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DRDO's Rustom-2 drone takes-off, India goes for armed Heron

Rustom-2 is capable of carrying different combinations of payloads depending on the mission objectives including synthetic aperture radar, electronic intelligence systems and situational awareness systems

By Shishir Gupta

New Delhi: Overcoming the initial program setbacks, the Defence Research and Development Organization (DRDO) on Friday flight tested the Rustom-2 medium altitude long endurance indigenous prototype drone and achieved eight hours of flying at an altitude of 16000 feet at Chitradurga, Karnataka. The prototype is expected to achieve a height of 26000 feet and endurance of 18 hours by 2020 end.

Rustom-2 is capable of carrying different combinations of payloads depending on the mission objectives including synthetic aperture radar, electronic intelligence systems and situational awareness systems. It has a satellite communication link to relay situation in the battle theatre on real time basis. “ The Rustom-2 had one hour of fuel left after eight hours of test flying at Challakere aeronautical test range in Chitradurga district of Karanataka and had achieved the test flight ceiling,” said a senior official.



DRDO on Friday flight tested the Rustom-2 medium altitude long endurance indigenous prototype drone

While the DRDO expects Rustom-2 surveillance drone to match the specifications of the Israeli Heron unmanned aerial vehicle used by the Indian Air Force and Navy, it has revitalized its drone program with a new mission head and objectives. The push to Rustom-2 program was given after the People's Liberation Army (PLA) tried to occupy Indian territory in Ladakh on the basis of a 1959 cartographical claim on the Line of Actual Control (LAC). The PLA has Wing Loong II armed drones in its arsenal and has even given four of them to Pakistan to protect the CPEC corridor and Gwadar port.

Although the Rustom-2 will have to undergo test and user trials before inducted in the Indian military, the Ministry of Defence is currently negotiating with Israeli Aerospace Industry (IAI) to not only upgrade the existing fleet of Heron drone but also arm them with air to surface missile and laser guided bombs.

According to South Block officials, the technical upgradation and arming of Heron drone is at contract negotiating committee level after being cleared by the Defence Acquisition Committee (DAC). The project will be cleared at the level of the Cabinet Committee on Security (CCS).

The Heron upgrade involves installing a satellite communication link so that there is no time gap in relaying situation on ground as well as installing hard points on the wings for missiles and laser guided bombs. While the Israelis have kept their armed drone program under cover, the Heron has a proven weaponized version.

Besides, India has also decided to go in for American MQ 9B armed drone instead of Sea Guardian surveillance drone with cost and numbers being worked out. Clearly, the future belongs to stand-off weapons and India this time will not miss the bus.

<https://www.hindustantimes.com/india-news/drdo-s-rustom-2-drone-flight-tested-india-goes-for-armed-heron-uavs/story-CZ5jd9tRo6Ph2jcq2HOpmM.html>



Sun, 11 Oct 2020

Amidst face-off with China, the importance of Rustom-2 in India's arsenal

By Vicky Nanjappa

New Delhi: The Defence Research and Development Organisation (DRDO) on Friday tested the Rustom-2 medium altitude long endurance indigenous prototype drone.

It achieved 8 hours of flying at an altitude of 16,000 feet at Chitradurga in Karnataka.

Depending on the mission objectives, Rustom-2 is capable of carrying different combinations of payloads, which includes electronic intelligence systems, situational awareness systems and also synthetic aperture radar.

The prototype is expected to achieve a height of 26,000 feet and an endurance of 18 hours by the end of 2020. On Friday after test flying for 8 hours, Rustom-2 had one hour of fuel remaining. The test was conducted at the Challakere aeronautical test range in Chitradurga.



The development comes at a time of the Chinese aggression along the Line of Actual Control (LAC). The PLA has the Wing Loong II armed drones. It may be recalled that four of these were given to Pakistan to protect the CPEC corridor as well as the Gwadar Port.

Last month, the three services came to a conclusion that India should opt for a weaponised drone. It was decided that India should have the weaponised MQ-9B Sky Guardian drone from the United States.

Further India will also upgrade its existing Heron fleet with satellite communications action capability. This would enhance its range as well as the surveillance capabilities amidst the military standoff with China at Ladakh.

The MQ-9B has a 40 hour endurance with a maximum altitude of 40,000 feet. It also has a payload capacity of over 2.5 tonnes, which includes air to surface missiles and laser guided bombs.

In addition to this India has asked Israel to upgrade its existing Heron medium altitude, long endurance surveillance drone by upgrading its communication skills. This would include fitting the drone with a satellite package. This would ensure that the drone is linked with the satellite and the information is sent on a real time basis.

These would be crucial considering the fact that the People's Liberation Army has deployed unmanned devices in large capacities in the Ladakh theatre. Further the PLA has also deployed sensors and surveillance cameras which provide advance warnings.

The upgrade to the Heron will allow it to conduct long range surveillance without the fear of losing contact with the base. This upgrade programme was approved by the Defence Ministry last month.

<https://www.oneindia.com/india/amidst-face-off-with-china-the-importance-of-rustom-2-in-india-s-arsenal-3161527.html>



Sun, 11 Oct 2020

DRDO के देसी ड्रोन रुस्तम-2 का चित्रदुर्ग में हुआ सफल टेस्ट, जानें क्या है खास

DRDO के अनमैन्ड व्हीकल रुस्तम 2 (Rustom 2) का शनिवार को ट्रायल किया गया। कर्नाटक के चित्रदुर्ग में यह ट्रायल सफल रहा। जानें इस स्वदेशी ड्रोन की खास बात क्या है। पढ़ें पूरी रिपोर्ट।

चित्रदुर्ग: रक्षा अनुसंधान और विकास संगठन (DRDO) ने शुक्रवार को स्वदेशी प्रोटोटाइप ड्रोन रुस्तम -2 (Rustom 2) की फ्लाइट टेस्टिंग की। कर्नाटक के चित्रदुर्ग में Rustom 2 ने 16,000 फीट की ऊंचाई पर आठ घंटे की उड़ान भरी। इस प्रोटोटाइप के साल 2020 तक अंत तक 26000 फीट और 18 घंटे की स्थिरता हासिल करने की उम्मीद है। डीआरडीओ ने इस तरह का ड्रोन सेना की मदद करने के लिए बनाया है। इसका इस्तेमाल दुश्मन की तलाश करने, निगरानी रखने, टारगेट पर सटीक निशाना लगाने और सिग्नल इंटेलिजेंस में होता है। बता दें कि अमेरिका आतंकीयों पर हमला करने के लिए ऐसे ड्रोन का अक्सर इस्तेमाल करता रहता है। इससे पहले साल 2019 के सितंबर में इसका ट्रायल फेल हो गया था। चित्रदुर्ग में ही एक टेस्टिंग के दौरान यह क्रैश हो गया था।

डीआरडीओ ने उम्मीद जाहिर की है कि रुस्तम 2 भारतीय वायु सेना और नौसेना द्वारा इस्तेमाल किए जाने वाले इजरायली हेरॉन अनमैन्ड एरियल व्हीकल वाहन का मुकाबला करेगा। पीपुल्स लिबरेशन आर्मी (PLA) द्वारा वास्तविक नियंत्रण रेखा (LAC) पर 1959 के कार्टोग्राफिक दावे के आधार पर लद्दाख में भारतीय क्षेत्र पर कब्जे की कोशिश के बाद रुस्तम -2 प्रोग्राम को शुरू किया गया। PLA के पास विंग लूंग-II आर्म्ड ड्रोन हैं। चीन ने उनमें से चार को CPEC गलियारे और ग्वादर बंदरगाह की सुरक्षा के लिए पाकिस्तान को दे दिया है।



रुस्तम 2 का शनिवार को सफल ट्रायल किया गया

हालांकि रुस्तम -2 को भारतीय सेना में शामिल होने से पहले ट्रायस और टेस्टिंग से गुजरना होगा। रक्षा मंत्रालय वर्तमान में इजरायली एयरोस्पेस उद्योग (IAI) के साथ बातचीत कर रहा है, ताकि न केवल हेरोन ड्रोन के मौजूदा बेड़े को अपग्रेड किया जा सके, बल्कि मिसाइल और लेजर गाइडेड बमों के साथ हवा से सतह पर मार करने के काबिल बनाया जा सके।

दुश्मनों का दुश्मन, रुस्तम ड्रोन


NEWS 18

जानिए DRDO के बनाए स्वदेशी रुस्तम-2 ड्रोन की खासियत

खासियत

लंबाई
9.5 मी.

ऊंचाई
2.4 मी.



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क्षमताएं

मीडियम और लॉन्ग रेंज इलेक्ट्रो ऑप्टिक

सिंथेटिक अपचर रडार

इलेक्ट्रॉनिक इंटेलिजेंस

कम्युनिकेशन इंटेलिजेंस

हिन्दुस्तान टाइम्स में प्रकाशित एक रिपोर्ट के मुताबिक, राष्ट्रीय राजधानी दिल्ली स्थित साउथ ब्लॉक के अधिकारियों के अनुसार, रक्षा अधिग्रहण समिति (डीएसी) द्वारा मंजूरी दिए जाने के बाद हेरोन ड्रोन का तकनीकी अपग्रेडेशन और आर्मिंग कॉन्ट्रैक्टिंग नेगोशिएटिंग कमिटी लेवल के पास है। परियोजना को सुरक्षा समिति (CCS) की कैबिनेट समिति के स्तर पर मंजूरी दी जाएगी।

रुस्तम का दूसरा नाम है - तापस

इस विमान को तापस बीएच-201 भी कहते हैं। रुस्तम 2 को डीआरडीओ ने पूरी तरह स्वदेशी तौर पर विकसित किया है। ये ऐसा ड्रोन है, जो दुश्मन की निगरानी करने, जासूसी करने, दुश्मन ठिकानों की फोटो खींचने के साथ दुश्मन पर हमला करने में भी सक्षम है। अमेरिका आतंकियों पर हमले के लिए ऐसे ड्रोन का इस्तेमाल करता रहा है। उसी तर्ज पर डीआरडीओ ने सेना में शामिल करने के लिए ऐसे ड्रोन बनाए हैं।

रुस्तम 2 ने फरवरी 2018, उसके बाद जुलाई में सफल परीक्षण उड़ान भरी थी। डीआरडीओ ने कहा था कि 2020 तक ये ड्रोन सेना में शामिल होने के लिए तैयार होंगे। रुस्तम-2 अमेरिकी ड्रोन प्रिडेटर जैसा है। प्रिडेटर ड्रोन दुश्मन की निगरानी से लेकर हमला करने में सक्षम है।

उड़ान के दौरान ज्यादा शोर नहीं करता रुस्तम-2 यूएवी

रुस्तम-2 को डीआरडीओ के एयरोनॉटिकल डेवलपमेंट इस्टैब्लिसमेंट (ADE) ने HAL के साथ पार्टनरशिप करके बनाया है। इसका वजन करीब 2 टन का है। विमान की लंबाई 9।5 मीटर की है। रुस्तम-2 के पंखे करीब 21 मीटर लंबे हैं। ये 224 किलोमीटर प्रति घंटे की स्पीड से उड़ान भर सकता है।

रुस्तम-2 कई तरह के पेलोड्स ले जाने में सक्षम है। इसमें सिंथेटिक अपचर राडार, इलेक्ट्रॉनिक इंटेलिजेंस सिस्टम और सिचुएशनल अवेयरनेस पेलोड्स शामिल हैं। रुस्तम-2 में लगे कैमरे 250 किलोमीटर तक की रेंज में तस्वीरें ले सकते हैं। रुस्तम-2 यूएवी उड़ान के दौरान ज्यादा शोर नहीं करता है।

