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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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## Atul Dinkar Rane appointed as BrahMos Aerospace Chief

*Atul Dinkar Rane has been appointed as the new Chief Executive Officer and Managing Director of the BrahMos Aerospace Limited that manufactures the BrahMos supersonic cruise missile*

*By Manjeet Negi*

New Delhi: Atul Dinkar Rane has been appointed as the new Chief Executive Officer and Managing Director of the BrahMos Aerospace Limited that manufactures the BrahMos supersonic cruise missile.

Rane is renowned for his decades of sustained R&D contributions in the indigenous design and development of mission critical Onboard Computers (OBC), hardware in loop simulation studies, systems analysis, development of mission software and avionics technologies for defence applications.

His pioneering contributions and techno-managerial leadership has been transformative for the successful development and induction of BrahMos Supersonic Cruise Missile into Armed Forces.

Rane graduated in Electronics and Communication Engineering from Guindy Engineering College, Chennai and received his post-graduate degree in Guided Missiles from the University of Poona.

He joined DRDO in the year 1987 and started his initial career at Defence Research and Development Laboratory (DRDL) as System Manager and carried out simulation studies and established modular real-time simulation test mechanisms for the indigenously developed Surface to Air Akash Missile System.

Later as part of onboard computers division, Research Centre Imarat (RCI), he led the development of Onboard Mission Software for Agni-I missile and also established a unique integrated testbed facility for seamless test and evaluation of Onboard Systems for various missile projects. He was one of the core team members of BrahMos Aerospace right from its foundation as a Joint Venture with Russia. His significant contributions as programme manager, avionics and system integration for programme PJ-10.

He steered the feasibility studies, conceptual design, planning, development, testing, integration and certification of DRDO Onboard systems culminating in successful demonstration, induction and subsequent productisation of BrahMos, the world's fastest supersonic cruise missile system strengthening the arsenal of armed forces with a formidable weapon system.

<https://www.indiatoday.in/india/story/atul-dinkar-rane-appointed-as-brahmos-aerospace-chief-1890136-2021-12-21>



Atul Dinkar Rane is renowned for R&D contributions in indigenous design. (Photo: ANI)

# LCA Tejas: Armed with lethal French, Israeli Missiles, India says indigenous fighter jets part of IAF's modernization drive

By Ashish Dangwal

India's Ministry of Defense has stated that the indigenous Tejas light combat aircraft (LCA) is not being inducted as a replacement of the aging MiG-21 fighter jet but as part of the modernization process of the Indian Air Force.

The latest information was provided by the junior defense minister Ajay Bhatt in a written reply to a lawmaker's query in the Upper House of Parliament on December 20. The overall cost of manufacturing 24 LCA Tejas delivered till September 30, 2021, according to the press statement, is Rs 6,653 crore.

Following the IAF's deal with Hindustan Aeronautics Limited (HAL), a total of 123 Tejas fighter aircraft will be manufactured. However, the news release also indicated that future manufacturing would be depending on the Indian armed forces' requirements or export orders.



[IAF Tejas – Wikimedia Commons](#)

Contrary to MOD's claims, the Indian government had declared plans to develop a new LCA in 1983 and was projected as a replacement for the Russian MiG-21s. The Soviet-era jets are still in service although they are way past their expiry date.

Moreover, in the Public Accounts Committee, 2018-19 report, it was clearly stated that the LCA would be inducted into IAF by 1994 as a replacement for the MiG-21.

The first prototype of the LCA, however, did not fly until 2001, 18 years after the project began. One of the main reasons for the delay was India's desire to develop its own jet engine, which is still a work in progress.

The Print's Editor-in-Chief Shekhar Gupta explained that India was stuck in a dreadful situation of technology denial in the 1970s and 1980s, particularly after the 1974 Pokhran nuclear tests. India was refused access to any "critical technology" by the West, particularly the United States. Furthermore, after India's nuclear tests in May 1998, Washington imposed sanctions on New Delhi.

The Tejas received the initial operational clearance in December 2013, and the IAF acquired the first aircraft with final operational clearance in 2019. On January 13, 2021, the Cabinet Committee on Security approved a Rs 48,000-crore procurement for 83 Tejas LCAs, including 73 Mark 1A versions, giving a push to the government's 'Make in India' initiative.

## Tejas Mk-1A

The latest order of 83 Tejas is the supplement of the initial order for 40 of the base Mark 1 model (including 8 trainers). India and HAL are banking on significant upgrades to the Mark-1A to ensure India's continued investment in the Tejas in various ways.

These improvements include mid-air refueling, enhancing the combat ability, and maintainability improvements through the incorporation of Active Electronically Scanned Array (AESA) Radar, Electronic Warfare (EW) suite, and Beyond Visual Range (BVR) missile capabilities.

Since the aircraft incorporates extensive collaboration between the private sector and HAL, it will provide a significant boost to the domestic aviation industry. Dynamatic Technologies will build the front fuselage of the latest Tejas, while VEM Technologies in Hyderabad will produce the middle part and Alpha Design Technologies in Bengaluru will develop the rear section. Larsen and Toubro will produce the wings for the Tejas Mk-1A.

MBDA, a European missile manufacturer, has reportedly stated that its high-performance Meteor beyond-visual-range missiles, which India is purchasing for its Rafale fighters, will not be integrated into Tejas.

The LCA Mk-1A will have the capability to fire BVR missiles like the Derby, and this capability is already incorporated into the present Tejas.

According to HAL officials, an indigenously developed BVR missile (ASTRA Mk 1) has been chosen to be incorporated into Mk-1A. Moreover, the LCA Mk-1A's survivability will be improved with the addition of a podded Self-Protection Jammer (SPJ) and AESA radar.

