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DRDO News

BSF eyes new rifle: Evaluating DRDO's Ugram to replace INSAS

Source: The Tribune, Dt. 21 April 2025,

URL: <https://www.tribuneindia.com/news/india/bsf-eyes-new-rifle-evaluating-drdo-s-ugram-to-replace-insas/>

The Border Security Force (BSF) is evaluating a new larger calibre indigenous assault rifle developed by the Defence Research and Development Organisation (DRDO), that could replace the existing INSAS rifles as the standard issue weapon.

The border guarding force has asked for 10 Ugram 7.62 mm rifles, along with ammunition, for trials. These rifles use a larger cartridge than the 5.56 mm INSAS rifles that were also developed by DRDO about three decades ago.



The move by the BSF to go in for a larger calibre rifle mirrors a similar move by the Army, which is adopting the Russian origin AK-203 as well as the SIG-716 rifles, which fire the 7,62 mm round.

Larger calibre rounds offer a higher kill probability and also longer range, with the emphasis being on 'shoot to kill' rather than on 'shoot to injure'. This is a departure from the existing philosophy that hinges on the premise that an incapacitated soldier would tie down more soldiers to assist or evacuate him.

Before the induction of INSAS, the Army and the Central Armed Police Forces (CAPFs) used the semi-automatic 7.62 mm self-loading rifle and prior to it the 7.62 mm bolt action rifle, the design of which dated back to the pre-World War 2 era. Both these rifles packed a powerful punch.

Developed by DRDO's Armament Research and Development Establishment (ARDE) and a Hyderabad-based firm Dvipa Armour India Private Limited, the Ugram rifle is claimed to be fully

indigenous, which if successful, would make it a cost-effective option. It has been designed to meet the Indian Army's requirements for an assault rifle to replace INSAS.

Besides the armed forces, all CAPFs as well as state police forces widely use INSAS. The combined strength of the armed forces is about 14 lakh and that of CAPFs about 10 lakh, which gives an indication of the number of rifles that could be procured.

The new rifle, unveiled in 2024, will be evaluated for its accuracy, reliability and ruggedness under field conditions. It has an effective range of 500 meters and weighs less than four kgs.

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Defence News

Defence Strategic: National/International

Refit Completion of MNDF Huravee Strengthens India-Maldives Defence Cooperation

Source: Press Information Bureau, Dt. 21 April 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2123218>

As part of India's commitment to regional maritime security under the vision of 'Mutual and Holistic Advancement for Security and Growth for all in the Region (MAHASAGAR)' and its 'Neighbourhood First' policy, the Indian Navy successfully completed a major refit of the Maldivian Coast Guard Ship MNDF Huravee at the Naval Dockyard, Mumbai.



The ship set sail for Maldives on 21 Apr upon completing her maiden Normal Refit at Naval Dockyard, Mumbai. Over the last four months since her arrival at Mumbai on 13 Nov 24, major works concerning maintenance of all machinery, weapons, and sensors, along with a habitability upgrade, were undertaken. The ship was thereafter put through rigorous harbour & sea trials, operational checks of equipment, safety audits and Operational Sea Training before her departure.

The efforts put in by various Indian Navy agencies and dockyard teams across multiple departments were instrumental in achieving this extensive refit within the stipulated timeframe. The successful refit of MNDF Huravee underscores the strong diplomatic and military cooperation between the two countries and reaffirms India's unwavering commitment to being a reliable partner in the region.

The Make in India ship handed over to MNDF in May 2023 as a replacement for an older platform, has played a crucial role in Humanitarian Assistance and Disaster Relief (HADR) and Medical Evacuation operations across the Maldivian archipelago.

