The scientists then predicted that the alternating electric fields could control the dipole moments of hybridized moiré excitons, while suppressing their diffusion in moiré lattices.

In this work, Guo et al. used a newly developed computational method to provide direct evidence of localized interlayer moiré excitons in vdW heterostructures and proposed the formation of hybrid moiré excitons under alternating electric fields, to suppress the diffusion of excitons within moiré lattices. The most appealing method to engineer a vdW heterostructure is by introducing a lattice mismatch or rotation misalignment between the two-dimensional (2-D) layers to form a moiré superlattice with new length and new energy scales for fascinating quantum phenomena. Van der Waal (vdW) heterostructures formed in this way with vertical stacks of 2-D crystals provides an unprecedented platform to develop quantum materials with exotic physical



Moiré patterns in the MoS_2/WS_2 heterobilayer. The unit cell of the moiré superlattice formed by a twisted MoS_2/WS_2 heterostructure with angle $\theta = 3.48^\circ$ (A) and $\theta = 56.52^\circ$ (B). The stacking configurations of the three local motifs, A, B, and C, are shown on the right. Credit: *Science Advances*, doi: 10.1126/sciadv.abc5638

properties such as unconventional superconductivity, fractal quantum Hall effect and Bose-Einstein condensation.

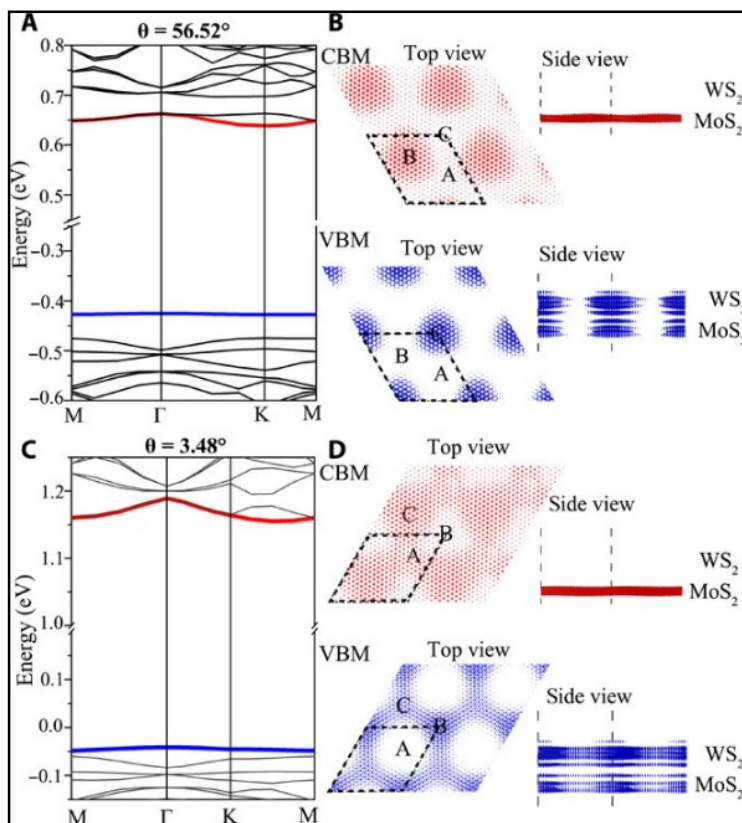
After initial theoretical predictions, researchers had reported a number of experimental observations of moiré excitons in vdW heterostructures of transition metal dichalcogenides (TMDs). The 2-D TMDs showed prominent excitonic effects due to quantum confinement and reduced dielectric screening. Although research work led to a surge of experimental and theoretical research on moiré excitons in vdW heterostructures, the first principles perspectives on the subject remain scarce due to computational challenges. Studies on first principles remain important since they can provide critical insight on the atomistic level of detail beyond experimental reach and phenomenological theories, while remaining an indispensable tool to explore the large and ever-increasing family of vdW heterostructures.