As reported earlier by The EurAsian Times, the Defence Research and Development Organisation (DRDO) has successfully integrated Israeli 5th-gen Python-5 air-to-air missiles with LCA Tejas.

The Derby BVR air-to-air missile is also being tested to prove its expanded capability, according to DRDO. Some Experts believed that the Derby is an offshoot of the Python missile family, as it bears a lot of similarities with the Python-4 with an active radar seeker.

India has also ordered HAMMER missiles from France to enhance the capabilities of its LCA Tejas jets. The acquisition will enable Tejas jets to strike enemy bunkers 70km away and allow them to carry Balakot-like airstrikes.

Earlier, EurAsian Times reported that HAL plans to replace the Tejas' F404 engine with the more powerful General Electric F414 turbofan in the future to achieve higher performance standards.

### **Tejas Mk-2**

HAL is also developing the Tejas Mark-II, a medium-weight delta-wing aircraft. The Tejas Mk-2 will feature enhanced range and endurance. It will have canards and a payload capacity of 6,500 kg. This is about twice the payload capacity of the LCA Tejas, which could carry 3,500 kg.

The MK-2 will be equipped with the Uttam AESA radar, which is a 'Made in India' product. This indigenous radar is thought to be advanced enough to give it an advantage over Israeli-made radars currently installed on other Tejas models.

The Uttam radar is also thought to be capable of detecting and neutralizing hostile electronic warfare (EW) attempts.

The aircraft's most intriguing feature is an onboard oxygen generation system. The Tejas Mk-2 will be armed with heavy weapons like the Scalp, Crystal Maze, and Spice-2000 classes.

The Tejas, however, may confront some difficulty in the future as the aircraft is a non-stealth fourth-generation fighter, while militaries around the world are pursuing stealthy fifth-generation aircraft programs. Given India's limited defense budget, funding for the Tejas program could also be a problem.

<https://eurasianimes.com/lca-tejas-armed-with-lethal-french-israeli-missiles-modernization-drive/>

## 24 Desi Tejas fighters inducted

New Delhi: Giving a boost to the IAF fighter aircraft fleet, 24 indigenously designed and manufactured Tejas light combat aircraft (LCA) have been inducted into the service. The total cost of these jets is more than Rs 6,000 crore and the IAF plans to have a total of 123 Tejas in the coming years, the Rajya Sabha was informed on Monday.

In one of biggest deals to procure indigenously manufactured weapons, the Cabinet Committee on Security (CCS), chaired by Prime Minister Narendra Modi in January this year, cleared the contract worth over Rs 47,000 crore for 83 Tejas jets. They will be manufactured by the public sector aerospace conglomerate Hindustan Aeronautics Limited (HAL).

Giving details about the modernisation plans, Minister of State for Defence Ajay Bhatt informed the Rajya Sabha on Monday the Tejas is not being inducted as a replacement of MIG-21 fighter aircraft, but as a part of modernisation of IAF.

He said amount spent so far on the manufacture of 24 LCA Tejas delivered till 30.09.2021 is Rs 6,653 crore. Considering the contract with the HAL, a total of 123 Tejas fighter aircraft are to be manufactured. Further production depends upon requirement for Defence forces and exports, the minister added. He gave this information in a written reply to an MP Brijlal.

The CCS nod earlier this year was for procurement of 73 LCA Tejas Mk-1A fighter aircraft and 10 LCA Tejas Mk-1 trainer aircraft at the cost of Rs 45,696 crore along with design and development of infrastructure sanctions worth Rs 1,202 Crore.

“This deal would be a game changer for self reliance in the Indian defence manufacturing, Defence Minister Rajnath Singh had then said on Twitter. The indigenous content of the LCA-Tejas was 50 per cent in the MK1A variant and it would be enhanced to 60 per cent by the end of the programme.

The MK-1A will have over 40 modifications over the MK1 variant, including some major ones like an Electronic Warfare system, Advanced Electronically Scanned Array (AESA) radar, Beyond Visual Range (BVR) missiles and a network warfare system comprising Software Defined Radio (SDR).

The Cabinet also approved infrastructure development by the IAF under the project to enable them handle repairs or servicing at their base depot so that the turnaround time would get reduced for mission critical systems and lead to increased availability of aircraft for operational exploitation, the defence ministry had said.

“This would enable the IAF to sustain the fleet more efficiently and effectively due to availability of repair infrastructure at respective bases,” it added.

The first LCA MK-1A is expected to roll out from 2023-24 onwards, from which the HAL plans to ramp up the production rate to 16 aircraft a year. While a second line had been set up, production on both lines has been kept at eight aircraft a year to keep the assembly running due to limited orders. The HAL is outsourcing significant work share to the private industry as it has more than 550 vendors for the LCA, which includes five companies manufacturing the structures.

<https://www.dailypioneer.com/2021/india/24-desi-tejas-fighters-inducted.html>

## **Jagran Explainer: What is DRDO's aerial delivery system CADS-500 and how it will help Indian Armed Forces**

*In a statement, the DRDO said that the flight demonstration, which was conducted at Agra in Uttar Pradesh using an AN-32 aircraft, is part of a series of activities organised towards celebrating 'Azadi Ka Amrit Mahotsav'.*

New Delhi: The Defence Research and Development Organisation (DRDO) on Sunday said that the Aerial Delivery Research and Development Establishment (ADRDE) had conducted a flight demonstration of its controlled aerial delivery system having the capability to deliver 500 kg of payload (abbreviated as CADS-500) on December 18.