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Soldiers must excel in combat skills while being proficient in mental stability & spirituality to tackle complex challenges: Raksha Mantri

Source: Press Information Bureau, Dt. 21 April 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2123145>

“To deal with challenges emanating from today's constantly-evolving nature of warfare, our soldiers must excel in the skills of combat while being equally proficient in mental stability and spiritual empowerment,” said Raksha Mantri Shri Rajnath Singh while addressing an event organised at the Brahma Kumaris Headquarters in Mount Abu, Rajasthan on April 21, 2025. He emphasised that, now-a-days, wars are being fought on cyber, space, information & psychological fronts and there is a need for the soldiers to become mentally strong as the nation can be protected with not just weapons, but also with strong personality, enlightened consciousness and awareness.

Shri Rajnath Singh pointed out that while physical strength is fundamental for a soldier, mental strength is equally vital. He stated that soldiers protect the nation while serving in difficult conditions, and these challenges are overcome through an energy born out of a strong inner-self. He added that prolonged stress, uncertainty and working in difficult conditions could affect the mental health, which calls for strengthening the inner self. The Brahma Kumaris' campaign to bolster the mental health of soldiers is a commendable step in that direction, he said.

Raksha Mantri added that this initiative will further strengthen the minds of the soldiers in view of the present global geopolitical scenario. “The theme of the campaign ‘Self-Empowerment - Through Inner Awakening’ is extremely interesting and relevant in today's times. Self transformation through meditation, yoga, positive thinking and self-dialogue will provide mental, emotional & spiritual strength to our brave soldiers. Self transformation is the seed, national

transformation is its fruit. In an atmosphere of global uncertainty, India can spread the message that protection of inner-self and borders is possible together," he said.

Shri Rajnath Singh described spirituality and yoga, which are ingrained in India's culture, as the biggest means to enhance mental well-being and deal with stress, anxiety and emotional turmoil. He said, an alert and strong security personnel becomes a lighthouse for the nation, which can face any storm with determination. He acknowledged the Security Service Wing of the Brahma Kumaris organisation for bolstering the security forces through residential, field & online programmes, special campaigns and force specific projects.

As part of the event, an MoU was signed between the Department of Ex-Servicemen Welfare, Ministry of Defence and Headquarters SSW, Rajyoga Education and Research Foundation of Brahma Kumaris in the presence of Shri Rajnath Singh. The aim is to guide Ex-Servicemen Contributory Health Scheme (ECHS) beneficiaries towards achieving better mental health and reducing dependency of medicines.

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"We have been able to meet some needs of Saudi Arabian armed forces" PM Modi pitches for enhanced defence engagement with Saudi Arabia

Source: The Economic Times, Dt. 21 April 2025,

URL: <https://economictimes.indiatimes.com/news/defence/we-have-been-able-to-meet-some-needs-of-saudi-arabian-armed-forces-pm-modi-pitches-for-enhanced-defence-engagement-with-saudi-arabia/articleshow/120504536.cms>

As Prime Minister Narendra Modi embarks on a crucial two day visit to Saudi Arabia he said that India considers Saudi Arabia as a force of positivity and stability in the region and that the growing defence and security engagement and collaboration between the two countries is a reflection of deep mutual trust.

"We consider Saudi Arabia as a force of positivity and stability in the region. As maritime neighbours, India and Saudi Arabia share a natural interest in safeguarding peace and stability in the region. The growing defence and security engagement and collaboration between the two countries is a reflection of deep mutual trust. It is also a testament to our shared commitment to regional stability and our mutual resolve to address the evolving challenges in our extended neighbourhood," PM Modi said.

"We have seen steady progress in security cooperation. This includes areas such as counterterrorism, combating extremism, disrupting terror financing and tackling drug trafficking. We are also exploring new frontiers of cooperation in cybersecurity, recognizing its growing importance in today's interconnected world. Last year, we achieved an important milestone: the first-ever joint exercises between the two land forces. These were complemented by two successful rounds of the joint naval exercise Al-Mohed Al-Hindi, which were held in 2021 and 2023, the Prime Minister said.

PM Modi said that he was happy that India had been able to meet some of the needs of the Saudi Armed forces.