डीआरडीओ ने रुस्तम-2 को यूएवी के 1500 करोड़ रुपए के प्रोजेक्ट से बनाया है। इसे वायुसेना और थलसेना के साथ नौसेना की जरूरतों को देखते हुए बनाया गया है। ये पनडुब्बी से उड़ान भरने में भी सक्षम है। इसके जरिए सेना दुश्मनों की निगरानी कर सकती है। दुश्मन ठिकानों की जासूसी की जा सकती है और जरूरत पड़ने पर इसके जरिए हमला भी किया जा सकता है।

<https://hindi.news18.com/news/nation/drdo-drone-rustom-2-aka-tapas-successful-trial-in-chitradurga-3288329.html>

चीनी ड्रॉन्स का मुकाबला करेंगे रुस्तम-2 और इजरायली हेरॉन, इनमें मिसाइलें और बम लगाने जा रहा भारत

DRDO ने लंबे वक़्त तक उड़ने में सक्षम रुस्तम-2 प्रोटोटाइप ड्रॉन (Rustom-2 drone) का टेस्ट किया है। इजरायली हेरॉन ड्रॉन (Heron drone) को भी हवा से जमीन में मार करने वाली मिसाइलों और लेजर गाइडेड बमों से लैस करने की तैयारी है।

By Deepak Verma

चीन ने पूर्वी लद्दाख में तेवर दिखाए तो भारत चौकन्ना हो गया। उसके ड्रॉन्स और फाइटर जेट्स कई बार सीमा के आस-पास मंडराते नजर आए। भारत ने अपने पास मौजूद सभी विकल्प बॉर्डर के पास मौजूद रखे हैं। सर्विलांस के लिए ड्रॉन्स का सहारा तो लिया ही जा रहा है, उन्हें और बेहतर बनाने की तैयारी है। डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन ने डेवलपमेंट का काम तेज कर दिया है। शुक्रवार को रुस्तम-2 ड्रॉन का सफल फ्लाइट टेस्ट हुआ। इसके अलावा इजरायल से मिले हेरॉन ड्रॉन्स को भी मिसाइलों और लेजर गाइडेड बमों से लैस करने की तैयारी है। पीएलए अपनी ड्रॉन पावर की डींगे कई बार हांक चुका है। भारत की तैयारी अपने अंदाज में चीन को मात देने की है।

26 हजार फीट की ऊंचाई तक जा सकता है रुस्तम-2

कर्नाटक के चित्रदुर्गा में रुस्तम का फ्लाइट टेस्ट हुआ। यह 16 हजार फीट की ऊंचाई पर लगातार 8 घंटे तक उड़ान भरता रहा। इसके बावजूद उसमें एक घंटे उड़ने के लिए काफी ईंधन बच गया था। 2020 के आखिर तक इस प्रोटोटाइप के 26,000 फीट की ऊंचाई पर उड़ने की क्षमता हासिल कर लेने की उम्मीद है। इसका फ्लाइट टाइम भी बढ़कर 18 घंटे करने पर काम हो रहा है।



चीनी ड्रॉन्स का मुकाबला करेंगे रुस्तम-2 और इजरायली हेरॉन, इनमें मिसाइलें और बम लगाने जा रहा भारत

जैसी मिशन की जरूरत, वैसा पेलोड ले जा सकता है ड्रॉन

रुस्तम-2 मिशन की जरूरत के हिसाब से अलग-अलग तरह के पेलोड्स ले जा सकता है। इस ड्रॉन के साथ सिंथेटिक अपर्चर रडार, इलेक्ट्रॉनिक इंटेलिजेंस सिस्टम और सिचुएशनल अवेयरनेस सिस्टम भेजा जा सकता है। इसमें एक सैटेलाइट कम्युनिकेशन लिंक भी है जो युद्ध की स्थिति में हालात की जानकारी रियल टाइम में दे सकता है।



हेरॉन की टक्कर का ड्रॉन बन सकता है रुस्तम-2

DRDO का मकसद रुस्तम-2 को इजरायल के हेरॉन UAV की टक्कर का ड्रॉन बनाना है। हेरॉन को एयरफोर्स और नेवी पहले से ही यूज कर रही है। रुस्तम-2 के डेवलपमेंट को चीन के साथ तनाव बढ़ने के बाद तेज किया गया है। हालांकि सेना का हिस्सा बनने से पहले इसे कड़े टेस्ट्स और यूजर ट्रायल्स से गुजरना होगा।

हेरॉन के अपग्रेड में लगी होंगी मिसाइलें और बम

भारत सरकार इजरायली ड्रॉन्स की पूरी फ्लीट को अपग्रेड करना चाहती है। इसके प्रस्ताव को रक्षा अधिग्रहण परिषद से मंजूरी मिल चुकी है। हेरॉन ड्रॉन्स में हवा से जमीन में मार करने वाली मिसाइल और लेजर गाइडेड बम लगाए जाएंगे। इसके अलावा एक सैटेलाइट लिंक भी लगाया जाएगा ताकि इन्फॉर्मेशन पहुंचने में देरी न हो।

<https://navbharattimes.indiatimes.com/india/drdo-rustom-2-and-israeli-heron-drone-to-counter-china-on-border/articleshow/78587588.cms?story=4>

FINANCIAL EXPRESS
Read to Lead

Sun, 11 Oct 2020

Rudram: DRDO's lethal anti-radiation missile can destroy enemy targets with 'pinpoint accuracy'! Check details

The Sanskrit name of India's first indigenous anti-radiation missile has some technical insights also. Rudram has 'ARM' in the name, which is a short-form of the anti-radiation missile

By Surabhi Pandey

Amid the ongoing Himalayan standoff with China, India on Friday added an extremely powerful arsenal that will exponentially increase its firepower. Strapped on the Sukhoi-30 MKI, Rudram anti-radiation missile destroyed the target with 'pinpoint accuracy,' the DRDO said in a statement after the successful test. Though it was flight-tested from Sukhoi, the officials say that Rudram can be launched from other combat jets also. The Sanskrit name of India's first indigenous anti-radiation missile has some technical insights also. An Indian Express report said that the name was chosen as it has the right letters in it. Rudram has 'ARM' in the name, which is a short-form of the anti-radiation missile. In Sanskrit, one of the meanings of Rudram is 'remover of sorrows.'

The report said that the unique feature of Rudram is that it can detect the enemy's radiation targets even when the device is switched off. Usually, devices such as radars, etc., are switched off to avoid the detection. However, Rudram has been specifically designed to track such targets. It has been fitted with a unique system that can trace and destroy various kinds of devices with wide-range radio frequencies. With a range of more than 100 km, Rudram gives India an unmatched power. It took more than eight years for the DRDO to accomplish the mission of developing Rudram. Combat planes from the Indian Air Force and other facilities from the Hindustan Aeronautics Ltd. worked also with the DRDO in the project.



In Sanskrit, one of the meanings of Rudram is 'remover of sorrows.' (ANI photo)

It is said that the modern-day defence is heavily dependent on the airpower of any nation. Keeping this view in mind, the DRDO's latest missile is loaded with the features to destroy the enemy's air defence systems. The missile is part of the 'Suppression of Enemy Air Defence' strategy. This strategy is generally used during the first phase of any aerial standoff. In case the air conflicts continue, SEAD tactic is used to protect the nation's fighter jets and other assets. In a present-day conflict situation, the anti-radiation missile can be used to not only target the enemy's

air defence systems but also disrupt the radio frequencies. Blocking the communication channels can give a decided advantage to the country.

<https://www.financialexpress.com/defence/rudram-drdos-lethal-anti-radiation-missile-can-destroy-enemy-targets-with-pinpoint-accuracy-check-details/2102404/>

ThePrint

Sun, 11 Oct 2020

India tests RUDRAM — here's why first indigenous anti-radiation missile is important

DRDO Friday successfully tested the new-generation anti-radiation missile RUDRAM on a radiation target located on Wheeler Island off Odisha

By Amrita Nayak Dutta

New Delhi: India's indigenous defence manufacturing acquired a new feather in its cap Friday as the Defence Research and Development Organisation (DRDO) successfully tested the new-generation anti-radiation missile, called RUDRAM, on a radiation target located on Wheeler Island off the coast of Odisha.

The long-range air-launched missile was launched from Su-30 MKI fighter aircraft.

Anti-radiation missiles are meant to debilitate enemy air defence systems, by taking out radars, communication sites, and other radio frequency emitting targets, thereby foiling any plans to launch surface-to-air missiles.

The reason RUDRAM was tested off a Su-30 is because the jets constitute the largest fighter fleet in the IAF, and have a carrying capacity second only to the newly-inducted Rafales'.

Currently, the IAF uses Russian-origin Kh-31 R anti-radiation missiles, which are deployed with Su-30s too. Other anti-radiation missiles are ground-based.

ThePrint tells you more about anti-radiation missiles.

A successful test

According to a statement released by the DRDO Friday, RUDRAM is the first indigenous anti-radiation missile of the country, and has the capability of varying ranges based on launch conditions.

It has INS-GPS navigation as well as a Passive Homing Head for the final attack. The Passive Homing Head can detect, classify and engage targets over a wide band of frequencies as programmed.

In its test Friday, the DRDO said, the RUDRAM hit the radiation target with pin-point accuracy. "The missile is a potent weapon for the IAF for Suppression of Enemy Air Defence effectively from large stand-off ranges," it added.

DRDO sources said the missile will undergo more tests before its eventual induction in the IAF.

What is an anti-radiation missile?

An anti-radiation missile can take out designated targets that emit radio frequency, including radars and jammers.

An IAF officer explained that an anti-radiation missile homes in on to the target radar and heads towards it, hits it, and destroys the enemy's ability to launch a surface-to-air missile.



The RUDRAM anti-radiation missile was successfully tested Friday | Twitter | @ANI

The missile is fed with various types of frequencies and relevant electronic information gathered from surveillance missions. Signals intelligence operations are carried out, during peacetime as well as wartime, with the help of special aircraft and aerial platforms, to detect different sources of transmission and their location.

The data captured is then subject to a detailed analysis to identify and classify the type of equipment that has been located.

This data is then fed into the anti-radiation missiles, and leads it to the designated radiating target.

“Being a passive seeker (missile is not radiating on its own to pick up the target at any stage) and launched from long stand-off ranges of 100-150 kilometres, it does not warn the enemy of the intended threat,” the officer said.

‘Can dictate the results of a war’

Many in the IAF say anti-radiation missiles can “dictate the results of war”.

A second IAF officer said radars are like the “eyes and ears” of an air defence system and taking them out can render an enemy incapable of detecting foreign aircraft.

“During a war, the goal of an air force would be to dominate the airspace. To prevent that from happening, surface-to-air missiles are deployed, so that the air force doesn’t have the ability to operate in the area in which the missile system is located,” the officer added.

Thus, initially, the officer said, any air force carries out ‘Suppression of Enemy Air Defences (SEAD)’ and ‘Destruction of Enemy Air Defences (DEAD)’ missions to counter the enemy’s air defence systems.

“Once the enemy air defences are taken out, there is freedom to operate and this exposes the enemy to be hit by short-range weapons,” the officer added. The officer said long-range weapons are expensive. So, taking out long-range enemy air defence gives a force the freedom to operate with short-range low-cost bombs and rockets, the officer added.