In a statement, the DRDO said that the flight demonstration, which was conducted at Agra in Uttar Pradesh using an AN-32 aircraft, is part of a series of activities organised towards celebrating 'Azadi Ka Amrit Mahotsav', commemorating 75 years of independence of India.

"System performance was demonstrated at Drop Zone, Malpura from an altitude of 5000m. The system was para-dropped from AN32 aircraft and then steered to the predesignated landing point in autonomous mode. Eleven paratroopers of Indian Army and Indian Air Force chased the CADS-500 in air and landed simultaneously," the Defence Ministry said in a release.



Pic credits: Twitter - @DRDO\_India

### **What is CADS-500 and why is it important for the Indian defence sector?**

The CADS-500 will help the Indian Armed Forces deliver a payload of 500 kg "at a predetermined location by making use of manoeuvrable capabilities of Ram Air Parachute (RAP)". As per the DRDO, the CADS-500 uses the Global Positioning System (GPS) for the coordinates, altitude and heading sensors for the heading information during its flight.

"The CADS, with its onboard electronics unit, autonomously steers its flight path using waypoint navigation towards target location by operating controls," the Defence Ministry release said.

### **What is ADRDE and what is its role?**

The ADRDE or the Aerial Delivery Research and Development Establishment is a research and development (R&D) lab of the DRDO that is located in Uttar Pradesh's Agra. It is involved in the development of paratrooper parachute systems, aircrew parachute systems, ammunition parachute systems, brake parachute, recovery parachute systems, aerial delivery parachute systems, heavy drop systems, inflatable systems, airship technologies and aircraft arrester barrier systems.

Currently, it is involved in projects such as armament delivery parachutes, balloon barrage and surveillance systems, airships and related applications and space recovery parachutes.

<https://english.jagran.com/india/jagran-explainer-what-is-drdo-s-aerial-delivery-system-cads500-and-how-it-will-help-indian-armed-forces-10036619>

## चीन-पाक को घुसकर मारेंगे देसी Drone, 100 KM तक बरसाएंगे बम-मिसाइल

शुरुआती स्तर पर ड्रोन निगरानी एवं जासूसी के लिए इस्तेमाल होते थे,  
लेकिन अब यह दुश्मन के घर में घुसकर तबाही मचाने के लिए इस्तेमाल हो रहे हैं।

By मोहित सक्सेना, Edited By Nihar Saxena

नई दिल्ली: चीन से वास्तविक नियंत्रण रेखा पर तनाव के बीच मोदी सरकार आत्मनिर्भर भारत अभियान के तहत सेनाओं के तीनों अंगों को हर चुनौती से निपटने के लिए तैयार कर रही है। भविष्य के युद्ध उन्नत हथियारों के साथ-साथ मानवरहित ड्रोन तैयार करने पर काम भी चल रहा है। इस कड़ी में बेहद उन्नत हथियारों से लैस ड्रोन अब भारत में ही तैयार किए जाएंगे। इसके लिए पूरा खाका तैयार कर लिया गया है। रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) इस किस्म के ड्रोन सेनाओं के तीनों अंगों के लिए बनाएगा। हालांकि तात्कालिक जरूरतों के लिए अभी भारत 30 अत्याधुनिक ड्रोन अमेरिका से खरीदने जा रहा है।



चीन और पाकिस्तान के लिए डीआरडीओ ने बजाई खतरे की घंटी. (Photo Credit: न्यूज नेशन)

### अगले एक दशक में ड्रोन उत्पादन में आत्मनिर्भर होगा भारत

रक्षा सूत्रों के अनुसार अगले एक दशक में देश में सशस्त्र ड्रोन तैयार कर लिए जाएंगे। डीआरडीओ की कई प्रयोगशालाएं इस पर काम शुरू कर चुकी हैं। इस परियोजना के तहत डीआरडीओ मौजूदा मानवरहित विमानों खासकर रुस्तम जी-2 को सशस्त्र ड्रोन के रूप में परिवर्तित करेगा। इसके अलावा नये ड्रोन प्लेटफॉर्म भी तैयार किए जाएंगे। सशस्त्र ड्रोन दुश्मन पर बम और मिसाइलों से हमले करने में सक्षम होंगे। सशस्त्र ड्रोन 100 किमी या इससे अधिक दूरी तक हमला करने में सक्षम होंगे। सूत्रों ने कहा कि तात्कालिक जरूरतों की पूर्ति के लिए अमेरिका से 30 सशस्त्र प्रीडेटार ड्रोन खरीदे जाएंगे जिनमें से 10-10 प्रत्येक सैन्य बलों को दिए जाएंगे। इनकी कीमत लगभग तीन अरब डॉलर बैठने का अनुमान है।

### भारी तबाही मचाते हैं उन्नत ड्रोन

दरअसल पारंपरिक युद्ध में आधुनिक हथियारों समेत उन्नत ड्रोन का महत्व तेजी से बढ़ रहा है। शुरुआती स्तर पर ड्रोन निगरानी एवं जासूसी के लिए इस्तेमाल होते थे, लेकिन अब यह दुश्मन के घर में घुसकर तबाही मचाने के लिए इस्तेमाल हो रहे हैं। सामरिक जानकारों का कहना है कि आने वाले समय में तमाम युद्ध ऐसे ही बिना पायलट वाले हथियारों से लैस छोटे विमानों और ड्रोन के जरिये लड़े जाएंगे। हाल में नौसेना प्रमुख आर हरिकुमार ने भी जोर देकर कहा कि हथियारबंद ड्रोन देश में ही तैयार किए जाएंगे।

<https://www.newsnationtv.com/india/news/indian-drone-attack-china-pakistan-by-reaching-100-km-inside-235511.html>



# Does India have hypersonic missile technology? The country gets ready to strengthen its capabilities: Know more

*Historically, based on the information available in the public domain, there were several kingdoms in India which had used rockets which were part of their warfare at the time.*

Close on the heels of China successfully conducting tests of a hypersonic glide vehicle (HGV), defence minister Rajnath Singh has urged scientists to work towards this technology. At a seminar organised by Defence Research and Development Organisation (DRDO), defence minister Rajnath Singh urged scientists to focus on this technology. Soon after China carried out tests, media reports indicated that the HGV circled the globe; however, it missed its target by a few kilometres.