"Over the past decade, defence manufacturing has taken deeper roots in India. Today, there is a strong military industrial complex with the ability to manufacture quality ammunition, small arms, tanks, armoured carriers. For the air force, we are building drones, advanced light helicopters and fighter jets. For the navy, we have the capacity to build patrol boats, submarines, and even aircraft carriers. We are not just fulfilling our own needs. India has also emerged as an important supplier of defence equipment to more than 100 countries around the world," PM Modi said

"I am glad that we have been able to meet some needs of the armed forces in Saudi Arabia. We support deeper engagement between private-sector players from both countries. We would welcome Saudi investment into the defence manufacturing sector in India that has been opened for private investment," he added.

PM Modi said that India is now exploring joint projects in refineries and petrochemicals with Saudi Arabia.

"Energy has been an important pillar of our economic partnership. Saudi Arabia has been a strong and reliable energy partner for us. It is one of our top suppliers of crude and other petroleum products. As India seeks to become a developed country, our energy demands will continue to grow. And Saudi Arabia will remain a close partner in our energy security. As strategic partners we agree that our energy cooperation is not limited to mere buyer-seller relationships. We are also exploring joint projects in refineries and petrochemicals," he said.

PM Modi also thanked the Saudi government for its continued assistance to the Muslims of India who come to Saudi for Haj and Umrah.

"As far as religious tourism is concerned, as you know we have a large Muslim population and they visit your beautiful country each year for Umrah and Haj pilgrimage. We are grateful to the Saudi leadership for the continued assistance provided to Indian pilgrims. Yoga has gained considerable popularity in Saudi Arabia over the recent years, thanks to the encouragement and support of the Saudi government. We are also noticing a growing interest in cricket," PM Modi told Arab Times.

Prime Minister Modi also thanked Saudi Crown Prince Mohammed bin Salman for the patronage provided to the Indian community in Saudi Arabia.

"First of all, let me put it on record that we are deeply grateful to Their Royal Highnesses, King Salman and Crown Prince Mohammed bin Salman, for the patronage they have provided to the Indian community in Saudi Arabia. We can never forget how they took care of the Indians as one of their own during the difficult times of the COVID pandemic. Indians have a very important character -- whichever country they go, they make it their home. They are law abiding, dedicated and professional to the core. They carry with them the values of empathy, compassion and care." he said.

"This very nature earns them respect of their host country. Saudi Arabia is no exception. Whenever I have met His Royal Highness Crown Prince Mohammed bin Salman, he has praised the Indian

community and appreciated their significant contribution to the economic growth of the Kingdom. He has even said that they are part of the Saudi family. These words of praise always fill my heart with pride and joy. For my government, the members of the Indian diaspora are the "rashtradoots" (national ambassadors). The 4Cs -- Care, Connect, Celebrate and Contribute -- is the motto of our engagement with our diaspora. Their safety, welfare and well-being is paramount for us," he added.

PM Modi said he was eagerly looking forward to reconnecting with the Indian diaspora during this visit.

The visit of Prime Minister reflects the importance India attaches to its bilateral relationship with the Kingdom of Saudi Arabia. It will provide an opportunity to further deepen and strengthen our multi-faceted partnership, as well as to exchange views on various regional and international issues of mutual interest according to a statement by the External Affairs Ministry.

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In race for tech supremacy, India can ill-afford to be mere spectator, says top Army officer

Source: The Economic Times, Dt. 21 April 2025,

URL: <https://economictimes.indiatimes.com/news/defence/in-race-for-tech-supremacy-india-can-ill-afford-to-be-mere-spectator-says-top-army-officer/articleshow/120492456.cms>

The race for technological supremacy has begun, and India can ill-afford to be a mere spectator in it, Lt Gen Amardeep Singh Aujla, the Army's Master General Sustenance (MGS), said on Monday. He called on the defence industry to "march together" with the armed forces to create a secure future for the country.