<https://theprint.in/defence/india-tests-rudram-heres-why-first-indigenous-air-radiation-missile-is-important/521000/>

नवभारत टाइम्स

Sun, 11 Oct 2020

जानें देश की पहली ऐंटी रेडिएशन मिसाइल रुद्रम-1 में क्या है खास

भारत की पहली ऐंटी रेडिएशन मिसाइल 'रुद्रम-1' में खास ट्रैकिंग सिस्टम लगा है। इसकी मदद से दुश्मन के सर्विलांस रडार, ट्रैकिंग और कम्युनिकेशन सिस्टम को आसानी से टारगेट किया जा सकता है।

By Deepak Verma

हाइलाइट्स:

- भारत ने किया 'रुद्रम-1' ऐंटी रेडिएशन मिसाइल का टेस्ट, सफल रहा
- सुखोई-30 फाइटर जेट से छोड़ी गई मिसाइल, ठीक निशाने पर जा लगी
- अलग-अलग तरह की कंडीशंस में लॉन्च की जा सकती है यह मिसाइल
- 'रुद्रम-1' में लगा है खास तरह का जीपीएस, टारगेट ढूंढने में माहिर है

नई दिल्ली: भारत ने पहली स्वदेशी ऐंटी-रेडिएशन मिसाइल, रुद्रम-1 का सफल टेस्ट किया है। डिफेंस रिसर्च ऐंड डेवलपमेंट ऑर्गनाइजेशन (DRDO) की बनाई यह मिसाइल सुखोई-30 से छोड़ी गई। यह मिसाइल टेस्ट भारतीय वायुसेना के लिए था। देश की पहली न्यू जेनेरेशन ऐंटी रेडिएशन मिसाइल (NGARM) का लॉन्च प्लेटफॉर्म फिलहाल

सुखोई ही है। मगर इसे जगुआर, मिराज 2000 और तेजस के साथ लॉन्च करने लायक भी बनाया जा रहा है। यह मिसाइल बेहद खास है जिसे अपना निशाना खोजने में महारत हासिल है। आइए जानते हैं भारत की पहली NGARM रूद्रम-1 के बारे में।

क्या होती है ऐंटी रेडिएशन मिसाइल?

ये वो मिसाइलें होती हैं जिन्हें बनाया ही दुश्मन के कम्युनिकेशन सिस्टम को ध्वस्त करने के लिए है। ये दुश्मन के रडार, जैमर्स और यहां तक कि बातचीत के लिए इस्तेमाल होने वाले रेडियो के खिलाफ भी यूज हो सकती हैं। इन मिसाइलों का इस्तेमाल किसी संघर्ष के शुरुआती दौर में होता है। इसके अलावा ये मिसाइलें अचानक आने वाली जमीन से हवा में मार करने वाली मिसाइलों के खिलाफ भी छोड़ी जा सकती हैं। इन मिसाइल्स में सेंसर्स लगे होते हैं जो रेडिएशन का सोर्स ढूंढते हैं। उसके पास जाते ही मिसाइल फट जाती है।



9 अक्टूबर को हुआ रूद्रम-1 का टेस्ट।

रूद्रम-1 में क्या है खास?

- NGARM में प्राइमरी गाइडेंस सिस्टम के तौर पर ऑन-बोर्ड पैसिव होमिंग हेड (PHH) दिया है जो ब्रॉडबैंड क्षमता से लैस है। इससे मिसाइलों को एमिटर्स में से अपना टारगेट चुनने की काबिलियत मिलती है। नई NGRAM D-J बैंड के बीच ऑपरेट करती है और 100 किलोमीटर की दूर से पता लगा सकती है कि रेडियो फ्रीक्वेंसी कहां से आ रही है।
- रूद्रम-1 टारगेट को ढूंढने वाली मिसाइल है। इसमें एक रडार डोम भी है। इसकी मदद से जमीन पर मौजूद दुश्मन के रडार को ध्वस्त किया जा सकता है।
- रूद्रम मिसाइल 100 से 250 किलोमीटर की रेंज में किसी भी टारगेट को उड़ा सकती है।
- इसे बनाया सुखोई Su-30MKI पर टेस्ट करने के लिए है। लेकिन भविष्य में इसे मिराज 2000, जगुआर, HAL तेजस और HAL तेजस मार्क 2 के साथ भी यूज किया जा सकता है।
- मिसाइल की लंबाई करीब साढ़े पांच मीटर है और वजन 140 किलो है।
- रूद्रम-1 से दुश्मन के एयर डिफेंस सिस्टम के साथ-साथ उन रडार स्टेशंस को भी उड़ाया जा सकता है जो डिटेक्शन से बचने के लिए खुद को शटडाउन कर लेते हैं।

पिछले दिनों हुए प्रमुख मिसाइलों के टेस्ट

3 अक्टूबर: शौर्य मिसाइल का सफल टेस्ट हुआ। यह मिसाइल पनडुबबी से छोड़ी जाने वाली BA-05 मिसाइल का जमीनी रूप है। मिसाइल 50 किलोमीटर की ऊंचाई पर मैच 7 या 2.4 किलोमीटर प्रति सेकेंड की रफ्तार से चलती है। रफ्तार इतनी तेज है कि सीमा पार बैठे दुश्मन के रडार को इसे डिटेक्ट, ट्रैक करने और इंटरसेप्ट करने के लिए 400 सेकेंड्स से भी कम का वक्त मिलेगा।

23 सितंबर: MBT अर्जुन टैंक से लेजर-गाइडेड ऐंटी टैंक गाइडेड मिसाइल (AGTM) का टेस्ट फायर किया गया। मिसाइल ने 3 किलोमीटर दूर टारगेट पर एकदम सटीक वार किया और उसे ध्वस्त कर दिया।

भारत ने टेस्ट किया 'समुद्री ब्रह्मास्त्र'

7 सितंबर: हाइपरसोनिक स्क्रेमजेट टेक्नोलॉजी का प्रदर्शन किया गया। अमेरिका, रूस और चीन के बाद भारत चौथा ऐसा देश बन गया जिसने खुद की हाइपरसोनिक टेक्नोलॉजी विकसित कर ली। बालासोर में हाइपरसोनिक टेक्नॉलजी



डिमॉन्सट्रेटर वीइकल (HSTDV) टेस्ट को अंजाम दिया। यह हवा में आवाज की गति से छह गुना ज्यादा स्पीड से दूरी तय करता है। यानी दुश्मन देश के एयर डिफेंस सिस्टम को इसकी भनक तक नहीं लगेगी।

22 जुलाई: थर्ड जेनरेशन ऐंटी-टैंक गाइडेड मिसाइल 'ध्रुवास्त्र' का टेस्ट हुआ। यह 'नाग हेलीना' (HELINA) का हेलीकॉप्टर संस्करण है। इसके जरिए आसमान से सीधे दाग कर दुश्मन के बंकर, बख्तरबंद गाड़ियों और टैंकों को तबाह किया जा सकता है।

<https://navbharattimes.indiatimes.com/india/anti-radiation-missile-explained-know-everything-about-rudram-1-developed-by-drdo/articleshow/78586819.cms>



Sun, 11 Oct 2020

India test-fires 10 missiles in 35 days. It is not a coincidence

The DRDO's effort to fast-track development of 'Made in India' strategic nuclear and conventional missiles comes against the backdrop of China's refusal to step back from the LAC

By Shishir Gupta

New Delhi: The Defence Research and Development Organisation will early next week fire the 800 km range Nirbhay sub-sonic cruise missile, the last for the solid rocket booster missile before its formal induction into the army and the navy, people familiar with the development told Hindustan Times. It would be the tenth missile test-firing by India's lead defence research organisation in the last 35 days.

The DRDO's effort to fast-track development of 'Made in India' strategic nuclear and conventional missiles - it has fired a missile every four days over nearly a month - comes against the backdrop of China's refusal to step back from the Line of Actual Control.

China's People's Liberation Army had first clashed with Indian soldiers on the northern bank of Ladakh's Pangong Tso lake on May 5 this year, setting up a stand-off that rapidly expanded to four locations in East Ladakh.

The stand-off escalated into a bloody clash in June that killed soldiers on both sides. It was the first time that the two countries had lost soldiers on this border in four decades. A little less than two months later, shots were also fired when Indian soldiers occupied the heights on the north bank of the picturesque salt water lake spread across 700 square km.

The two countries have held numerous rounds of negotiations at the level of diplomats, military officials and ministers; another round is scheduled on Monday. But China has been reluctant to go back to the positions it held before stepping up tensions.

US Secretary of State Mike Pompeo has held up Chinese president Xi Jinping's aggression on the border with India as an example of the Chinese communist party's "bad behaviour". The US estimates China has mobilised about 60,000 troops in depth locations across Ladakh.

The DRDO was quietly told to fast-track its missile programme in the early part of the standoff because the Indian government had doubts about China's commitment to peace on the border, a missile expert associated with the projects said.

The Hypersonic Technology Demonstrator Vehicle (HSTDV) was the first one to be fired on 7 September. Over the next four weeks or so, the DRDO has test-fired the extended-range version of



PM Narendra Modi's government stressed on upgrading defence systems in the early days of the standoff because of its assessment that China would try to push the envelope on the Line of Actual Control (PTI File photo)

the supersonic cruise missile BrahMos that can blow up targets 400 km away, the nuclear-capable Shaurya supersonic missiles that can travel at twice to thrice the speed of sound; and the supersonic missile assisted release of the torpedo that targets submarines apart from test-firing the laser-guided anti-tank guided missile just 10 days apart.

In between, the DRDO also carried out a night trial of the nuclear-capable ballistic missile Prithvi-II, the surface-to-surface missile capable of attacking targets at a range of 300 km. It is India's first indigenous surface-to-surface strategic missile.

The expedited development and testing has made it possible to deploy the terrain-hugging subsonic Nirbhay missile along the Ladakh border in limited numbers.

"The Shaurya missile would be next," an official said about the new-age weapon that can carry a nuclear warhead weighing around 200 kg and flies at 2.4 km per second. The government has cleared its induction into the military. The Indian Strategic Forces Command will decide locations of its deployment under guidance from the National Security Council.