## History of Missiles and related technology in India

Historically, based on the information available in the public domain, there were several kingdoms in India which had used rockets which were part of their warfare at the time. It is all pre-Independence history. And in the 18th century, the then Mysore ruler Hyder Ali's army had inducted iron-cased rockets. Based on the information available, there was a company of rocketeers attached to each of the brigade. The numbers were around 5000 rocket carrying troops.



Indo-Russian jointly developed BrahMos – 300-500 km range is already operational and short-range is ramjet-powered. (PTI image)

## Did India have any indigenous missile capabilities after independence?

No. There was no such indigenous missile capability with India. In 1958, the government at the time set up the Special Weapon Development Team and this was later expanded and named the Defence Research and Development Laboratory (DRDL). And in 1962, this moved from Delhi to Hyderabad.

## Details from DRDO official history

According to the DRDO Lab History, “Project Devil was initiated in 1972 this project formed the technology base for the future IGMDP Programme. And this project was for the development of a medium range Surface-to-Surface Missile.”

It was during this period that several test facilities and infrastructure was set up which were used for development of components / systems for Project Devil. And, by 1982, DRDL was working on several technologies under the Integrated Guided Missiles Development Programme (IGMDP)

Under the IGMP which was at that time headed by APJ Abdul Kalam, who later was India's President is the man behind Prithvi, and then Agni.

Missiles India has

India belongs to the elite group of countries which has developed and designed its missiles indigenously. However, it has a long way to go as it is way behind countries like the US, Russia or China in terms of range.

The DRDO is working on different kinds of missiles and among the surface-launched systems:

## ANTI-TANK GUIDED MISSILE:

This missile is already part of the Indian armed forces and it is the only “fire-and-forget ATGM. This has the capability to meet all weather requirements for its range which is around 20 km.

Recently the DRDO had announced that Heli-Nag was tested. This missile which can be operated from helicopters is expected to be inducted in 2022. Another one is Stand-off Anti-Tank (SANT) missile, this has a range over 10 km, and this was tested last week from the helicopters of Indian Air Force (IAF). This missile has a millimeter wave seeker and this helps in enhancing target detection in all weather conditions. As has been reported earlier, even man-portable ATGMs are available.

#### **SURFACE-TO-AIR MISSILE:**

The Indian Army and the IAF have already inducted short-range SAM system Akash. The Indian Army has got the Acceptance of Necessity (AoN) for Akash 1, which is equipped with a seeker. And for the New Generation Akash tests were carried out earlier this year in July and more tests are expected to be carried out.

#### **Medium-Range SAM:**

The Indian Navy is expected to place orders for the MRSAM soon, according to DRDO. Production is already complete for MRSAM, and Jaisalmer-based 2204 Squadron of the IAF was the first unit to get this missile system in September this year. The DRDO is expected to soon carry out flight tests for the MRSAM for the Indian Army.

#### **Short-Range SAM:**

Flight tests have been carried out for the Navy.

Air-launched systems:

#### **AIR-TO-AIR:**

Beyond Visual Range Air-to-Air Missile (BVRAAM) Astra has already completed all tests and is ready to be inducted. This missile has a 100 km range and efforts are on to induct it on more platforms of the IAF including the indigenous Light Combat Aircraft “Tejas”. And the DRDO is working on a long-range Astra and initial tests have been conducted successfully. This missile uses solid fuel ramjet technology. This technology, according to DRDO enhances speed and has an indigenously-built seeker.

#### **AIR-TO-GROUND:**

Rudram, this is a New Generation Anti-Radiation Missile (NGRAM), and has cleared initial tests and more tests are expected to take place soon. It has a maximum range of around 200 km, and it targets radar, communication, and surveillance systems of the adversary. In 2020, this was tested from the Sukhoi-30MKI fighter aircraft.

Indo-Russian jointly developed BrahMos – 300-500 km range is already operational and short-range is ramjet-powered. Can hold a single warhead, is a supersonic anti-ship or land attack cruise missile.

Last week, a supersonic missile-assisted torpedo system was successfully launched and it carried a torpedo and delivered it at a longer range. This will further strengthen the Indian Navy’s anti-submarine capability and has a range of 400 km.

#### **Agni (Fire) & Prithvi (Earth) missile systems**

Both these are already being used by the Strategic Forces Command.

Agni (range around 5,000), this is country’s only contender for an inter-continental ballistic missile (ICBM). Very few countries in the world have ICBM.

A missile with 350 km range, Prithvi, falls in the category of short-range surface-to-surface missile and has strategic uses.

In April 2019, for the first time India tested an anti-satellite system. To hit a low orbit satellite, DRDO used a modified anti-ballistic missile named Prithvi Defence Vehicle Mk 2 was used to hit a low-orbit satellite. After this test, India joined another elite group of countries which have this capability like China, Russia and the US.