Moiré potential and controlling the local bandgap

The unit cells of two moiré superlattices can be formed by twisting a molybdenum disulfide/ tungsten disulfide (MoS_2/WS_2) bilayer (group of transition metal dichalcogenide materials), where the unit cells maintain a similar lattice constant and number of atoms. There are three local motifs in both superlattices (labeled A, B and C) that preserve the threefold rotational symmetry and play a crucial role to determine the properties of moiré lattices. The atomic structures of these motifs are, however, different for the two superlattices. The team mapped out the maximum amplitude of the moiré potentials – the most important property of moiré superlattices and calculated the energy bandgap of the MoS_2/WS_2 bilayer. They used the bandgap modulation to understand the moiré potentials and noted the amplitude of the interlayer moiré potentials to be much greater than the intralayer moiré potentials, where the interlayer moiré excitons were more localized than the intralayer moiré excitons.

A first principles approach

Conventionally, physicists use the Bethe-Salpeter equation (BSE) method based on the many-body perturbation theory. However, the method is expensive for moiré excitons due to the large number of atoms in the unit cell. To overcome the problem, Guo et al. developed an alternative first-principles method to provide a reliable description of excitonic effects without excessive computational costs. They based the method on time-dependent density functional theory (TDDFT) and examined moiré excitons in the twisted MoS_2/WS_2 heterostructures with different angles. As the twist angle increased, the moiré potential became shallower and the excitons became less localized to provide first direct evidence of localized moiré excitons in vdW heterostructures from first principles. The team thereafter determined the exciton binding energy in a variety of MoS_2/WS_2 heterostructures.



Flat bands in twisted MoS_2/WS_2 heterostructures. (A) The single-particle band structure for the MoS_2/WS_2 heterostructure with $\theta = 56.52^\circ$. The CBM and VBM bands are shown in red and blue, respectively. (B) Top and side views of the charge density of the CBM and VBM bands for the heterostructure. The unit cell of the moiré lattice is indicated by the dashed box. (C) Band structure for the MoS_2/WS_2 heterostructure with $\theta = 3.48^\circ$. (D) Top and side views of the charge density of the CBM and VBM bands for the heterostructure. Credit: Science Advances, doi: 10.1126/sciadv.abc5638

Electrically tuning moiré exciton positions

The scientists then schematically represented an experimental setup that allowed electrical control of excitonic properties. While a positive electric field pointing from the tungsten disulfide (WS_2) to the molybdenum disulfide (MoS_2) layer could increase the energy of MoS_2 while lowering the energy of WS_2 , the effects were vice versa for a negative electric field. When applying a positive field, the electron and hole of moiré excitons also switched layers to form an interlayer moiré with the opposite polarity. Furthermore, a negative field could reduce the energy gap of the heterostructure and the energy of the interlayer excitons. In this way, Guo et al. used the electric field to tune and program the location, polarity, and emission energy of moiré excitons to control quantum information carriers on demand. Even though the moiré excitons are localized, they can tunnel through the moiré potentials and diffuse across long distances, therefore the ability to control either enhanced or suppressed exciton diffusion is also of interest at present.

In this way, the large family of two-dimensional materials presented an unprecedented engineering opportunity in quantum materials, specifically relative to 2-D transition metal dichalcogenide (TMD) heterostructures with potential applications as quantum emitters or high-performance lasers and twistrionics. Understanding, predicting and controlling moiré excitons in vdW heterostructures is of great scientific importance, although highly challenging. Hongli Guo and colleagues used first-principles simulations to address the challenges and offer critical insights at the atomic and electronic scale that have hitherto remained unknown. They determined the distribution of exciton charge densities in twisted molybdenum disulfide/tungsten disulfide (MoS_2/WS_2) heterostructures by using first-principles calculations to provide direct evidence of localized moiré excitons in TMD heterostructures. The team also showed how the vertical field could be tuned to control the position, polarity, emission energy and hybridization strength of the moiré excitons. The team predict that alternating electric fields could suppress the diffusion of moiré excitons in 2-D materials.