India's race to test missiles

- Hypersonic Technology Demonstration Vehicle 7 Sept
- ABHYAS-High Speed Expendable Aerial Target 22 Sept
- Laser Guided Anti Tank Guided Missile 22 Sept
- Night trial of strategic missile Prithvi II 23 Sept
- Supersonic cruise missile BrahMos 30 Sep
- Laser Guided Anti Tank Guided Missile 1 Oct
- Supersonic Shaurya strategic missile 3 Oct
- Supersonic Missile Assisted Release of Torpedo 5 Oct
- Anti Radiation Missile 9 Oct

<https://www.hindustantimes.com/india-news/india-races-to-upgrade-its-armoury-fires-a-missile-every-4-days/story-UB5RQaMY4zVITIYbNFR8EL.html>



Sun, 11 Oct 2020

चीन से तनाव के बीच भारत ने 35 दिनों में किया 10 मिसाइलों का परीक्षण

भारत शर्मा

लद्दाख में वास्तविक नियंत्रण रेखा (LAC) पर चीन के साथ बढ़े तनाव के बीच भारत अपने रक्षा तंत्र को मजबूत करने में जुटा हुआ है।

भारत लगातार मिसाइल और ताकतवर हथियारों का परीक्षण कर रहा है। इसी कड़ी में रक्षा अनुसंधान एवं विकास संगठन (DRDO) अगले सप्ताह एक और ताकतवर मिसाइल 'निर्भय' का परीक्षण करेगा। यह पिछले 35 दिनों में भारत का दसवां मिसाइल परीक्षण होगा।



यहां जानते हैं अब तक किए गए परीक्षण और उन मिसाइलों की ताकत।

इस खबर में

- भारत ने 7 सितंबर को किया था हाइपरसोनिक टेक्नोलॉजी डिमॉन्स्ट्रेटर व्हीकल का परीक्षण
- 22 सितंबर को किया 'अभ्यास' का परीक्षण
- लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का परीक्षण
- 23 सितंबर को किया पृथ्वी-2 का सफल परीक्षण
- 30 सितंबर को किया सुपरसोनिक क्रूज मिसाइल 'ब्रह्मोस' का परीक्षण
- 1 अक्टूबर को किया लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का दूसरा परीक्षण
- 3 अक्टूबर को किया गया था सुपरसोनिक 'शौर्य' मिसाइल का परीक्षण
- 5 अक्टूबर को किया सुपरसोनिक 'स्मार्ट' मिसाइल का परीक्षण
- शुक्रवार को किया था पहली स्वदेशी एंटी-रेडिएशन मिसाइल 'रुद्रम' का सफल परीक्षण
- अगले सप्ताह किया जाएगा सब-सोनिक क्रूज मिसाइल 'निर्भय' का परीक्षण

1. भारत ने 7 सितंबर को किया था हाइपरसोनिक टेक्नोलॉजी डिमॉन्स्ट्रेटर व्हीकल का परीक्षण

DRDO ने सबसे पहले 7 सितंबर को हाइपरसोनिक टेक्नोलॉजी डिमॉन्स्ट्रेटर व्हीकल (HSTDV) का सफल परीक्षण किया था।

उसके साथ ही भारत हाइपरसोनिक मिसाइल तकनीक विकसित करने वाला अमेरिका, रूस और चीन के बाद चौथा देश बन गया। यह हवा में आवाज की गति से छह गुना ज्यादा रफ्तार से दूरी तय करता है। दुश्मन देश के एयर डिफेंस सिस्टम को इसकी भनक नहीं लग पाती है।

यह अपने साथ लॉन्ग रेंज और हाइपरसोनिक क्रूज मिसाइलें ले जा सकता है।

2. 22 सितंबर को किया 'अभ्यास' का परीक्षण

DRDO ने 22 सितंबर को ओडीशा के बालासोर में हाई स्पीड एक्सपेंडेबल एरियल टार्गेट (HEAT) 'अभ्यास' का सफल परीक्षण किया था।

परीक्षण में विभिन्न रडारों और इलेक्ट्रो ऑप्टिक प्रणाली के जरिये इसकी निगरानी की गई थी। इसका उपयोग विभिन्न मिसाइल प्रणालियों के मूल्यांकन के लिए एक लक्ष्य के रूप में किया जा सकता है।

यह एक छोटे गैस टरबाइन इंजन और MEMS नेविगेशन सिस्टम पर काम करता है। यह नवीन तकनीक का उदाहरण है।

3. लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का परीक्षण

DRDO ने 22 सितंबर को ही लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का सफल परीक्षण किया था। उसे महाराष्ट्र के अहमदनगर में MBT अर्जुन टैंक से दागा गया था।

इसे कई-प्लेटफॉर्म लॉन्च क्षमता के साथ विकसित किया गया है। यह मिसाइल मॉडर्न टैंक्स से लेकर भविष्य के टैंक्स को भी नेस्तनाबूद करने में सक्षम है।

इसका हेड हिलते हुए लक्ष्य पर निशाना बांधने में सक्षम बनाता है। इसे कम ऊंचाई पर उड़ने वाले हेलिकॉप्टर्स भी ढेर हो सकते हैं।

4. 23 सितंबर को किया पृथ्वी-2 का सफल परीक्षण

DRDO ने 23 सितंबर को ही देश में विकसित पृथ्वी-2 मिसाइल का सफल रात्रिकालीन परीक्षण किया था। सतह से सतह पर मार करने वाली यह मिसाइल परमाणु हथियार ले जाने में सक्षम है। इसकी मारक क्षमता 350 किलोमीटर की है।

5. 30 सितंबर को किया सुपरसोनिक क्रूज मिसाइल 'ब्रह्मोस' का परीक्षण

DRDO ने 30 सितंबर को सुपरसोनिक क्रूज मिसाइल 'ब्रह्मोस' के विस्तारित रेंज वर्जन का सफल परीक्षण किया था।

यह मिसाइल 450 किमी तक की दूरी और 200 किलो का पारंपरिक वॉरहेड ले जाने की क्षमता रखती है। नौ मीटर लंबी और 670 मिमी व्यास वाली यह मिसाइल 14 किमी तक की ऊंचाई तक जा सकती है और 20 किमी की दूरी पर मार्ग बदल लेती है।

इसे पनडुब्बी, जहाज, एयरक्राफ्ट या जमीन से भी लॉन्च किया जा सकता है।

6. 1 अक्टूबर को किया लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का दूसरा परीक्षण

DRDO ने 1 अक्टूबर को लेजर गाइडेड एंटी टैंक गाइडेड मिसाइल का दूसरा सफल परीक्षण किया था। इसकी मारक क्षमता पांच किलोमीटर है। यह मिसाइल विस्फोटक प्रतिक्रिया बख्तर से सुरक्षित बख्तरबंद वाहनों को डेढ़ से पांच किलोमीटर के रेंज में ध्वस्त कर सकती है।

7. 3 अक्टूबर को किया गया था सुपरसोनिक 'शौर्य' मिसाइल का परीक्षण

DRDO ने 3 अक्टूबर को सुपरसोनिक तकनीक से विकसित 'शौर्य' मिसाइल का सफल परीक्षण किया था। यह हल्की है और इसे आसानी से ऑपरेट किया जा सकता है। इसकी मारक क्षमता 1,000 किलोमीटर है। जमीन से जमीन पर मार करने वाली यह मिसाइल पनडुब्बी से लांच किए जाने वाली बैलिस्टिक मिसाइल का जमीनी रूप है।

यह आवाज की गति से छह गुना अधिक रफ्तार से चलती है। इसे ट्रैक करने के लिए 400 सैंकंड से भी कम समय मिलता है।

8. 5 अक्टूबर को किया सुपरसोनिक 'स्मार्ट' मिसाइल का परीक्षण

DRDO ने 5 अक्टूबर को देश में विकसित 'सुपरसोनिक मिसाइल असिस्टेड रिलीज ऑफ टॉरपीडो' (स्मार्ट) का ओडिशा के बालासोर से सफल परीक्षण किया। यह एक तरह की सुपरसोनिक एंटी-शिप मिसाइल है।

इसके साथ कम वजन का टॉरपीडो लगा है जो पेलोड की तरह इस्तेमाल होता है। दोनों इसे एक सुपरसोनिक एंटी-सबमरीन मिसाइल बनाते हैं यानी इसमें मिसाइल के फीचर्स भी मिलेंगे और पनडुब्बी नष्ट करने की क्षमता भी। इसी क्षमता 650 किलोमीटर है।

9. शुक्रवार को किया था पहली स्वदेशी एंटी-रेडिएशन मिसाइल 'रुद्रम' का सफल परीक्षण

DRDO ने शुक्रवार को पहली स्वदेशी एंटी-रेडिएशन मिसाइल 'रुद्रम' का सफल परीक्षण किया। इसे सुखोई-30 लड़ाकू विमान से दागा गया था।

इस मिसाइल को लॉन्च प्लेटफॉर्म के रूप में सुखोई-30 लड़ाकू विमान पर लगाया गया है। लॉन्च की स्थिति के आधार पर यह मिसाइल अलग-अलग दूरी तक मार कर सकती है।

इसमें लगा पैसिव होमिंग हेड अलग-अलग फ्रेक्वेंसी पर लक्ष्यों की पहचान कर और उन्हें वर्गीकृत कर निशाना साध सकता है।

10. अगले सप्ताह किया जाएगा सब-सोनिक क्रूज मिसाइल 'निर्भय' का परीक्षण

DRDO के अधिकारियों के अनुसार अगले सप्ताह में सब-सोनिक क्रूज मिसाइल 'निर्भय' का परीक्षण किया जाएगा। इसकी मारक क्षमता 800 किलोमीटर की होगी। इस परीक्षण के सफल होने से रक्षा क्षेत्र में भारत की ताकत और अधिक बढ़ जाएगी।

<https://hindi.newsbytesapp.com/timeline/india/22737/116350/india-test-fires-10-missiles-in-35-days>

India likely to conduct maiden test of Indigenous Technology Cruise Missile on October 12

The weapon system that has completed six developmental trials between 2012 and 2019 was recently deployed following Chinese aggression along the line of actual control

By Hemant Kumar Rout

Bhubaneswar: After conducting successful trials of seven missiles in a month, India is all set to conduct the maiden trial of its Indigenous Technology Cruise Missile (ITCM) from a defence test facility off the Odisha coast on Monday.

A highly placed defence source on Saturday told *The New Indian Express* that the missile, a new version of subsonic cruise missile Nirbhay will be test fired with short turbo fan engine and an advanced radio frequency seeker.

Nirbhay missile was India's first indigenously developed cruise missile. The weapon system that has completed six developmental trials between 2012 and 2019 was recently deployed following Chinese aggression along the line of actual control.

"The new version of Nirbhay has been fitted with advanced software and more indigenous systems, including the turbo fan engine. All the preparations for the test are in the final stage and the missile is ready for the test. The launch window has been set between Monday and Wednesday. The missile will be flight tested as per schedule if the weather favours," the sources said.

Although the earlier version of Nirbhay has a strike range of 800 km to 1,000 km, the navigation area warning is issued for a range of around 400 km for the ICTM test.

After the take off, the missile will travel vertically for a range of around 150 km before making a steep dive and following the horizontal trajectory.

More than 200 scientists and technical officials are camping at the launch site and leaving no stone unturned for the successful trial of the missile to establish the India's power in developing long range cruise missiles that are faster and stealthier.

While the turbo fan engine has been developed by Gas Turbine Research Establishment, the radio frequency seeker has been produced by the Research Centre Imarat.

"Since Nirbhay had failed to deliver desired results during a couple of initial phase trials, we are trading very cautiously this time. As all faults in its earlier version have been rectified and the missile is now a matured technology, we hope the ICTM will be roaring success," said a defence scientist.

Developed by Defence Research and Development Organisation (DRDO), the new cruise missile will supplement the Indo-Russian joint venture supersonic cruise missile BrahMos.

India had successfully test fired the extended range version of BrahMos with indigenous booster recently.

The two-stage ICTM has a length of six meters, diameter of 0.52 m, wing span 2.7 m and a launch weight of about 1.5 tonne.

<https://www.newindianexpress.com/states/odisha/2020/oct/11/india-likely-to-conduct-maiden-test-of-indigenous-technology-cruise-missile-on-october-12-2208832.html>



A new version of the subsonic cruise missile Nirbhay as seen here, will be test fired with short turbo fan engine and an advanced radio frequency seeker. (Photo | EPS)

India-China standoff: How Indian Air Force's 5th generation fighter jet will change air equation in South Asia

As the Indian Air Force celebrated its 88th founding day, defence circles and India's technology industry is busy working on the 5th generation fighter jet to be unveiled in 2029.