#### **Does India have hypersonic technology?**

In 2020, DRDO had successfully tested a Hypersonic Technology Demonstrated Vehicle (HSTDV). During the tests, hypersonic air-breathing scramjet technology was demonstrated.

According to sources, India has developed its own cryogenic engine and has demonstrated in a 23-second flight. There are plans to make a hypersonic cruise missile using HSTDV.

Hypersonic weapons systems with medium-to-long range capabilities are also expected to be available in the next four years.

When developed BrahMos, at 2.5-3 times the speed of sound, was among the fastest in the world. Following the nuclear blast in 1998, sanctions were imposed on India and India under the 'Missile Man' of India along with others developed cryogenic technology.

<https://www.financialexpress.com/defence/does-india-have-hypersonic-missile-technology-the-country-gets-ready-to-strengthen-its-capabilities-know-more/2384494/>



Tue, 21 Dec 2021

## **Explained: भारत मिसाइल तकनीक में चीन को देगा टक्कर, जानें कहां खड़े हैं अमेरिका और रूस**

*India Missile Power: समझते हैं कि भारत मिसाइल तकनीक (India Missile) के मामले में किस स्थान पर है। अगर दुनियाभर में मिसाइल तकनीक की बात करें तो भारत सर्वोच्च 5 देशों में स्थान रखता है। लेकिन अभी भी तकनीक के मामले में हम अमेरिका, रूस और चीन से काफी पीछे हैं।*

नई दिल्ली: चीन (China) ने बीते दिनों हाइपरसोनिक ग्लाइड व्हीकल के साथ हाइपरसोनिक मिसाइल (Hypersonic Missile) का सफल परीक्षण करके दुनियाभर को चौंका दिया था। हालांकि रिपोर्ट बताती हैं कि परीक्षण में पता चला कि इसने दुनिया का चक्कर तो लगाया, लेकिन कुछ ही किलोमीटर पर यह अपने लक्ष्य से चूक गया था। आइए समझते हैं कि भारत मिसाइल तकनीक (India Missile Power) के मामले में किस स्थान पर है। अगर दुनियाभर में मिसाइल तकनीक की बात करें तो भारत सर्वोच्च 5 देशों में स्थान रखता है। लेकिन अभी भी तकनीक के मामले में हम अमेरिका, रूस और चीन से काफी पीछे हैं।

### **क्या है भारत में मिसाइल तकनीक का इतिहास**

आजादी से पहले भारत में बहुत सारे साम्राज्य मौजूद थे जो युद्ध तकनीक में रॉकेट का इस्तेमाल किया करते थे। मैसूर के राजा हैदर अली ने 18वीं सदी के मध्य में अपनी सेना को लोहे के कवच वाले रॉकेट से परिचित कराया था। हैदर के बेटे टीपू सुल्तान की मौत होने तक उनकी सेना की हर टुकड़ी के साथ एक रॉकेट चलाने वाला जुड़ा हुआ था। एक अनुमान के मुताबिक उनके दल में करीब 5000 रॉकेट चलाने वाले मौजूद थे।

आजादी के वक्त भारत में स्वदेशी स्तर पर मिसाइल क्षमता नहीं थी। भारत सरकार ने 1958 में विशेष शस्त्र विभाग का निर्माण किया। यही आगे चलकर डिफेंस रिसर्च एंड डेवलपमेंट लैबोरेटरी (डीआरडीएल) यानी रक्षा अनुसंधान एवं विकास प्रयोगशाला बना, जिसे 1962 में दिल्ली से हैदराबाद में स्थानांतरित किया गया।

एक मीडिया रिपोर्ट के मुताबिक डीआरडीओ की प्रयोगशाला के आधिकारिक रिकॉर्ड बताते हैं कि 1972 में सतह से सतह पर हमला करने वाली मध्यम रेंज की मिसाइल के विकास की शुरुआत प्रोजेक्ट डेविल के नाम से की गई। इस दौरान बड़ी संख्या में परीक्षण सुविधा और बुनियादी ढांचे का निर्माण हुआ। 1982

आते आते डीआरडीएल, इंटीग्रेटेड गाइडेड मिसाइल डेवलपमेंट प्रोग्राम (आईडीएमडीपी) यानी एकीकृत निर्देशित मिसाइल विकास कार्यक्रम के तहत कई मिसाइल तकनीकों पर काम कर रहा था।

### **भारत के पास किस तरह की मिसाइल**

जहां तक स्वदेशी स्तर पर मिसाइल डिजाइन और विकसित करने की बात है, भारत सर्वोच्च पांच देशों में शुमार है। हालांकि रेंज के मामले में भारत, अमेरिका, चीन और रूस से काफी पीछे है। सतह से लॉन्च की जाने वाली मिसाइलों में- एंटी टैंक गाइडेड मिसाइल नाग पहले से ही सेना में शामिल है। इंडियन एक्सप्रेस में प्रकाशित खबर के मुताबिक नाग एकमात्र फायर एंड फॉरगेट यानी दागो और भूल जाओ वाला एटीजीएम है जो अपनी रेंज (20 किमी) में सभी मौसमों में काम करती है। हाल ही में हेली नाग का परीक्षण किया गया जिसे हेलीकॉप्टर से चलाया जा सकेगा। इसके 2022 तक सेना में शामिल होने का अनुमान है। एक स्टैंड ऑफ एंटी टैंक (सैंट) मिसाइल भी है जिसकी रेंज 10 किमी से ज्यादा है। 11 दिसंबर को भारतीय वायु सेना के हेलीकॉप्टर से इसका परीक्षण किया गया था। इसमें मिलीमीटर वेव सीकर होता है जो किसी भी तरह के मौसम में लक्ष्य को खोज लेने की काबिलियत को बढ़ाता है।