More information: Hongli Guo et al. Shedding light on moiré excitons: A first-principles perspective, *Science Advances* (2020). DOI: [10.1126/sciadv.abc5638](https://doi.org/10.1126/sciadv.abc5638)

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DOI: [10.1103/PhysRevLett.121.266401](https://doi.org/10.1103/PhysRevLett.121.266401)

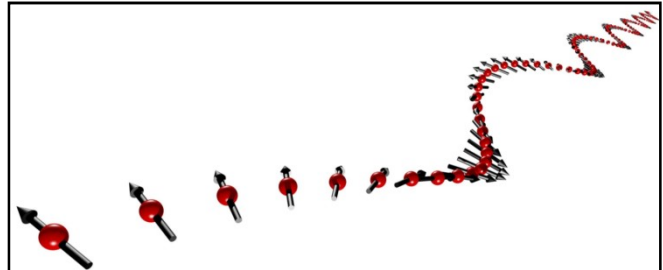
Journal information: [Science Advances](#) , [Nature](#) , [Physical Review Letters](#)
<https://phys.org/news/2020-10-moir-excitons-first-principles-perspective.html>

Reviewing multiferroics for future, low-energy data storage

A new UNSW study comprehensively reviews the magnetic structure of the multiferroic material bismuth ferrite (BiFeO₃—BFO).

The review advances FLEET's search for low-energy electronics, bringing together current knowledge on the magnetic order in BFO films, and giving researchers a solid platform to further develop this material in low-energy magnetoelectric memories.

BFO is unique in that it displays both magnetic and electronic ordering (ie, is 'multiferroic') at room temperature, allowing for low-energy switching in data storage devices.



Spin (magnetic order) in the multi-ferroic material bismuth-ferrite 'cycles' through the crystal, offering potential application in emerging electronics fields such as magnonics. Credit: FLEET

Multiferroics: combined magnetic and electronic ordering for low-energy data storage

Multiferroics are materials that have more than one 'order parameter'.

For example, a magnetic material displays magnetic order: you can imagine that the material is made up of lots of neatly arranged (ordered), tiny magnets.

Some materials display electronic order—a property referred to as ferroelectricity—which can be considered the electrical equivalent of magnetism.

In a ferroelectric material, some atoms are positively charged, others are negatively charged, and the way these atoms are arranged in the material gives a specific order to the charge in the material.

In nature, a small fraction of known materials possess both magnetic and ferroelectric order (as is the case for BFO) and are thus referred to as multiferroic materials.

The coupling between magnetic and ferroelectric order in a multiferroic material unlocks interesting physics and opens the way for applications such as energy-efficient electronics, for example in non-volatile memory devices.

Studies at FLEET focus on the potential use of such materials as a switching mechanism.

The storage of data on traditional hard disks relies on switching each bit's magnetic state: from zero, to one, to zero. But it takes a relatively large amount of energy to generate the magnetic field required to accomplish this.

In a 'multiferroic memory,' the coupling between the magnetic and ferroelectric order could allow 'flipping' of the state of a bit by electric field, rather than a magnetic field.

Electric fields are a lot less energetically costly to generate than magnetic fields, so multiferroic memory would be a significant win for ultra-low-energy electronics, a key aim in FLEET.

BFO: A unique multiferroic material

Bismuth ferrite (BFO) is unique among multiferroics: its magnetic and ferroelectric persist up to room temperature. Most multiferroics only exhibit both order parameters at far below room temperature, making them impractical for low-energy electronics.

(There's no point in designing low-energy electronics if it costs you more energy to cool the system than you save in operation.)

The new UNSW study reviews the magnetic structure of bismuth ferrite; in particular, when it is grown as a thin single crystal layer on a substrate.

The paper examines BFO's complicated magnetic order, and the many different experimental tools used to probe and help understand it.

Multiferroics is a challenging topic. For example, for researchers trying to enter the field, it's very difficult to get a full picture on the magnetism of BFO from any one reference.

"So, we decided to write it," says Dr. Daniel Sando. "We were in the perfect position to do so, as we had all the information in our heads, Stuart wrote a literature review chapter, and we had the combined necessary physics background to explain the important concepts in a tutorial-style manner."

The result is a comprehensive, complete, and detailed review article that will attract significant attention from researchers and will serve as a useful reference for many.

Co-lead author Dr. Stuart Burns explains what new researchers to the field of multiferroics will gain from the article:

"We structured the review as a build-your-own-experiment starter pack: readers will be taken through the chronology of BFO, a selection of techniques to utilize (alongside the advantages and pitfalls of each) and various interesting ways to modify the physics at play. With these pieces in place, experimentalists will know what to expect, and can focus on engineering new low-energy devices and memory architectures."