IAF'S fifth generation Advanced Medium Combat Aircraft

According to reports, India has decided to manufacture fifth generation Advanced Medium Combat Aircraft on its own under the Atmanirbhar Bharat Abhiyan. The move is a quantum leap in India's bid for high technology in its bid to catch up with other nations over the next decade.

The Rafale fighter jets currently being sold to India by France in the 4.5 generation stage. China on the other hand claims its J-20 stealth aircraft is a 5th generation fighter.

First prototype

According to reports, DRDO (Defence Research & Development Organization), the HAL (Hindustan Aeronautics Limited) will be involved in making the 5th-generation fighter jet for India. The Advanced Medium Combat Aircraft (AMCA) programme is likely to public-private program, reports say.



The first prototype is set to be unveiled in by 2026-27. India had earlier pulled out of Su-57 fifth-generation fighter program with Russia two years ago.

UK's Tempest

Reports say India's state of the art fifth-generation fighter aircraft could be included into the Indian Air Force by 2029, that is in just nine years which is will be an extraordinary feat for India's defence technology.

In 2007, India and Russia had agreed to jointly develop the fifth-generation fighter jet under the Sukhoi/HAL Fifth Generation Fighter Aircraft (FGFA) programme but had pulled out in 2018.

In fact, there were reports of the Indian Air Force ready to align with the UK sixth-generation fighter aircraft "Tempest" which is more advanced than F-22, F-35, J-20 and J-31.

Eurofighter Typhoon

Reports said India had shortlisted the Eurofighter Typhoon which is set to be operational post-2035.

However, there is no clarity that Indian authorities will take the deal forward, especially now with the decision to manufacture fifth-generation Advanced Medium Combat Aircraft at home.

Supersonic, long-range, highly maneuverable fighter

In the race for the supreme fighter, the biggest question remains what exactly is a fifth-generation fighter?

According to Lockheed Martin, the fighter should have a "combination of very low observable stealth, advanced sensors, information fusion and network connectivity – all packaged within in a supersonic, long-range, highly manoeuvrable fighter."

Lockheed defines the F-35 being flown by the US Air Force as the perfect example of a 5th generation fighter.

"With its advanced technology, the F-35A is a multi-role fighter capable of successfully executing any and all mission, including new missions not traditionally fulfilled by legacy fighters," it says.

'Specifically configured for the Indian Air Force'

There were reports earlier that the US government wanted to offer F-35 combat jet to India. The Indian Air Force is in dire need to replace its ageing fleet of MiG-21 and MiG-27 squadrons which is set to retire before 2025 creating a big hole in its arsenal.

Reports say the Indian Air Force needs at least 100 fighter jets to replenish its fleet.

According to Lockheed Martin, the F-21 fighter is specifically configured for the Indian Air Force as it provides "unmatched" 'Make in India' opportunities and strengthens India's path to an advanced airpower future.

Lockheed Martin and Tata to produce F-21 in India

The F-21 addresses the Indian Air Force's unique requirements and integrates India into the world's largest fighter aircraft ecosystem with the world's pre-eminent defence company. Lockheed Martin and Tata would produce the F-21 in India, for India, it says. "F-21 production in India supports thousands of US supplier jobs, including hundreds of US-based Lockheed Martin engineering, program management, sustainment and customer support positions," the company says.

Rafale: India's 4.5 generation aircraft India's

Rafale is generally recognised as the 4.5 generation aircraft which can take on the Chinese on its own strength as it combines both air-to-air and air-to-ground capabilities and can carry a range of potent weapons. European missile maker MBDA's Meteor air-to-air missile and Scalp cruise missile is the mainstay of their weapons package. Meteor is a next-generation beyond visual range air-to-air missile (BVRAAM) designed to revolutionise air-to-air combat. The weapon has been developed by MBDA to combat common threats facing the UK, Germany, Italy, France, Spain and Sweden.

Beyond Visual Range interception

It has been cleared to operate weapons like the MICA air-to-air 'Beyond Visual Range' (BVR) interception, combat and selfdefence missiles, the METEOR very long-range air-to-air missile, the HAMMER -- Highly Agile and Manoeuvrable Munition Extended Range -- modular, rocket-boosted air-to-ground precision-guided weapon series, laser-guided bombs with different warheads, and "specific armaments" selected by some clients. The Rafale is also fitted with 14 hardpoints, out of which five are capable of drop tanks and heavy ordnance. The jet's total external load capacity is more than nine tonnes. "Hence, Rafale can lift the equivalent of its own empty weight in payloads," according to Dassault. As per the manufacturers, the pilot interface is very easy to use and relies on a highly integrated suite of equipment which has capabilities for short-term, medium and long-term actions. The design of the cockpit gives a wide field of view at the front, on both sides, and at the rear.

<https://www.wionews.com/photos/india-china-standoff-how-indian-air-forces-5th-generation-fighter-jet-will-change-air-equation-in-south-asia-334475#beyond-visual-range-interception-316496>

Drones stand out among other threats in their destructive potential: Army Vice Chief

Vice Chief of Army Staff Lt Gen S K Saini said a large number of the Army's troops are deployed in extremely high altitude areas where the temperature touches -50 degrees celsius but India is still importing cold-weather clothing and equipment for them due to "lack of viable indigenous solutions"

New Delhi: Drones or unmanned aerial vehicles (UAVs) stand out among other threats in their innovative employment and destructive potential, Vice Chief of Army Staff Lt Gen S K Saini said on Saturday.

"Considering their (drones) low cost, multi-use and dense proliferation, the threat will no doubt increase manifold in the years to come," he said during a webinar organised by the Centre for Joint Warfare Studies (CENJOWS).

He said the "third dimension" threats like drones may take precedence in the near future and the Army needs to plan for them now.

"Both hard kill and soft kill counter-drone solutions, including swarm technology, are the need of the hour," Saini noted.

He was addressing the webinar titled "Force Protection India 2020" during which various issues pertaining to requirements for armed forces' protection were discussed.

"Among other threats, drones and UAVs stand out in their innovative employment and destructive potential," Saini mentioned.

He said a large number of the Army's troops are deployed in extremely high altitude areas where the temperature touches -50 degrees celsius but India is still importing cold-weather clothing and equipment for them due to "lack of viable indigenous solutions".

"A collaborative effort needs to be put in this field to fulfil our vision of Atmanirbhar Bharat," he added.

Saini said the Indian Army has evolved considerably in terms of modern arms, ammunition, protection, kitting and clothing but there is still much scope for innovation.

"There is a requirement to focus on night-vision goggles, combat helmets, bulletproof jackets, light portable communication sets and many more," he added.

The Army vice chief said the threat from improvised explosive devices (IEDs) is here to stay as it seems to be gaining traction as a favoured tool among terrorists and anti-national elements.



SK Saini was addressing the webinar titled "Force Protection India 2020" during which various issues pertaining to requirements for armed forces' protection were discussed.(HT Photo)

“The threat (from the IEDs) is sophisticated and can be used while avoiding direct contact. It ends up causing both physical and psychological trauma and seriously impairs own readiness, by forcing us to commit scarce resources for our own protection,” he stated.

Technological innovation is key to combating the threat from the IEDs, Saini said.

“A combination of robotics, artificial intelligence and big data analysis could provide a possible answer,” he added.

Security of defence establishments and vital installations across the country is another key area where the Army has focused its efforts in the past few years, as these present lucrative and high profile targets, he said.

“Though the industry has stepped up to the challenge (of providing security to defence establishments), the solutions provided, however, lack innovation and integration,” Saini mentioned.

He added that the effort in this field must be to ensure a reduction in manpower commitment by integrating physical and electronic surveillance and incorporating automation and innovation in perimeter fencing, intrusion detection systems, etc.

Saini said the Army’s deployment footprint extends across the length and breadth of the country and across varying terrains and the sheer magnitude of its requirements presents a golden opportunity to the industry, scientists and entrepreneurs.

<https://www.hindustantimes.com/india-news/drones-stand-out-among-other-threats-in-their-destructive-potential-army-vice-chief/story-Mcqm42NITGvCc3wjQGOiWJ.html>



Sun, 11 Oct 2020

Concerns raised over imports of mountain clothing for Army

Vice-Chief of Army Lt. Gen. S.K. Saini calls for domestic production

New Delhi: With the Army looking to strengthen troops in high altitude areas in Eastern Ladakh due to the ongoing standoff with China, the Vice-Chief of Army Lt. Gen. S.K. Saini on Saturday called for attaining self-reliance and reducing import of special clothing and mountaineering equipment.

“A large number of our troops are deployed in super high-altitude areas where the temperature touches (minus) 50°C. However, we are still importing cold weather equipment, mainly due to the lack of viable indigenous solutions,” Lt. Gen. Saini said. A collaborative effort is needed to fulfil the vision of Atmanirbhar Bharat, he said at a webinar organised by the Centre for Joint Warfare Studies.

The Army has been maintaining troops in high altitude areas of Siachen glacier at heights of 20,000 feet for decades. With the ongoing standoff along the disputed border with China, the Army has procured clothing and shelter to house the troops through the winter in Ladakh as there has been no progress in talks for disengagement.

Security of establishments

Lt. Gen. Saini also highlighted the security of defence establishments and vital installations, improvised explosive devices (IED) and drones as major priority areas to find domestic solutions. “Though the industry has stepped up to the challenge, the solutions provided lack innovation and



Lt. Gen. S.K. Saini. Photo: Special Arrangement

integration,” he said, calling for efforts to ensure reduction in manpower commitment by integrating physical and electronic surveillance and incorporating automation.

Lt. Gen. Saini said IEDs seem to be gaining traction as a favoured tool for terrorists and anti-national elements. “It ends up causing both physical and psychological trauma and seriously impairs readiness, by forcing us to commit scarce resources for our protection,” he said, stressing that technological innovation is the key to combating the threat.

“Amongst other threats, drones and unmanned aerial vehicles (UAV) stand out in their innovative employment and destructive potential,” Lt. Gen. Saini said. Considering their low-cost, multi-use and dense proliferation, he said, “Both hard kill and soft kill counter-drone solutions, including swarm technology, are the need of the hour.”

<https://www.thehindu.com/news/national/concerns-raised-over-imports-of-mountain-clothing-for-army/article32823073.ece>

THE
WIRE

Mon, 12 Oct 2020

How does the Indian Army's winter deployment in Ladakh fare against the PLA's?

While PLA troops will weather the same punitive environment, better living conditions will give them an advantage over their Indian rivals, despite the latter's superior experience in mountain warfare

By Rahul Bedi

Chandigarh: The rival Indian and Chinese armies locked in an intractable faceoff along the disputed line of actual control (LAC) since May, are now positioning themselves for their harsh winter deployment at forbidding altitudes in the desolate Himalayan Ladakh region, the world's highest and most fierce-some desert.

Senior Indian army officials said that other than remaining vigilant at heights of over 13,000 feet and above, the two armies are furiously preparing to combat, till April 2021, the harsh and unrelenting environment in which temperatures have already dropped to well below zero degrees Celsius in some parts.



Military tankers carrying fuel move towards forward areas in the Ladakh region, September 15, 2020. Photo: Reuters/Danish Siddiqui

To counter such bitter cold and temperatures that will shortly average minus 25 degrees Celsius, before plummeting further in the upper mountainous reaches to minus 40 degrees, China has provided its People's Liberation Army (PLA) troops with prefabricated thermal shelters in an environ where even the slightest carelessness can be fatal.