In his address at an 'Industry Interactive Session' hosted by the PHD Chamber of Commerce and Industry here, Lt Gen Aujla impressed upon the representatives of the domestic defence industry the importance of "customised solutions", as what is needed for Siachen will be different from the requirements for the armed forces in the plains or the desert.

"I am also looking at a capability that this industry should have. At the end of the day, even if we are in a conflict, you should be able to give me a solution based on my requirements within the earliest possible timeframe. So, that is the level of investment and R&D that has to happen," he said.

The officer emphasised that if the end-user is the armed forces, quality should be the defining factor for the industry as "we are working for a national cause". He pointed out that it is "my moral duty to ensure that the soldier gets the very best".

The industry and the armed forces can be "co-creators" of a very secure, robust and dynamic India of the future, Lt Gen Aujla said.

"Global dynamics are changing. India is also changing and so are the armed forces. When we are changing and we have got boots on the ground, we want equal boots on the ground and on the shop floor as well.

"So, let us not walk separately. Let us march together, let's be comrades in capability development," he told the gathering.

In his address, the officer emphasised that India's military power, as far as the future is concerned, "will no longer get decided only in boardrooms and operation rooms."

"It will now get decided also in R&D labs, on testing grounds and on the potency of the industry."

"The race for technology or technological supremacy has begun and India can ill-afford to be a mere spectator... or just a participant. You (industry) are the people who will have to... take the charge and come up trumps," Lt Gen Aujla said. "So, it's a clarion call for everyone."

"We have to rise, we have to step up, we have to deliver for the national cause. And in that national cause, revenue procurement and sustainability are extremely important," he added.

Later, Lt Gen Aujla interacted with the audience and fielded a range of questions, including those on various policies of the Defence Ministry and some of the issues faced by private players in the defence sector.

The Ministry of Defence has declared 2025 as the 'Year of Reforms'.

Responding to a question on his expectations from these anticipated reforms, Lt Gen Aujla said he is "very, very optimistic".

In his address earlier, the officer also said his proposition is that one "invests 40 per cent in the present, but looks at 60 per cent for the future".

"We have to be ahead of the curve to give us solutions which not only enhance the combat effectiveness of the Indian Army but you should be looking at the global needs as well," he added.

"From being cost-effective to having capacities which are aligned with the needs of the nation, to quality that you produce, to the timeline that you adhere, to the competitiveness that has to come, whether it is cooperation versus competition or it is cooperation and competition, it is for you to take a call," Lt Gen Aujla said.

The MGS of the Army said that as users "we are looking at our equipment and our sustainability in a matrix, which is absolutely top-notch". There is "no scope of any kind of dilution" whatsoever when it comes to quality, he underlined.

Emphasising that "our biggest strength today has to be technology", he also pitched for hiking the quantum of investment in R&D. Through the industry, the Army is looking at digital transformation, effective use of AI, Machine Learning, blockchain, robotics, and enhancing cyber security, he said.

He also said that unless the MSMEs and start-ups become strong and resilient, the Indian defence industry won't be able to make inroads in the desired manner.

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PM Modi, JD Vance review bilateral ties, focus on tech & defence

Source: The Times of India, Dt. 22 April 2025,

URL: <https://timesofindia.indiatimes.com/india/pm-modi-jd-vance-review-bilateral-ties-focus-on-tech-defence/articleshow/120501753.cms>

Prime Minister Narendra Modi and US vice president J D Vance reviewed and positively assessed progress in various areas of bilateral cooperation, while taking note of continued efforts towards enhancing cooperation in energy, defence, strategic technologies and other areas, the Indian readout said.

The US is looking to ramp up its defence exports to India, hoping it will help bridge its trade deficit with Delhi.

Cooperation in critical and emerging technologies, and also small and advanced modular reactors, is also on top of the Indian agenda with the US.

The two leaders also exchanged views on various regional and global issues of mutual interest and called for dialogue and diplomacy as the way forward, according to the Indian govt. There was a discussion on the situation in Ukraine and Gaza, with the PM reiterating India's support for peace talks involving all stakeholders.