The other lead author, Oliver Paull, says "We hope that other researchers in our field will use this work to train their students, learn the nuances of the material, and have a one-stop reference article which contains all pertinent references—the latter in itself an extremely valuable contribution."

Prof Nagy Valanoor added "The most fulfilling aspect of this paper was its style as a textbook chapter. We left no stone unturned!"

The discussion paper includes incorporation of BFO into functional devices that use the cross coupling between ferroelectricity and magnetism, and very new fields such as antiferromagnetic spintronics, where the quantum mechanical property of the spin of the electron can be used to process information.

"The Experimentalist's Guide to the Cycloid, or Noncollinear Antiferromagnetism in Epitaxial BiFeO₃" was published in *Advanced Materials* in September 2020.

Nagarajan ('Nagy') Valanoor's team at UNSW Sydney has comprehensively studied BFO and other ferroic materials, gaining a wide appreciation for relevant studies, and making significant advances themselves.

The team synthesises ferroelectric and ferromagnetic heterostructures and novel topological oxides used by other FLEET researchers seeking low-energy transistors, within the Centre's Research theme 1 and Enabling technology A.

More information: Stuart R. Burns et al, The Experimentalist's Guide to the Cycloid, or Noncollinear Antiferromagnetism in Epitaxial BiFeO₃, *Advanced Materials* (2020). DOI: [10.1002/adma.202003711](https://doi.org/10.1002/adma.202003711)

Journal information: [Advanced Materials](https://phys.org/news/2020-10-multiferroics-future-low-energy-storage.html)
<https://phys.org/news/2020-10-multiferroics-future-low-energy-storage.html>

Researchers develop simple way to capture high quality 3-D images of live cells and organisms

Researchers have developed a simple method for simultaneously acquiring images at different depths with a standard microscope. The new technique can be applied to a variety of microscopy methods, making it useful for a wide range of biological and biomedical imaging applications.

"Optical microscopy has been an indispensable tool for studying 3-D complex biological systems and processes," said Sheng Xiao, a member of the research team from Boston University. "Our new multifocus technique allows live cells and organisms to be observed at high speeds and with high contrast."

In *Optica*, The Optical Society's (OSA) journal for high impact research, researchers led by Jerome Mertz describe their new straightforward and fast way to acquire information from different depths with standard microscopy. The new approach can be simply added to most existing systems and is easy to replicate, making it accessible to other researchers.

Capturing multifocus images

Standard camera-based microscopy systems acquire sharp images at a single focal plane. Although researchers have tried various strategies to simultaneously acquire images with different focal depths, these approaches typically require multiple cameras or use a specialized diffractive optical element to perform image splitting with a single camera. Both strategies are complex, and a diffractive optical element can be difficult to manufacture.

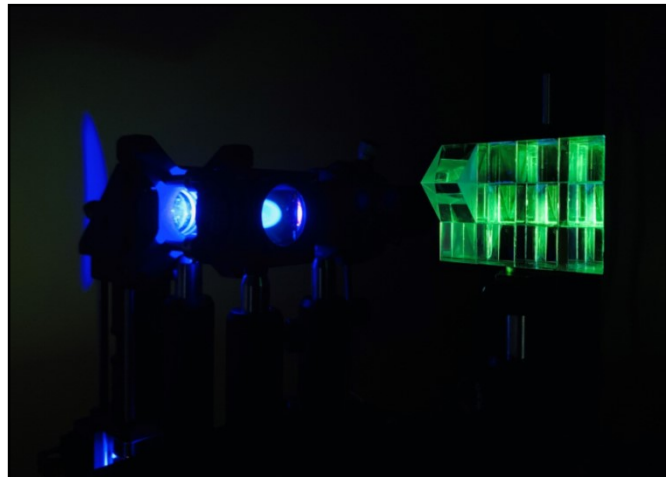
"We used a z-splitter prism that can be assembled entirely from off-the-shelf components and is easily applied to a variety of imaging modalities such as fluorescence, phase-contrast or darkfield imaging," said Xiao.