**सतह से हवा में मार करने वाली मिसाइल-** छोटी रेंज वाला सैम सिस्टम आकाश पहले ही वायु और थल सेना में शामिल किया जा चुका है। आकाश 1 के लिए सेना को पहले ही सरकार से ज़रूरी स्वीकृति मिल चुकी है। आकाश ( नई जेनरेशन) का पहला परीक्षण इसी साल जुलाई में किया गया था। इसके कुछ और परीक्षण होने अभी बाकी हैं।

**मध्यम रेंज सैम-** जलसेना के लिए मध्यम रेंज का सैम यानि सरफेस टू एयर मिसाइल का ऑर्डर दिया जा चुका है। जैसलमेर में तैनात वायु सेना की 2204 स्कॉड्रन पहली यूनिट है जिसे इस साल सितंबर में मध्यम रेंज सैम प्राप्त हुआ है। थल सेना के लिए इसकी तकनीक पर अच्छे से काम हो रहा है और जल्दी इसका परीक्षण किया जाएगा।

**छोटी रेंज वाला सैम-** जलसेना के लिए पहला फ्लाइंग परीक्षण सफलतापूर्वक संचालित किया जा चुका है।

**हवा से हवा में मार करने वाला -** अस्त्र, भारत का बियाँड विजुअल रेंज एयर टू एयर मिसाइल (बीवीआरएएम) यानि ऐसी मिसाइल जो नजर में नहीं आने वाले लक्ष्य को साधता है उसका परीक्षण पूरा हो चुका है और यह सेना में शामिल किये जाने की प्रक्रिया में है। इसकी रेंज करीब 100 किमी है। डीआरडीओ इसे वायु सेना के मंच से परिचित कराने का प्रयास कर रहा है। जिसे स्वदेशी स्तर पर विकसित किया गया लाइट कॉम्बैट एयरक्राफ्ट तेजस भी शामिल है। लंबी दूरी वाले अस्त्र को भी विकसित किया जा रहा है,जिसके शुरुआती परीक्षण संचालित किए जा चुके हैं। इस मिसाइल में सॉलिड फ्यूल रामजेट तकनीक का इस्तेमाल किया जाता है जिससे इसकी गति और बढ़ जाती है।

**हवा से ज़मीन पर मार करने वाला -** रुद्रम एक नई जेनरेशन की एंटी-रेडिएशन मिसाइल (एनजीआरएएम) है, जिसके शुरुआती परीक्षण पूरे किये जा चुके हैं। और जल्दी ही कुछ और परीक्षण किए जाएंगे। इसकी अधिकतम रेंज करीब 200 किमी तक होगी। यह मिसाइल मुख्यतौर पर दुश्मन के संचार, रडार और निगरानी तंत्र को लक्षित करता है। पिछले साल सुखोई-30 एमकेआई फाइटर जेट से इसका परीक्षण किया गया था। वहीं रूस के साथ संयुक्त तौर पर विकसित किया गया ब्रह्मोस पहले से संचालित किया जा रहा है। इसकी 300 से 500 किमी की रेंज है। और यह एक कम दूरी वाली, रैमजेट पर चलने वाली, सिंगल वॉरहेड, सुपरसोनिक एंटी शिप और ज़मीन पर हमला करने वाली क्रूज मिसाइल है। बीते दिनों एक सुपरसोनिक मिसाइल समर्थित तारपीडो सिस्टम लान्च किया गया था। यह तारपीडो को लेकर गया और लंबी दूरी पर इसे पहुंचाया। इससे 400 किमी रेंज के साथ जलसेना की एंटी सबमरीन की क्षमता बढ़ेगी।

## भारत का कौन सा मिसाइल सिस्टम सबसे अहम

भारत के सबसे अहम दो मिसाइल तंत्र हैं, अग्नि और पृथ्वी। दोनों ही स्ट्रेटेजिक फोर्सस कमांड इस्तेमाल कर रही हैं। अग्नि (5000 किमी रेंज) भारत की ओर से एकमात्र इंटर-कांटीनेंटल बैलिस्टिक मिसाइल यानी अंतर महाद्वीपीय बैलिस्टिक मिसाइल दावेदार है, जो फिलहाल कुछ ही देशों के पास मौजूद है। पृथ्वी जैसे तो एक कम दूरी वाली सतह से सतह पर मार करने वाली 350 रेंज की मिसाइल है। भारत एक एंटी सेटेलाइट सिस्टम का भी अप्रैल 2019 में परीक्षण कर चुका है। पृथ्वी डिफेंस व्हीकल एमके 2 नाम से सुधार की गई एंटी बैलिस्टिक मिसाइल का इस्तेमाल निचली कक्षा में स्थित सेटेलाइट को मार करने के लिए उपयोग में लाया जाता रहा है। इससे भारत मिसाइल के मामले में बस अमेरिका, चीन और रूस से पीछे रह जाता है।

## हाइपरसोनिक तकनीक क्या है

भारत कुछ सालों से इस तकनीक पर काम कर रहा है, डीआरडीओ ने सितंबर 2020 को सफलतापूर्वक हाइपरसोनिक तकनीक डिमोन्स्ट्रेटेड व्हीकल (एचएसटीडीवी) का परीक्षण किया था। और इसकी हाइपरसोनिक एयर-ब्रीदिंग स्कामजेट तकनीक का प्रदर्शन किया था। सूत्रों की माने तो अब तक केवल रूस ही अपनी हाइपरसोनिक क्षमता का प्रदर्शन कर पाया है। वहीं चीन ने अपनी एचजीवी क्षमता को प्रस्तुत किया है। भारत को उम्मीद है कि अगले चार सालों में उसके पास मध्यम से लंबी दूरी क्षमता वाले हाइपरसोनिक हथियार तंत्र होंगे।