PM Modi was said to have fondly recalled his visit to the US in Feb, within weeks of Trump's return to the White House, and his "fruitful discussions with President Trump which laid down the roadmap for close cooperation between India and the US, leveraging the strengths of Make America Great Again (MAGA) and Viksit Bharat 2047".

The American side too recalled that during that meeting, the two leaders had reaffirmed the strength of the India-US Comprehensive Global Strategic Partnership and jointly launched the India-US COMPACT (Catalysing Opportunities for Military Partnership, Accelerated Commerce and Technology) for the 21st century, an initiative anchored in mutual trust, shared interests, goodwill and robust engagement of their citizens.

"Prime minister Narendra Modi extended his best wishes to the vice president, second lady and their children for a pleasant and productive stay in India," the Indian govt said.

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Army suggests correction in Defence Procurement Manual, says address tilt towards PSUs

Source: The Hindu BusinessLine, Dt. 21 April 2025,

URL: <https://www.thehindubusinessline.com/news/army-suggests-correction-in-defence-procurement-manual-says-address-tilt-towards-psus/article69474737.ece>

The Indian Army has suggested amendments to Defence Procurement Manual (DPM), under the review of Ministry of Defence since 2021, to correct its tilt towards defence Public Sector

Undertakings (PSUs) and ensure common level playing field for private industry for true realisation of aatmanirbharta in military domain.

It has also recommended to bring in the concept of ‘apportionment’ in certain kinds of tendering so that bidders in a fray, offering the same quality product, too get work if the numbers are high and the L1 emerging company has limited capability, said Lt Gen Amardeep Singh Aujla, Master General Sustenance, which looks after Army’s revenue procurement, at an PHD Chambers of Commerce and Industry (PHDCCI) event on Monday.

Addressing the PHDCCI’s industry interactive session on “Revenue Requirements of Indian Army”, Lt Gen Aujla said: “The DPM has to be revised. We have been at it for the last two years” and “we are pushing policy makers to amend this DPM so that it comes out faster.”

The MGS said the DPM’s Paragraph 2.4.8 which deals with procurement from ordnance factories and DPSU restricts the force not to move away from original equipment manufacturers (OEMs).

For us 80 per cent of our goods are supplied by the DPSUs, he said of the Army’s revenue procurement. The annual spending of the MGS branch is to the tune of ₹25,000 crore to ₹30,000 crore, the Lt Gen stated.

“We want a level playing field. We want contenders. We want to move away.. to participative and competitive tendering.. while the attempts are on, the systems are such that it takes time. So we are in that period of transition. But very soon you people should see some kind of change, some kind of environment that suits your requirements,” Aujla stated, bringing glee to the faces of industry representatives at the session.

User driven market

In that context, he also observed that it has to be a user driven market and not a vendor driven market. That’s how we look at things, he observed.

The Army and the private industry were on the same page as Vaibha Gupta, CO-Chair PHDCCI Defence & HLS Committee, and Director of Kanpur-based MKU Ltd, too sought release of revised DPM 2021 so that DPSUs and private firms are on the same footing. “Only then can the sector fully align with ambitions of Make in India, strategic partnership and the IDDM framework,” he said in the opening address ahead of Lt Gen Aujla’s speech.

Gupta also flagged that the DPM does not encourage long-term vendor development from private players, and has rigid L1 procurement system giving precedence to cost over capability. He also pointed out that MSMEs offering digital, predictive maintenance tools with upgrades rarely get shortlisted, while outdated DPSU solutions are preferred due to the defined procurement rules.

Referring to procedural frictions, MKU Ltd Director stressed that cumbersome documentation, inspection norms and delayed payments deter private investment in the defence sector. Others who participated in the session included Maj General HPS Hansi, Additional Director General MGS Branch, and his two other colleagues- Brigadier Bhupendra Rekhi and Brigadier Pradeep Godara.