According to UK's *Jane's Defence Weekly (JDW)*, the *PLA Daily* had reported that these thermally insulated habitats, developed by the Army Engineering University comprise dormitories, wash rooms, toilets, warehouses, microgrids and heating equipment. The latter, the *Daily* stated is capable of managing temperatures up to minus 55 degrees by maintaining an indoor balminess of 15 degrees Celsius.

The October 9 *JDW* report goes on to reveal that such PLA facilities, which have been in use across outposts on the Tibetan plateau and surrounding mountainous areas over the past two years, can be adjusted in terms of size, structure and interior spaces to meet the soldier's needs.

Quoting from the *PLA Daily*, JDW claims that these shelters can reduce reliance on long-distance fuel distribution, whilst additional warmth can be supplemented by diesel heaters to tackle rainy and snowy conditions, as well as extreme temperature lows. The prestigious magazine further stated that PLA personnel deployed in this region against the Indian Army had also been issued an assortment of ‘new high-tech’ clothing to combat the cold, but provided no details of Chinese troop numbers in the area.

Army sources, however, said these totalled around 50,000 PLA personnel, adding that logistically these troops had a “topographical advantage’ with regard to terrain and, unlike on the Indian side, their outposts were serviced by a web of metalled roads that crisscrossed the Tibetan plateau. This network rendered transporting troops, materiel, ordnance and other essentials like food far less cumbersome, faster and cheaper for the PLA.

The well accoutred PLA posts along the LAC are also likely to be fully electrified soon. The *Global Times*, a mouthpiece for the Chinese Communist Party, recently claimed that the Chinese State Grid Corporation was scheduled to complete a mega power project in the region by December by laying a 1.689km long transmission line. Costing over \$1.1 billion this arterial link line connected China’s national power grid to the Ngari prefecture in Tibet’s westernmost area abutting the LAC.

Unlike the PLA, the Indian Army had major haulage problems and infrastructural handicaps in the form of roads and unfriendly terrain in servicing its forward vertiginous positions along the LAC. It sourced a majority of its requirements, including food, fuel, oil and lubricants from the plains, transporting them via an unending fleet of civilian and army trucks that travelled up to Ladakh throughout summer, augmented by supplies ferried in by Indian Air Force (IAF) heavy-lift aircraft like C-17 Globemaster IIIs and C-130J-30 Super Hercules at astronomical cost.

In its LAC deployment of around 40,000 troops spread across 250-300km of the LAC, the army is drawing upon its experiences garnered from 36-years of manning the 17,000 feet high Siachen Glacier, which has the additional hazards of avalanches and slippery slopes, which are not there in Ladakh.

But the overwhelming challenges the army faces in its winter deployment along the LAC remain formidable.

“Although the threat perception from China always existed, it remained in the background and we never acted upon it or took any remedial action to obviate it” said military analyst Major General A.P. Singh (retired) who has served in Ladakh. Now that it has emerged abruptly, we are scrambling to make do with what we have to make good our extended winter deployment along the LAC, he resignedly added.

Meanwhile, the army’s Enhanced Winter Stocking (EWS) is currently at an advanced stage of amassing lakhs of tons of assorted supplies, including ammunition, at Leh from where these goods are being pushed further to logistics nodes, either aboard trucks or helicopters and even by mules and porters to remoter areas. “In places like Ladakh logistics is of huge importance” Major General Arvind Kapoor, chief of staff of the army’s Leh-based XIV Corps recently told *Reuters*. In the last 20 years, we have mastered it and all supplies that we need have already been pushed to wherever they are required, he added.

Army engineers are also erecting an assortment of imported arctic tents for three to five soldiers and varied pre-fabricated insulated huts, sourced locally, to accommodate six to 20 troops each. Every habitation is being equipped with kerosene-fuelled Bukhari’s or special heaters, without which it would be impossible to exist, while hasty imports of high altitude clothing and mountaineering equipment mostly from Europe, at high cost, is underway. Hundreds of previously worn serviceable clothing items from Siachen are being passed on to formations now based along the LAC.

Additionally, pre-fabricated toilet and bathing stalls-unlikely to be used much, if at all, due to a severe water shortage-and kitchens are also being erected. Officers who have been posted in the area said rocky terrain, limited spaces and fierce winds carrying deadly particles of sand, made it

difficult to assemble larger structures similar to those of the PLA. Semi-permanent brick-and-mortar constructions were simply out of the question, as their cement if applied now would only dry the following summer, said Gen Singh, adding that it is difficult to even remotely imagine the extreme adversities army troops will imminently face along the LAC.

Water for drinking, basic daily usage and for cooking too will be in short supply, as many rivers and tributaries in the area are already freezing up, and unlike Siachen where snow can be melted, this option is limited along the LAC. Furthermore, water from the Pangong Lake and other large water bodies scattered across the desolate region, is brackish and undrinkable.

Army officers also anticipate an additional workload on the Army Medical Corps (AMC) in anticipation of a host of potential high-altitude complications amongst soldiers like pulmonary and cerebral oedema and hypothermia-related attrition. Equally debilitating problems like frostbite, high blood pressure, nose bleeds, hypertension and respiratory ailments are also not uncommon at those heights. Consequently, the number of AMC teams per battalion, staffed by doctors and nursing orderlies too will need augmenting.

And though PLA troops too will weather the same punitive environment, their better living conditions will give them an overall advantage over their Indian rivals, despite the latter being widely acknowledged as hardier and more experienced in mountain warfare compared to their Chinese adversaries.

The PLA, for its part last fought a four-week long war with Vietnam in 1979, in which it came off worse. Thereafter, following a gap of over four decades it is, for the first time currently locked in a faceoff with a 'real' enemy with a comparable military in altogether inhospitable conditions that pose a daunting threat to its men and machines.

It remains to be seen how competently it will emerge from this ordeal next summer.

<https://thewire.in/security-security/indian-army-ladakh-china-peoples-liberation-army-winter-deployment>

ThePrint

Sun, 11 Oct 2020

Indian Army's Russian Dragunov sniper rifle could soon get long-awaited upgrade

DSR is a gas-operated short-stroke piston rifle. Indian Army has been one of the largest users of DSR & its different versions have been supplied by its Russian manufacturer Kalashnikov

By Snehes Alex Philip

New Delhi: The long-awaited upgrade of the legendary Dragunov sniper rifle, commonly known in the armed forces as DSR, could soon be a reality as an Indian private company has come out with an indigenous solution that gives the weapon night-firing capability, besides other new features.

While the Russian manufacturer of the rifle, Kalashnikov, has also come up with an upgrade, the upgrade programme is mentioned in the negative import list put out by the defence ministry in August. The cut-off date mentioned in the negative import list is December 2020.

Bangalore-based firm SSS Defence has come out with an upgrade, which also brings down the recoil, besides giving it a bipod.

While the Northern Command has come out with



An upgraded Dragunov sniper rifle | Source: SSS Defence

a Request for Proposal for the upgrade of 90 pieces of the nearly three-decade-old rifle, the Army is estimated to have anywhere between 6,000-7,000 pieces.

What are DSRs?

Designed by a Soviet weapon designer, Yevgeny Dragunov, in the late 1950s, the DSR is a gas-operated short-stroke piston rifle.

The weapon was put through exhaustive testing across environments before the former Soviet armed forces began inducting them. By the late 1970s, the weapon was used in combat in several countries across continents.

The Indian Army has been one of the largest users of the DSR and its different versions have been supplied by Kalashnikov.

While Army officers still swear by the ability of the DSR that has an effective range of around 800 metres, they say that mission criteria and nature of operations has changed over time.

The weapons have largely not undergone any major modification except what is known as ‘Special Operations Modifications’.

The DSRs in service with the Indian Army, for the most part, don’t have the ability to operate with an inline clip on day-sight and night-sight together.

“In fact, the DSR does not offer a system to mount night vision at all. Even the sniper scopes that can be used in conjunction are limited to a 4x magnification and modern day sniper scopes can’t be mounted at all,” a source said.

Also, the weapon can’t use stability-imparting accessories like a bipod, the source added.

Older versions of DSRs, which populate the Indian Army’s arsenal, have wooden buttstocks and a recoil that affects accuracy and convenience of use.

Why is the Army looking at upgrading DSRs?

According to sources, the barrel of a DSR can easily fire up to 7,000 rounds and most have not done more than 3,000 each.

“This means that the rifle still has a long life ahead. It may not be a sniper weapon in the present day, but it is still a decent squad ‘Designated Marksman Rifle’ or DMR. The Army will easily take a few years to acquire and induct a more lethal sniper weapon with effective ranges of 1.2 km and above,” a second source said.

“The modern day sniper variants that the Indian Army plans to procure and have procured in limited numbers are intended for long-range targeting. Taking them into combat at intermediate ranges of 500m to 800m with expensive ammunition and high-trained snipers is the equivalent of taking a sledgehammer to crack a nut,” the source added.

What does the upgrade of DSR mean?

A DSR upgrade can help bridge the gap between the age-old precision weapon and demands of modern infantry warfare.

According to SSS Defence, its upgrade significantly reduces recoil with a new tactical buttstock with a built-in monopod and adjustable cheek rest.

A full-length picatinny rail that allows for the clipping of a thermal weapon sight or image intensifier sight in front of a day scope is also the part of upgrade. The clip on configuration allows the operator to maintain the existing day scope.

The upgrade will also come with an ergonomic pistol grip, attachment of accouterments like a laser range finder, besides a new muzzle brake for reduced recoil and flash.

<https://theprint.in/defence/indian-armys-russian-dragunov-sniper-rifle-could-soon-get-long-awaited-upgrade/520538/>

Navy to hold passage exercise with U.S. carrier

Navy ships will hold a PASSEX with USS Ronald Reagan on October 12 as it transits through the Indian Ocean, the official said

By Dinakar Peri

New Delhi: Continuing the series of its maritime engagements, the Navy is scheduled to hold another Passage Exercise (PASSEX) with a U.S. Navy aircraft carrier group on October 12, an official source said.

Navy ships will hold a PASSEX with USS Ronald Reagan on October 12 as it transits through the Indian Ocean, the official said. The PASSEX is likely to be held in the waters off Kochi.

On September 25, for the first time a U.S. Navy P-8A long range maritime patrol aircraft (MPA) landed at Port Blair, Andaman and Nicobar Islands, for refuelling under the bilateral logistics support agreement.

In July, frontline warships of the Navy conducted a PASSEX with the U.S. Navy's Nimitz carrier strike group near the Andaman and Nicobar islands as it was transiting the Indian Ocean. The USS Nimitz was returning from the South China Sea through the Strait of Malacca where it undertook Freedom of Navigation Operations (FONOP). USS Ronald Reagan was in the South China Sea in August to conduct FONOPs amid tensions between China and the U.S.

The trilateral Malabar Naval exercise with Japan and the U.S. is also scheduled to be held in November, though there is no clarity on inviting Australia for the exercise.

<https://www.thehindu.com/news/national/navy-to-hold-passage-exercise-with-us-carrier/article32823126.ece>



The USS Ronald Reagan is anchored off in Manila Bay on August 7, 2019. | Photo Credit: AFP



Mon, 12 Oct 2020

Indian private sector to be co-traveller in India's space journey, says Union Minister Jitendra Singh

Jitendra Singh said this is also a part of the Narendra Modi-led government's 'AtmaNirbhar' roadmap towards self-reliant India

Edited By Pushkar Tiwari

Highlights

1. *Jitendra Singh said this is also a part of the Narendra Modi-led government's 'AtmaNirbhar' roadmap towards self-reliant India.*
2. *Elaborating further, the Union Minister said that the private companies will be provided with a level playing field in satellite launches and space-based activities.*
3. *Singh stated that the new reforms will seek to shift the space-related activities in the country from 'Supply Based Model' to a 'Demand Based Model'.*

New Delhi: Union Minister Jitendra Singh on Sunday (October 11, 2020) said here today that the ISRO (Indian Space Research Organisation) is all set to open its facilities for the private sector and that the Indian private sector will be a co-traveller in India's space sector journey.