The z-splitter prism divides detected light to simultaneously produce several images in a single camera frame. Each image is focused at a different depth in the sample. Using a high-speed camera with a large sensor area and high pixel count allowed the researchers to distribute multiple high-resolution images on the same sensor without any overlap.

The multifocal images acquired with the new technique make it possible to estimate the out-of-focus background from the sample much more accurately than can be done with a single image. The researchers used this information to develop an improved 3-D deblurring algorithm that eliminates the out-of-focus background light that is often a problem when using widefield microscopy.

"Our extended volume 3-D deblurring algorithm suppresses far-out-of-focus background from sources beyond the imaging volume," said Xiao. "This improves both the image contrast and signal-to-noise ratio, making it particularly beneficial in fluorescence imaging applications involving thick samples."

Demonstrated versatility



Researchers developed a new multifocus technique that uses a z-splitter prism (right) to split detected light in a standard microscope. This simultaneously produces several images, each focused to a different depth in the sample, in a single camera frame. Credit: Sheng Xiao, Boston University

The researchers demonstrated the new technique with commonly used microscopy modalities, including fluorescence, phase-contrast and darkfield imaging. They captured large field-of-view 3-D images encompassing hundreds of neurons or entire freely moving organisms as well as high-speed 3-D images of a rotifer cilia, which beat every hundredth of a second. This showed how the approach provides the flexibility to prioritize a large field-of-view or high speed.

To demonstrate the capabilities of the extended volume 3-D deblurring algorithm, the researchers imaged various thick samples, including the brain of a living mouse. They observed significant contrast and signal-to-noise ratio improvements compared to both raw multifocus images and more traditional 3-D deblurring algorithms. The researchers are now working on expanding the technique so that it will work with even more imaging modalities.

More information: Sheng Xiao et al, High-contrast multifocus microscopy with a single camera and z-splitter prism, *Optica* (2020). [DOI: 10.1364/OPTICA.404678](https://doi.org/10.1364/OPTICA.404678)

Journal information: [Optica](https://www.nature.com/journal/optica)

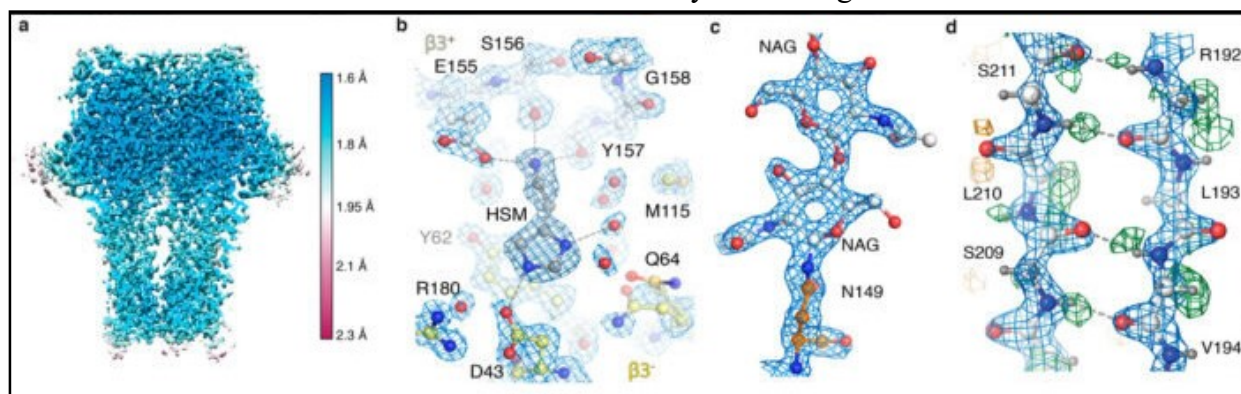
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Fri, 23 Oct 2020

Scientists break resolution records to visualize individual atoms with single-particle cryo-EM

Looking at the precise three-dimensional arrangement of atoms within a protein helps us to understand how it can perform its functions. Although electron cryo-microscopy (cryo-EM) has developed rapidly as an important structural biology technique in recent years, X-ray crystallography had been the only technique able to visualize individual atoms. Radu Aricescu's and Sjors Scheres' groups at the MRC Laboratory of Molecular Biology, in collaboration with scientists at Thermo Fisher Scientific and elsewhere, have now been able to resolve individual protein atoms for the first time in a three-dimensional cryo-EM image.