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Army on buying spree, inks Rs 85K cr deals for arms procurement in '24-'25

Source: The New Indian Express, Dt. 22 April 2025,

URL: <https://www.newindianexpress.com/nation/2025/Apr/22/army-on-buying-sprees-inks-rs-85k-cr-deals-for-arms-procurement-in-24-25>

The Indian Army has worked out major procurement deals with an expenditure of Rs 85,000 crore for 2024-2025, with a thrust on self-reliance. "26 capital procurement contracts totalling Rs 85,000 crore have been finalised in the capital budget, with only three sourced from foreign vendors," an Army source said.

On the utilisation of the budget under the capital head, "Army utilised Rs 35,000 crore. 95% of this expenditure was allocated to domestic sources, reinforcing the Make-in-India initiative," source said.

According to planners in the Army, money spent on procurements from the indigenous sources adds to the growth of the economy and employment generation. "Indian Army's historic Rs 85,000 crore procurement spree marks a decisive push for self-reliance, dramatically transforming India's military capabilities into a future-ready force," a defence official said.

Army's domestic procurement and indigenous defence production are "not only strengthening operational preparedness but also acting as a powerful economic stimulus, driving job creation, investment, and industrial growth," the official said.

The move, as part of the Aatmanirbhar Bharat, is expanding India's indigenous defence manufacturing ecosystem. "It is expected to stimulate economic growth, boost GDP, and create thousands of skilled jobs," the official said.

The total allocation towards the defence was Rs 6,21,541 crore for 2024-25. The Union Budget made a provision of Rs 6, 81,210.27 crore for 2025-26 for the defence ministry. The allocation for defence capital expenditure for 2024-25 is Rs 1.72 lakh crore. The capital budget is spent on adding new weapons, systems and equipment.

"In the current geopolitical scenario where the world is witnessing a changing paradigm of modern warfare, Indian armed forces need to be equipped with state-of-the-art weapons and have to be transformed into a technologically advanced combat-ready force. Keeping this in view, Rs 1,80,000 crore has been allocated on capital outlay of the defence forces. This allocation is 4.65% higher than the budgetary estimate (BE) of 2024-25," the MoD said.

Plans to hold Defence Expo in Ranchi

India's next edition of the DefExpo is to be held in Ranchi, Jharkhand, if things go as planned. "The international 5-day DefExpo is likely to be held in Ranchi, which happens to be the Lok Sabha constituency of Minister of State for Defence Sanjay Seth," said a source.

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China steps up testing of sixth-gen stealth fighters amid tensions with US

Source: Business Standard, Dt. 21 April 2025,

URL: https://www.business-standard.com/external-affairs-defence-security/news/china-j36-j50-stealth-fighter-tests-us-f47-jet-race-defense-sector-125042100816_1.html

China appears to be accelerating test flights of its next-generation stealth aircraft, with new videos and images of two advanced fighter jets emerging on Chinese social media platforms in recent weeks, as reported by The South China Morning Post. The increased activity coincides with rising geopolitical tensions between Beijing and Washington.

Unofficially referred to as the J-36 and J-50, the aircraft were spotted near the headquarters of their respective developers — Chengdu Aircraft Industry Corporation (CAIC) in Sichuan and Shenyang Aircraft Corporation (SAC) in Liaoning. The visuals were widely shared on platforms such as Weibo and Douyin.

Footage reportedly filmed in early April shows the CAIC-developed J-36 conducting sharp aerial manoeuvres over Chengdu. The aircraft's distinctive ginkgo leaf-like wing shape, small trailing edge flaps, and delta configuration suggest a focus on extreme agility and advanced flight control.

One video, allegedly shot by a motorist near the CAIC airfield, showed the jet flying at low altitude over a highway as it prepared to land, with its unique dorsal inlet and three exhaust nozzles clearly visible.