## भारत की तुलना में चीन और पाकिस्तान

रिपोर्ट के मुताबिक, पेंटागन में 2020 में आई एक रिपोर्ट बताती है कि चीन जमीन आधारित पारंपरिक बैलिस्टिक और क्रूज मिसाइल क्षमता के मामले में या तो अमेरिका के बराबर है या उससे आगे निकल गया है। चीन की मिसाइल क्षमता हमारे लिए चिंता की वजह बन सकती है। लेकिन ऐसा नहीं है कि भारत इस पर काम नहीं कर रहा है, या भारत के पास काबिलियत नहीं है, बल्कि बीते दिनों हुए परीक्षण बताते हैं कि भारत जल्दी ही विकास करेगा। उधर चीन अपनी तकनीक पाकिस्तान के साथ साझा कर रहा है, लेकिन किसी तकनीक को हासिल करना और उस पर काम करके उसे विकसित करना बिल्कुल ही अलग बात होती है।

<https://hindi.news18.com/news/nation/explained-india-missile-power-comparison-china-pakistan-drdo-3909393.html>



**Press Information Bureau**  
**Government of India**  
**Ministry of Defence**

*Mon, 20 Dec 2021 3:01PM*

### **New Armament Production Units**

In the last five years, a total of 194 Industrial Licenses have been issued to private companies in Defence sector for manufacturing of items like ammunitions, artillery guns, howitzers, air defence guns, UAVs, destroyers, frigates, night vision devices, ballistic protection items, radars, opto-electronic devices etc. License to manufacture defence equipment is granted by the licensing authorities namely, Department for Promotion of Industry and Internal Trade (DPIIT) and Ministry of Home Affairs under Industries (Development & Regulation) Act and Arms Act respectively, in consultation with Ministry of Defence. Further, to provide autonomy and enhance efficiency and unleash new growth potential in the Ordnance Factories, the Government has corporatized OFB and converted it into seven (07) new Defence Public Sector Undertakings (DPSUs). All new Defence PSUs have become operational from 1<sup>st</sup>October 2021. The Government has decided to grandfather the indents/orders, worth more than Rs62,000 crore, pending with the OFB post corporatisation, to ensure continuity in supply of strategic arms and ammunitions to the services.

Moreover, two positive indigenization lists for total 209 items have also been notified by the Government with an embargo on the import beyond the timeline indicated against each of them. There has been a decline in percentage of capital expenditure on procurement of defence equipment from foreign vendors from 48% in 2018-19 to 36% in 2020-21.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Ms Saroj Pandey in Rajya Sabha today.

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1783414>

## India deploys first S-400 air defence system in Punjab sector, to take care of aerial threats from both China, Pakistan

### Synopsis

*The S-400 air defence system was contracted for by India in a deal worth around Rs 35,000 crore and five squadrons would be provided to India for tackling air threats from up to 400 km.*

In a major boost to the country's air defence capabilities, the Indian Air Force (IAF) is deploying the first squadron of the S-400 air defence missile system in the Punjab sector.

"The first squadron is being deployed in the Punjab sector. The batteries of the first squadron would be capable of taking care of aerial threats from both Pakistan and China," government sources told ANI.

Parts of the Russian missile system had started reaching India earlier this month and the unit is expected to be operationalized in the next few weeks, they said.



The S-400 air defence system was contracted for by India in a deal worth around Rs 35,000 crore and five squadrons would be provided to India for tackling air threats from up to 400 km.

The first squadron deliveries are expected to be complete by the end of this year.

Sources said the equipment is being brought to India through both sea and air routes.

Sources said after the first squadron is deployed, the Air Force would start focusing on the Eastern borders along with providing resources for training of personnel within the country.

Indian Air Force officers and personnel have trained in Russia on the system.

The air defence system would give India an edge in South Asian skies as they would be able to take out enemy aircraft and cruise missiles from a 400 km distance.

The S-400 missile defence system is equipped with four different missiles which can engage enemy aircraft, ballistic missiles, and AWACS planes at 400 km, 250 km, the medium-range 120 km and the short-range 40 km.

Due to tough bargaining and negotiations, India managed to bring down the S-400 price by almost a billion dollars, sources said.

<https://economictimes.indiatimes.com/news/defence/india-deploys-first-s-400-air-defence-system-in-punjab-sector-to-take-care-of-aerial-threats-from-both-china-pakistan/articleshow/88397852.cms>

## **Bangladesh Air Force Chief meets COAS Naravane; hold talks on defence cooperation**

*Bangladesh Air Chief Marshal Shaikh Abdul Hannan met Indian Army Chief General Manoj Mukund Naravane on Monday, 20 December.*

*By Apoorva Kaul*

Bangladesh Air Chief Marshal Shaikh Abdul Hannan met Indian Army Chief General Manoj Mukund Naravane on Monday, as the two discussed means to boost defence ties between their countries. Taking to Twitter, Additional Directorate General of Public Information, IHQ of MoD (Army) informed about the meeting between COAS Naravane and Bangladesh Air Force Chief Hannan. During the meeting, both sides highlighted the ways to bolster bilateral defence cooperation.