Referring to some of the reforms in the Department of Space under Prime Minister Narendra Modi, Singh said, "Possibly for the first time in the history of independent India, future projects for planetary exploration, outer space travel etc will be open for the private sector."

Singh said this is also a part of the Modi government's 'AtmaNirbhar' roadmap towards self-reliant India, which envisages the initiative to boost private sector participation in Space activities.



File Photo (www.pib.gov.in)

Elaborating further, the Union Minister said that the private companies will be provided with a level playing field in satellite launches and space-based activities.

Singh stated that the new reforms will seek to shift the space-related activities in the country from 'Supply Based Model' to a 'Demand Based Model'.

"With the creation of Indian National Space Promotion and Authorisation Centre (IN-SPACe), there will be a mechanism in place and the private sector will be allowed to use ISRO's facilities and other relevant assets to improve their capacities," he said.

Singh said that a web link has been provided for private industries to submit their applications.

"Applications received from industries and Start-ups are to be processed by a high level committee," he added.

<https://zeenews.india.com/india/indian-private-sector-to-be-co-traveller-in-indias-space-journey-says-union-minister-jitendra-singh-2316652.html>

ISRO's human space flight rocket to have multiple backups for crucial systems

India's human space flight rocket will have multiple redundancies/backup systems as a matter of safety and the necessary hardware for building the rocket are coming in, said a senior official

New Delhi: India's human space flight rocket will have multiple redundancies/backup systems as a matter of safety and the necessary hardware for building the rocket are coming in, said a senior official.

"The GSLV (Geosynchronous Satellite Launch Vehicle) that will be used for the Gaganyaan or the human space flight mission will be built with four redundancies (backup systems) for critical functions as a safety measure," S. Somanath, Director, Vikram Sarabhai Space Centre (VSSC) told IANS.

The VSSC is part of Indian Space Research Organisation (ISRO) and based in Thiruvananthapuram in Kerala.

For instance, there will be multiple sensors for a particular function so that if one fails the other will be functional, a former ISRO official told IANS.

The Indian space agency has said the parachute systems are configured with redundancy.

The avionics for Crew Escape System are configured as an independent system including instrumentation system and sequencing system, ISRO said.

According to Somanath, no major design changes were made to the GSLV Mk-III rocket that will carry three Indian astronauts to space.

"We have just modified the design slightly as per the need," Somanath said.

The electronics will be the major cost component in the rocket.

India plans to send three astronauts to space to be in orbit for about a week.

The first unmanned test flight of GSLV, as part of the country's human space mission Gaganyaan, is expected to happen in 2021.

Two unmanned GSLV rockets will be tested before the actual human flight can happen.

ISRO Chairman K. Sivan had earlier said that the "design and engineering of the launch vehicle and orbital module system for India's human space flight has been completed. A series of tests have to be completed to validate the design and engineering of the systems in 2020".

According to ISRO, the facilities required for carrying out the preparation and check-out of orbital module have been identified and actions taken for the realisation of various systems and equipment.

A full scale integration mock-up of crew module has been realised through industry for integration trials of subsystems.

<https://www.indiatvnews.com/news/india/isro-s-human-space-flight-rocket-to-have-multiple-backups-for-crucial-systems-655985>

ISRO plans to launch new rocket made at cost of about Rs 120 crore by November 2020

The Indian space agency is working towards launching its new rocket 'Small Satellite Launch Vehicle (SSLV)' before December 2020, said a senior official

Edited By Namrata Agrawal

Chennai: The Indian space agency is working towards launching its new rocket 'Small Satellite Launch Vehicle (SSLV)' before December 2020, said a senior official.

He also said necessary tests to check its biggest motor - booster motor fired by solid fuel - will be done in November.

"The SSLV launch will be from the first launch pad at Sriharikota rocket port after the flight of Polar Satellite Launch Vehicle C49 (PSLV C49). Post PSLV C49's flight, the launch pad set up has to be reconfigured to suit SSLV," S. Somanath, Director, Vikram Sarabhai Space Centre (VSSC) part of the Indian Space Research Organisation (ISRO) told IANS.

Sometime next month PSLV C49 will fly with about 10 satellites. The rocket will be carrying India's RISAT-2BR2 and other commercial satellites. It will be followed by PSLV C50 with the GSAT-12R satellite in December. The rocket is being assembled at Sriharikota with various systems coming from different centres. It will fly from the second launch pad, Somanath said.

"From the drawing board to launch pad the time taken is only about two-and-half years. The SSLV is a three stage/engine rocket all powered by solid fuel," Somanath added.

The 34-metre rocket will have a liftoff mass of 120 tons. The rocket has the capability for multiple satellite launches at different orbits. The SSLV can carry a 500 kg payload for low earth orbit (LEO) and 300 kg for sun-synchronous orbit (SSO).

According to Somanath, the development cost of the rocket is about Rs 120 crore.

"The major development for SSLV is its brand new electronic systems with local components. All the qualifications of the systems have been done. The rocket also has a simple pyrotechnic system," Somanath said.

The new miniaturised telemetry system developed for SSLV has achieved 70 per cent mass reduction in the telemetry package.

According to Somanath, in order to develop the rocket at a lower cost, ISRO with a simplified manufacturing process -- for instance, cutting down the machining time wherever possible -- went to the next level of vendors with the necessary capabilities.

Somanath said the developmental cost of SSLV is low and only the third stage of the PSLV rocket has been adopted for the new rocket.

The per kg cost of launching a satellite will be similar to that of ISRO's other rocket PSLV.

He said the first payload for SSLV has already been booked and some more payloads are being looked at as the rocket has a capacity to carry up to 500 kg.

According to ISRO, the first satellite to be carried by SSLV will be 142 kg Mircrosat-2A to demonstrate launch on demand capability. The satellite is expected to meet the ever-increasing user demands for cartographic applications at cadastral level, urban and rural management, coastal land use and regulation, utilities mapping, development and various other geographic information system (GIS) applications.

Queried about a different name for the rocket as new private players have named their rockets as 'Vikram' and 'Agnibaan', Somanath said it is for the government to decide on that.

<https://zeenews.india.com/india/isro-plans-to-launch-new-rocket-made-at-cost-of-about-rs-120-crore-by-november-2020-2316190.html>

New NIST project to build nano-thermometers could revolutionize temperature imaging

By Ben P. Stein

Cheaper refrigerators? Stronger hip implants? A better understanding of human disease? All of these could be possible and more, someday, thanks to an ambitious new project underway at the National Institute of Standards and Technology (NIST).

NIST researchers are in the early stages of a massive undertaking to design and build a fleet of tiny ultra-sensitive thermometers. If they succeed, their system will be the first to make real-time measurements of temperature on the microscopic scale in an opaque 3-D volume—which could include medical implants, refrigerators, and even the human body.

The project is called Thermal Magnetic Imaging and Control (Thermal MagIC), and the researchers say it could revolutionize temperature measurements in many fields: biology, medicine, chemical synthesis, refrigeration, the automotive industry, plastic production—"pretty much anywhere temperature plays a critical role," said NIST physicist Cindi Dennis. "And that's everywhere."

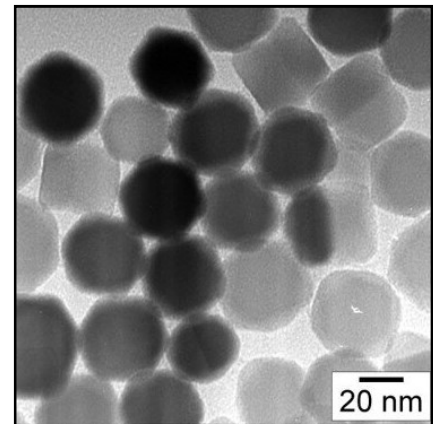
The NIST team has now finished building its customized laboratory spaces for this unique project and has begun the first major phase of the experiment.

Thermal MagIC will work by using nanometer-sized objects whose magnetic signals change with temperature. The objects would be incorporated into the liquids or solids being studied—the melted plastic that might be used as part of an artificial joint replacement, or the liquid coolant being recirculated through a refrigerator. A remote sensing system would then pick up these magnetic signals, meaning the system being studied would be free from wires or other bulky external objects.

The final product could make temperature measurements that are 10 times more precise than state-of-the-art techniques, acquired in one-tenth the time in a volume 10,000 times smaller. This equates to measurements accurate to within 25 millikelvin (thousandths of a kelvin) in as little as a tenth of a second, in a volume just a hundred micrometers (millionths of a meter) on a side. The measurements would be "traceable" to the International System of Units (SI); in other words, its readings could be accurately related to the fundamental definition of the kelvin, the world's basic unit of temperature.

The system aims to measure temperatures over the range from 200 to 400 kelvin (K), which is about -99 to 260 degrees Fahrenheit (F). This would cover most potential applications—at least the ones the Thermal MagIC team envisions will be possible within the next 5 years. Dennis and her colleagues see potential for a much larger temperature range, stretching from 4 K-600 K, which would encompass everything from supercooled superconductors to molten lead. But that is not a part of current development plans.

"This is a big enough sea change that we expect that if we can develop it—and we have confidence that we can—other people will take it and really run with it and do things that we currently can't imagine," Dennis said.



These prototype nanoparticle cores for thermometry are 35 nm in diameter. Credit: A. Biacchi/NIST

Potential applications are mostly in research and development, but Dennis said the increase in knowledge would likely trickle down to a variety of products, possibly including 3-D printers, refrigerators, and medicines.

What Is It Good For?

Whether it's the thermostat in your living room or a high-precision standard instrument that scientists use for laboratory measurements, most thermometers used today can only measure relatively big areas—on a macroscopic as opposed to microscopic level. These conventional thermometers are also intrusive, requiring sensors to penetrate the system being measured and to connect to a readout system by bulky wires.

Infrared thermometers, such as the forehead instruments used at many doctors' offices, are less intrusive. But they still only make macroscopic measurements and cannot see beneath surfaces.

Thermal MagIC should let scientists get around both these limitations, Dennis said.

Engineers could use Thermal MagIC to study, for the first time, how heat transfer occurs within different coolants on the microscale, which could aid their quest to find cheaper, less energy-intensive refrigeration systems.

Doctors could use Thermal MagIC to study diseases, many of which are associated with temperature increases—a hallmark of inflammation—in specific parts of the body.

And manufacturers could use the system to better control 3-D printing machines that melt plastic to build custom objects such as medical implants and prostheses. Without the ability to measure temperature on the microscale, 3-D printing developers are missing crucial information about what's going on inside the plastic as it solidifies into an object. More knowledge could improve the strength and quality of 3-D-printed materials someday, by giving engineers more control over the 3-D printing process.

Giving It OOMMF

The first step in making this new thermometry system is creating nano-sized magnets that will give off strong magnetic signals in response to temperature changes. To keep particle concentrations as low as possible, the magnets will need to be 10 times more sensitive to temperature changes than any objects that currently exist.

To get that kind of signal, Dennis said, researchers will likely need to use multiple magnetic materials in each nano-object. A core of one substance will be surrounded by other materials like the layers of an onion.