Meanwhile, the SAC-developed J-50 reappeared in clearer detail in early April. A photo taken on April 4, followed by flight videos dated April 8 and 16, were posted online by aviation enthusiasts. These visuals captured the J-50's lambda wing platform, articulated wingtips, and side weapon bays. Observers also noted its refined diverterless supersonic inlet design, which blends smoothly with the aircraft's fuselage and enhances stealth.

J-36, J-50 features

Both jets feature tailless airframes, which are considered a hallmark of sixth-generation stealth fighters and contribute to radar evasion. The two aircraft were first seen in December 2023, but these recent visuals offer the clearest look yet at China's most advanced combat aircraft in development.

While Chinese authorities have not officially confirmed the existence of either fighter, the repeated sightings and analysis by open-source intelligence communities suggest that China is making significant strides in military aviation.

US pushes forward with sixth-gen fighter programme

The developments come as the United States moves forward with its own sixth-generation fighter programmes, including the F-47 for the Air Force, which US President Donald Trump said has been undergoing secret testing for several years.

On March 21, US President Trump awarded Boeing a contract to build what is expected to be the Air Force's most advanced fighter to date, an announcement that surprised many. However, details regarding its specifications, capabilities, and operational role remain under wraps, leaving many in the defence community speculating about its design and potential impact on modern warfare.

The unveiling of the F-47 project is part of the broader US strategy to maintain a technological edge in the ongoing military aviation arms race.

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Science & Technology News

SpaDeX Mission: ISRO successfully executes docking of satellites for second time

Source: The Hindu, Dt. 21 April 2025,

URL: <https://www.thehindu.com/sci-tech/science/spadex-mission-isro-successfully-executes-second-docking-of-satellites/article69473419.ece>

The Indian Space Research Organisation (ISRO) has successfully executed the second docking of the two satellites, which are part of the Space Docking Experiment (SpaDeX) mission. On April 21, Union Minister of State for Science and Technology Jitendra Singh posted on social media the second docking of the satellites SDX01 (Chaser) and SDX02 (Target).

“#ISRO SPADEX Update: Glad to inform that the second docking of satellites has been accomplished successfully. As informed earlier, the PSLV-C60 / SPADEX mission was successfully launched on 30 December 2024. Thereafter the satellites were successfully docked for the first time on 16 January 2025 at 06:20 AM and successfully undocked on 13 March 2025 at 09:20 AM. Further experiments are planned in the next two weeks,” the Minister posted on X.

Earlier this year, India became the fourth country after the U.S., Russia and China to conduct the docking experiment.

The SpaDeX mission is an important project by ISRO. It is designed to develop and demonstrate the technology needed for spacecraft rendezvous, docking and undocking using two small satellites.

The demonstration of this technology is essential for future missions, such as sending an Indian astronaut to the Moon, returning samples from the Moon, and the building and operation of the Indian Space Station.

The other objectives of the mission include demonstration of the transfer of electric power between the docked spacecraft, which is essential for future applications, such as in-space robotics, composite spacecraft control and payload operations after undocking.

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Signs of life beyond Earth a start, conclusive proof will take time—researcher who led discovery team

Source: The Print, Dt. 21 April 2025,

URL: <https://theprint.in/science/signs-of-life-beyond-earth-a-start-conclusive-proof-will-take-time-researcher-who-led-discovery-team/2597255/>

Never in the history of human existence have we come so close to finding life beyond Earth, says professor Nikku Madhusudhan from the University of Cambridge, who has led a team that discovered chemical footprints of molecules associated with life on an exoplanet.

While still in early stages, he stressed that these observations would form the basis of future interplanetary studies.

On Thursday, the team led by the astrophysicist and exoplanetary expert published its findings in the peer-reviewed journal *The Astrophysical Journal Letters*, claiming to have detected the chemical fingerprints of dimethyl sulphide (DMS) and dimethyl disulphide (DMDS) in the atmosphere of the exoplanet K2-18b, which orbits its star in the habitable zone. This is the region around a star where liquid water can exist on the surface of a planet.

Professor Madhusudhan spoke to ThePrint about the significance of the findings and the road ahead.