GABAA receptor map snapshots. (a) local resolution; (b) the agonist pocket showing histamine coordination and water molecules; (c) N-linked glycan; (d) hydrogen bonding network revealed by the difference map (green peaks).

This collaboration started in early 2019 when Radu and Abhay Kotecha, a researcher at Thermo Fisher Scientific, wanted to test new cryo-EM hardware on a small membrane protein sample. GABAA receptors, a focus of Radu's research for over a decade, were chosen because the highest achievable resolution using the best available technology seemed to have reached a limit at around 2.5 Ångströms (Å), but higher resolution was clearly needed for better drug design.

What is atomic resolution?

Resolution is usually reported in Ångströms, a unit of length that is one ten-billionth of a meter or 0.1 nanometres, and refers to the smallest distance between which two objects can be seen to be separate.

The length of a typical carbon-carbon bond is 1.5 Å; other bonds in proteins are a bit shorter. Thus, as the resolution gets down to 1.2 Å, it becomes possible to see individual atoms within a protein, achieving true atomic resolution.

While testing new hardware developments that included a cold field emission gun electron source, a new energy filter, and a new camera, the team also had to develop new processing strategies. Algorithms for the correction of optical aberrations that were previously developed by Jasenko Zivanov in Sjors' group, as well as an algorithm proposed by Chris Russo and Richard Henderson, played crucial roles in squeezing the most information out of the images.

After receiving images collected on the new microscope hardware by Abhay Kotecha at Thermo Fisher Scientific in Eindhoven, Netherlands, Takanori Nakane, a postdoc in Sjors' group, developed an optimal workflow in RELION and Andrija Sente, along with other members of Radu's group, used this workflow to process GABAA receptor images, while feeding back results to rapidly optimize microscope settings. A new, high-capacity data storage system developed by Jake Grimmer and Toby Darling in the LMB's Scientific Computing team offered crucial support to handle the approximately one hundred terabytes of data generated. This sustained team effort led to an unprecedented 1.7 Å resolution GABAA receptor structure.

This was the best reported resolution achieved using cryo-EM for any protein sample other than for the protein apoferritin. Apoferritin is commonly used as a benchmark for cryo-EM, because its molecular stability and 24-fold symmetry allow high-resolution reconstructions from relatively few particles.

Using the new hardware and processing strategies, the team were able to obtain a 1.22 Å resolution apoferritin structure, beating the previous 1.53 Å record to be the highest resolution single-particle cryo-EM structure yet obtained. Most impressively, this resolution enabled visualization of individual hydrogen atoms, even on water molecules inside the protein structure. The visualization of hydrogen bonding networks inside protein structures and in drug binding pockets allows researchers to better understand how they work.

This work represents the breaking of a key barrier for cryo-EM as a structural biology technique and the new technology, data collection, and processing strategies will expand the number of proteins whose structures can be solved to high resolution. These higher-resolution reconstructions will allow a better understanding of how proteins work and facilitate design of more specific drugs that could impact on treatments for a huge range of diseases.

More information: Takanori Nakane et al. Single-particle cryo-EM at atomic resolution, *Nature* (2020). DOI: [10.1038/s41586-020-2829-0](https://doi.org/10.1038/s41586-020-2829-0)

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Ewen Callaway. 'It opens up a whole new universe': Revolutionary microscopy technique sees individual atoms for first time, *Nature* (2020). DOI: [10.1038/d41586-020-01658-1](https://doi.org/10.1038/d41586-020-01658-1)

Journal information: [Nature](https://www.nature.com)
<https://phys.org/news/2020-10-scientists-resolution-visualize-individual-atoms.html>

COVID-19 vaccine may be ready by December. Trials to safety — a look at India's vaccine journey

By Anulekha Ray

- *At present, three vaccine candidates — Covaxin, ZyCoV-D and Covishield — are at different phases of trial in India*
- *The regulator granted permission to Dr Reddy's Laboratories for conducting phase II clinical trials of the Russian COVID-19 vaccine Sputnik V*

The whole world is waiting with bated breath for a 'safe and effective' vaccine against novel coronavirus. The central government expects that a COVID-19 vaccine will be ready for sale in India as early as December if clinical trials are successful, according to *Mint* report.