The trouble is that there are practically endless combinations of properties that can be tweaked, including the materials' composition, size, shape, the number and thickness of the layers, or even the number of materials. Going through all of these potential combinations and testing each one for its effect on the object's temperature sensitivity could take multiple lifetimes to accomplish.

To help them get there in months instead of decades, the team is turning to sophisticated software: the Object Oriented MicroMagnetic Framework (OOMMF), a widely used modeling program developed by NIST researchers Mike Donahue and Don Porter.

The Thermal MagIC team will use this program to create a feedback loop. NIST chemists Thomas Moffat, Angela Hight Walker and Adam Biacchi will synthesize new nano-objects. Then Dennis and her team will characterize the objects' properties. And finally, Donahue will help them feed that information into OOMMF, which will make predictions about what combinations of materials they should try next.

"We have some very promising results from the magnetic nano-objects side of things, but we're not quite there yet," Dennis said.

Each Dog Is a Voxel

So how do they measure the signals given out by tiny concentrations of nano-thermometers inside a 3-D object in response to temperature changes? They do it with a machine called a magnetic particle imager (MPI), which surrounds the sample and measures a magnetic signal coming off the nanoparticles.

Effectively, they measure changes to the magnetic signal coming off one small volume of the sample, called a "voxel"—basically a 3-D pixel—and then scan through the entire sample one voxel at a time.

But it's hard to focus a magnetic field, said NIST physicist Solomon Woods. So they achieve their goal in reverse.

Consider a metaphor. Say you have a dog kennel, and you want to measure how loud each individual dog is barking. But you only have one microphone. If multiple dogs are barking at once, your mic will pick up all of that sound, but with only one mic you won't be able to distinguish one dog's bark from another's.

However, if you could quiet each dog somehow—perhaps by occupying its mouth with a bone—except for a single cocker spaniel in the corner, then your mic would still be picking up all the sounds in the room, but the only sound would be from the cocker spaniel.

In theory, you could do this with each dog in sequence—first the cocker spaniel, then the mastiff next to it, then the labradoodle next in line—each time leaving just one dog bone-free.

In this metaphor, each dog is a voxel.

Basically, the researchers max out the ability of all but one small volume of their sample to respond to a magnetic field. (This is the equivalent of stuffing each dog's mouth with a delicious bone.) Then, measuring the change in magnetic signal from the entire sample effectively lets you measure just that one little section.

MPI systems similar to this exist but are not sensitive enough to measure the kind of tiny magnetic signal that would come from a small change in temperature. The challenge for the NIST team is to boost the signal significantly.

"Our instrumentation is very similar to MPI, but since we have to measure temperature, not just measure the presence of a nano-object, we essentially need to boost our signal-to-noise ratio over MPI by a thousand or 10,000 times," Woods said.

They plan to boost the signal using state-of-the-art technologies. For example, Woods may use superconducting quantum interference devices (SQUIDs), cryogenic sensors that measure extremely subtle changes in magnetic fields, or atomic magnetometers, which detect how energy levels of atoms are changed by an external magnetic field. Woods is working on which are best to use and how to integrate them into the detection system.

The final part of the project is making sure the measurements are traceable to the SI, a project led by NIST physicist Wes Tew. That will involve measuring the nano-thermometers' magnetic signals at different temperatures that are simultaneously being measured by standard instruments.

Other key NIST team members include Thinh Bui, Eric Rus, Brianna Bosch Correa, Mark Henn, Eduardo Correa and Klaus Quelhas.

Before finishing their new laboratory space, the researchers were able to complete some important work. In a paper published last month in the *International Journal on Magnetic Particle Imaging*, the group reported that they had found and tested a "promising" nanoparticle material made of iron and cobalt, with temperature sensitivities that varied in a controllable way depending on how the team prepared the material. Adding an appropriate shell material to encase this nanoparticle "core" would bring the team closer to creating a working temperature-sensitive nanoparticle for Thermal MagIC.

In the past few weeks, the researchers have made further progress testing combinations of materials for the nanoparticles.

"Despite the challenge of working during the pandemic, we have had some successes in our new labs," Woods said. "These achievements include our first syntheses of multi-layer nanomagnetic systems for thermometry, and ultra-stable magnetic temperature measurements using techniques borrowed from atomic clock research."

More information: A.J. Biacchi, T.Q. Bui, C.L. Dennis, S.I. Woods, A.R. Hight Walker. Design and engineering colloidal magnetic particles for nanoscale thermometry. *International Journal on Magnetic Particle Imaging*. Published September 2, 2020.

DOI: [10.18416/ijmpi.2020.2009068](https://doi.org/10.18416/ijmpi.2020.2009068)

<https://phys.org/news/2020-10-nist-nano-thermometers-revolutionize-temperature-imaging.html>



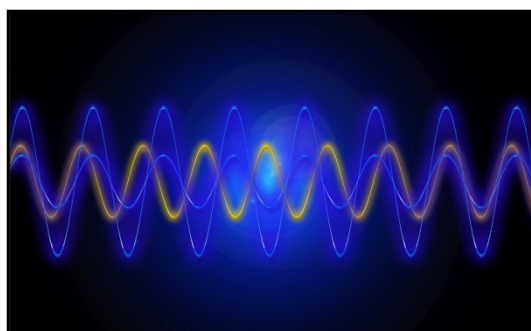
Sat, 10 Oct 2020

Scientists find upper limit for the speed of sound

A research collaboration between Queen Mary University of London, the University of Cambridge and the Institute for High Pressure Physics in Troitsk has discovered the fastest possible speed of sound.

The result- about 36 km per second—is around twice as fast as the speed of sound in diamond, the hardest known material in the world.

Waves, such as sound or light waves, are disturbances that move energy from one place to another. Sound waves can travel through different mediums, such as air or water, and move at different speeds depending on what they're travelling through. For example, they move through solids much faster than they would through liquids or gases, which is why you're able to hear an approaching train much faster if you listen to the sound propagating in the rail track rather than through the air.



Credit: CC0 Public Domain

Einstein's theory of special relativity sets the absolute speed limit at which a wave can travel which is the speed of light, and is equal to about 300,000 km per second. However until now it was not known whether sound waves also have an upper speed limit when travelling through solids or liquids.

The study, published in the journal *Science Advances*, shows that predicting the upper limit of the speed of sound is dependent on two dimensionless fundamental constants: the fine structure constant and the proton-to-electron mass ratio.

These two numbers are already known to play an important role in understanding our Universe. Their finely-tuned values govern nuclear reactions such as proton decay and nuclear synthesis in stars and the balance between the two numbers provides a narrow 'habitable zone' where stars and planets can form and life-supporting molecular structures can emerge. However, the new findings suggest that these two fundamental constants can also influence other scientific fields, such as materials science and condensed matter physics, by setting limits to specific material properties such as the speed of sound.

The scientists tested their theoretical prediction on a wide range of materials and addressed one specific prediction of their theory that the speed of sound should decrease with the mass of the atom. This prediction implies that the sound is the fastest in solid atomic hydrogen. However, hydrogen is an atomic solid at very high pressure above 1 million atmospheres only, pressure comparable to those in the core of gas giants like Jupiter. At those pressures, hydrogen becomes a fascinating metallic solid conducting electricity just like copper and is predicted to be a room temperature superconductor. Therefore, researchers performed state-of-the-art quantum mechanical calculations to test this prediction and found that the speed of sound in solid atomic hydrogen is close to the theoretical fundamental limit.

Professor Chris Pickard, Professor of Materials Science at the University of Cambridge, said: "Soundwaves in solids are already hugely important across many scientific fields. For example, seismologists use sound waves initiated by earthquakes deep in the Earth interior to understand the nature of seismic events and the properties of Earth composition. They're also of interest to materials scientists because sound waves are related to important elastic properties including the ability to resist stress."

More information: "Speed of sound from fundamental physical constants" *Science Advances* (2020). advances.sciencemag.org/lookup...1126/sciadv.abc8662

Journal information: *Science Advances*
<https://phys.org/news/2020-10-scientists-upper-limit.html>

COVID-19 Research News

live**mint**

Sun, 11 Oct 2020

India's first COVID-19 vaccine Covaxin journey: From test results to phase 3 trial, latest updates

By Anulekha Ray

- *Covaxin is currently in the phase II clinical trial in the country*
- *Covaxin will use adjuvant Alhydroxiqum-II to boost immune response and longer lasting immunity, Bharat Biotech said*

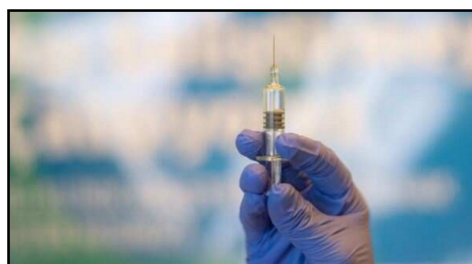
Covaxin, India's first COVID-19 vaccine candidate has sought the drug regulator's approval to start the large scale phase III clinical trial in the country. The Drugs Controller General of India asked the vaccine maker Bharat Biotech to submit "complete safety and immunogenicity data of the phase II trial" and some clarifications before proceeding for the next stage.

Developed by Bharat Biotech in collaboration with the Indian Council of Medical Research (ICMR), Covaxin is currently in the phase II clinical trial in the country. Hyderabad-based Bharat Biotech earlier released the animal study results of Covaxin. "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.

Covaxin will use adjuvant Alhydroxiqum-II to boost immune response and longer lasting immunity, the firm said last week. The technology is being used under a licensing agreement with Kansas-based ViroVax, said Bharat Biotech.

"There is critical need for development and availability of adjuvants that elucidate mechanisms of action inducing greater antibody responses to vaccine antigens, thus resulting in long-term protection against pathogens. Adjuvants also enhance the sustainability of the global vaccine



Covaxin has been derived from a strain of the novel coronavirus isolated by the National Institute of Virology in Pune (AFP)

supply on account of their antigen-sparing effect," Krishna Ella, chairman and managing director of Bharat Biotech said.

How does Covaxin work?

Covaxin has been derived from a strain of the novel coronavirus isolated by the National Institute of Virology in Pune. Bharat Biotech developed an "inactivated" vaccine at its high-containment facility at Genome Valley in Hyderabad.

"Once the vaccine is injected into a human, it has no potential to infect or replicate, since it is a killed virus. It just serves to the immune system as a dead virus and mounts an antibody response towards the virus," Bharat Biotech said.

For phase III trial, the drugmaker plans to enroll 28,500 volunteers aged 18 years and above. The trial will be conducted across 10 states including Delhi, Mumbai, Patna and Lucknow. The phase III clinical trial application proposed a dose of 0.5 ml on day 0 and 28, sources told *PTI*.

COVID-19 vaccine candidates in India

India's coronavirus vaccine production and delivery capacity will help all humanity in fighting the pandemic, said Prime Minister Narendra Modi at the United Nations General Assembly last month. "As the largest vaccine producing country of the world, I want to give one more assurance to the global community today. India's vaccine production and delivery capacity will be used to help all humanity in fighting this crisis," he added.

Besides, Bharat Biotech, another vaccine candidate developed by Zydus Cadila Ltd is in the phase II of the human clinical trials. Serum Institute of India has partnered with AstraZeneca for manufacturing the COVID-19 vaccine candidate developed by the University of Oxford. Pune-based drugmaker is conducting Phase II and III human clinical trials of the candidate in India.

<https://www.livemint.com/science/health/india-s-first-covid-19-vaccine-covaxin-from-phase-iii-trial-to-results-latest-updates-11602329585580.html>