Could you tell us what your team has found?

In a nutshell, we have found hints of DMS and DMDS—one or both of these two molecules—in the atmosphere of the planet K2-18b, which is about 124 light years away from Earth. We have been looking at this planet with theoretical studies and observations for the last five years.

We already have proof, through other studies, that this planet could be habitable—that it could be a Hycean world (proposed class of exoplanets characterised by planet-wide oceans beneath a hydrogen-rich atmosphere). This new evidence adds a bit more to the narrative that the planet could have life on it. But we have to be careful because these are very early signs.

This is a major step in the path of searching for life, but we cannot make a robust association with life just yet. What we are celebrating today is the ability to do so, and the first signs of it. But we should be careful not to stretch it too far and say we have conclusively found life.

Why DMS and DMDS? What association do these molecules have with life?

Both these molecules are known to be produced primarily by life here on Earth. Studies in the past have assessed various molecules that you would look for while finding life elsewhere, and these molecules have emerged as some of the best contenders. As far as we know, these two molecules cannot be produced in large quantities by any process other than life.

Though there have been experiments where tiny amounts of these have been produced in labs, large quantities of these molecules are not produced by any medium other than life. So, these are known to be strong biomarkers for life.

When we talk about large quantities, how large do we mean?

Our initial inference shows that it is a part in 100,000. That may sound like a small number, but when you observe how much of these molecules are present in the Earth's atmosphere, it is in the order of a part in a billion or lower. So, very small quantities in the atmosphere.

We are inferring that these molecules are thousands of times higher than what we see in the Earth's atmosphere. That is the significant bit.

Past studies have shown that if you see these molecules in such high quantities, the biological flux of sulphur-based bio-molecules (DMS and DMDS) from the ocean should be at least 20 times higher than what we see on Earth. That association had already been made before our observation, and that is an important point to note. There was a prediction already, and we have made an observation confirming those predictions. This is the big thing.

What was the process you followed to make these observations?

We have been observing this planet (K2-18b) for the last few years.

The first observation we made was two years ago in 2023, with the James Webb Space Telescope (JWST). Back then, too, we had seen significant evidence of carbon-bearing molecules, methane and carbon dioxide, and the absence of molecules, like ammonia and carbon monoxide.

That combination of molecules is what told us that this is most likely a Hycean world—a world with an ocean-covered surface and hydrogen-rich atmosphere.

We made these observations using the transit method. This is where you are looking at a star. You have a telescope and you can take a spectrum of the stars. Spectrum means light as a function of wavelength. But when you are looking at a star, as the planet transits in front of it, some of that starlight passes through the atmosphere of the planet before reaching the telescope. The molecules in the atmosphere absorb some of that starlight at different wavelengths. Light is slightly dimmer when the planet is moving in front of it.

Based on that absorption of light, and when you compare that to when the planet is not in front of the star, that difference can tell you how much absorption is happening in the planet's atmosphere. That is what is known as the transmission spectrum.

Based on that, we can work out what molecules are in the atmosphere and how much of these molecules need to be in the atmosphere.

The observations are still at a nascent level, a sigma three (in the scientific discovery parameter). How long and how much more observation would it take to reach a sigma five (the acceptable standard for any scientific discovery)?

The three-sigma level is around 99.7 percent. It is a grey area, so it is telling you that there are hints, but we are not 100 percent sure. That is where we are right now. It is enough for us to be interested and invest resources.

With one observation, we could get to this level. We are hoping that with another two or three observations, exactly of the type that we have right now, we can get to a four or five sigma level. That is a big deal. This is why it is such a transformational moment in the search for life.

We got here with eight hours of observation. We would need another 16-24 hours with the JWST.

But even after we get to a sigma five, we will have to do our due diligence and follow up with a lot of experimental work to establish that there are no unknowns. Right now, we know that these molecules only come from life, but we need to be doubly sure that there are no other methods before we can say for sure.

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