Additional Directorate General of Public Information, IHQ of MoD (Army) in the tweet said, "Air Chief Marshal Shaikh Abdul Hannan, Chief of Air Staff, Bangladesh Air Force called on General MM Naravane #COAS and discussed ways to strengthen the bilateral defence cooperation between the two countries." In the tweet, ADGPI also shared pictures of the meeting between Naravane and Hannan.



Image: Twitter/@adgpi

Earlier on 20 December, Bangladesh Air Force chief Shaikh Abdul Hannan met his Indian counterpart Air Chief Marshal Vivek Ram Chaudhari, according to ANI. During the meeting, both sides discussed ways to strengthen bilateral defence cooperation. The visit of Bangladesh Air Chief Marshal comes after Indian President Ram Nath Kovind visited Bangladesh to attend the 50th Vijay Diwas celebrations as the Guest of Honour.

### **President Ram Nath Kovind visits Bangladesh**

Last week, President Ram Nath Kovind visited Bangladesh in a bid to mark the 50th anniversary of Bangladesh's Vijay Diwas. President Kovind, who was on his three-day state visit to Bangladesh from December 15 to 17, was his first state visit since the outbreak of the COVID pandemic. President Kovind attended the national event as the Guest of Honour. President Kovind, who arrived in Bangladesh to attend the golden jubilee celebrations of Bangladesh's independence from Pakistan in 1971, held talks with Mohammad Abdul Hamid, the President of Bangladesh.

During his meeting with Abdul Hamid, President Kovind "reiterated that Bangladesh has a special place in India's "neighbourhood first" policy" and said that India's development partnership with Bangladesh is one of the most comprehensive and wide-ranging ones, according to a statement issued by the Indian President's office. Kovind highlighted that connectivity forms an important part of India-Bangladesh relations. President Ram Nath Kovind held talks with Bangladeshi PM Sheikh Hasina as well.

<https://www.republicworld.com/india-news/general-news/bangladesh-air-force-chief-meets-coas-naravane-hold-talks-on-defence-cooperation.html>





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## Measuring a quantum computer's power just got faster and more accurate

What does a quantum computer have in common with a top draft pick in sports? Both have attracted lots of attention from talent scouts. Quantum computers, experimental machines that can perform some tasks faster than supercomputers, are constantly evaluated, much like young athletes, for their potential to someday become game-changing technology.

Now, scientist-scouts have their first tool to rank a prospective technology's ability to run realistic tasks, revealing its true potential and limitations.

A new kind of benchmark test, designed at Sandia National Laboratories, predicts how likely it is that a quantum processor will run a specific program without errors.

The so-called mirror-circuit method, published today in *Nature Physics*, is faster and more accurate than conventional tests, helping scientists develop the technologies that are most likely to lead to the world's first practical quantum computer, which could greatly accelerate research for medicine, chemistry, physics, agriculture and national security.

Until now, scientists have been measuring performance on obstacle courses of random operations.

But according to the new research, conventional benchmark tests underestimate many quantum computing errors. This can lead to unrealistic expectations of how powerful or useful a quantum machine is. Mirror-circuits offer a more accurate testing method, according to the paper.

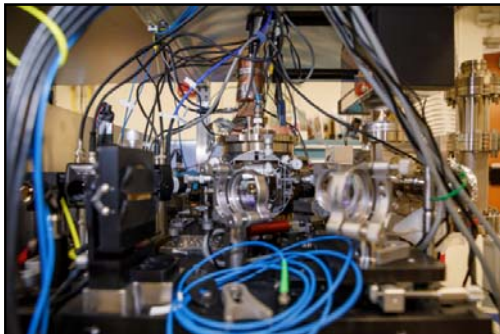
A mirror circuit is a computer routine that performs a set of calculations and then reverses it.

"It is standard practice in the quantum computing community to use only random, disordered programs to measure performance, and our results show that this is not a good thing to do," said computer scientist Timothy Proctor, a member of Sandia's Quantum Performance Laboratory who participated in the research.

The new testing method also saves time, which will help researchers evaluate increasingly sophisticated machines. Most benchmark tests check for errors by running the same set of instructions on a quantum machine and a conventional computer. If there are no errors, the results should match.

However, because quantum computers perform certain calculations much faster than conventional computers, researchers can spend a long time waiting for the regular computers to finish.

With a mirror circuit, however, the output should always be the same as the input or some intentional modification. So instead of waiting, scientists can immediately check the quantum computer's result.



Sandia National Laboratories has designed a faster, more accurate style of test for quantum computers, such as the one pictured here. Credit: Bret Latter, Sandia National Laboratories

### **New method reveals flaws in conventional performance ratings**

Proctor and his colleagues found that randomized tests miss or underestimate the compound effects of errors. When an error is compounded it grows worse as the program runs, like a wide receiver who runs the wrong route, straying farther and farther from where they are supposed to be as the play goes on.

By mimicking functional programs, Sandia found final results often had larger discrepancies than randomized tests showed.

"Our benchmarking experiments revealed that the performance of current quantum computers is much more variable on structured programs" than was previously known, Proctor said.

The mirror-circuit method also gives scientists greater insight into how to improve current quantum computers.

"By applying our method to current quantum computers, we were able to learn a lot about the errors that these particular devices suffer—because different types of errors affect different programs a different amount," Proctor said. "This is the first time these effects have been observed in many-qubit processors. Our method is the first tool for probing these error effects at scale."

**More information:** Timothy Proctor, Measuring the capabilities of quantum computers, *Nature Physics* (2021). DOI: [10.1038/s41567-021-01409-7](https://doi.org/10.1038/s41567-021-01409-7). [www.nature.com/articles/s41567-021-01409-7](https://www.nature.com/articles/s41567-021-01409-7)

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