At present, three vaccine candidates are at different phases of trial in India. Two homegrown vaccine candidates — Covaxin by Bharat Biotech and ZyCoV-D by Zydus Cadila have already started the phase II clinical trial. Another vaccine candidate, Covishield, developed by the University of Oxford has recently commenced the phase III clinical trial in India. Vaccine maker AstraZeneca has signed a deal with Serum Institute of India to manufacture Oxford's COVID-19 vaccine candidate for India and low-income countries.

"We're expecting that early next year we should have vaccine in the country from maybe more than one source. Our expert groups are formulating strategies to plan on how to roll out the distribution of the vaccine in the country," health minister Harsh Vardhan said earlier.

Oxford COVID-19 vaccine trial by Serum Institute of India

Pune based drugmaker Serum Institute of India recently commenced the final stage of the clinical trial of vaccine made by the University of Oxford.

Dubbed as AZD1222 or ChAdOx1 nCoV-19, the vaccine is arecombinant viral vector vaccine. It uses a weakened version of a chimpanzee common coldvirus that encodes instructions for making proteins from the novel coronavirus to generate an immune response and prevent infection. The vaccine is likely to provide protection for about a year, AstraZeneca CEO Pascal Soriot said in June.

The vaccine maker will be ready with 60-70 million dosages of vaccines by December 2020 but that will come in the market in 2021 after the clearance of licensing, Dr Suresh Jadhav, executive director, Serum Institute of India said.

Covaxin phase II/III trial update

Covaxin, India's first coronavirus vaccine has been developed by Bharat Biotech developed by Bharat BioTech, Indian Council of Medical Research (ICMR) and National Institute of Virology (NIV).

"The vaccine candidate was found to generate robust immune responses. Thus, preventing infection and disease in the primates upon high amounts of exposure to live SARS-CoV-2 virus," the drugmaker said.

In the early stage of human trials, Covaxin has been tested in 12 hospitals across the country. Volunteers between the ages of 18 and 55 with no co-morbidity conditions have participated in the

trial. The vaccine trial took place in Hyderabad, Rohtak, Patna, Kancheepuram, Delhi, Goa, Bhubaneswar and Lucknow among other places.

The drugmaker has sought the drug regulator's approval to start the large scale phase III clinical trial in the country. The Drugs Controller General of India asked the vaccine maker Bharat Biotech to submit "complete safety and immunogenicity data of the phase II trial" and some clarifications before proceeding for the next stage.

Zydus Cadila phase II trial update

ZyCoV-D, developed by Zydus Cadila began its phase II clinical trials in August. "The company reports that the doses of the vaccine administered to healthy volunteers in the phase I clinical trial, which began on July 15, 2020, has been well tolerated," Cadila Healthcare said.

"All the subjects in phase I clinical trial were closely monitored in a clinical pharmacological unit for 24 hours post dosing for safety and for 7 days thereafter and the vaccine was found to be very safe," Zydus Cadila Chairman Pankaj R Patel said.

Sputnik V trial update in India

Central Drugs Standard Control Organisation (CDSCO) granted permission to Dr Reddy's Laboratories for conducting phase II clinical trials of the Russian COVID-19 vaccine Sputnik V in India. Russia was the first country in the world to register a COVID-19 vaccine after less than two months of human testing. Developed by Gamaleya Research Institute and the Russian defence ministry, the vaccine is currently under the phase III trial of the vaccine, which involved more than 40,000 people at more than 45 medical centres around Russia, the TASS news agency reported

Dr Reddy's said that phase II trial would include 100 subjects, while the phase III would involve 1,400 volunteers. Upon regulatory approval in India, Russian Direct Investment Fund shall supply to drug maker Dr Reddy's 100 million doses of the vaccine, the firm had said last month.

<https://www.livemint.com/science/health/covid-19-vaccine-may-be-ready-by-december-says-govt-a-look-at-india-s-vaccine-journey-11603359897416.html>

