

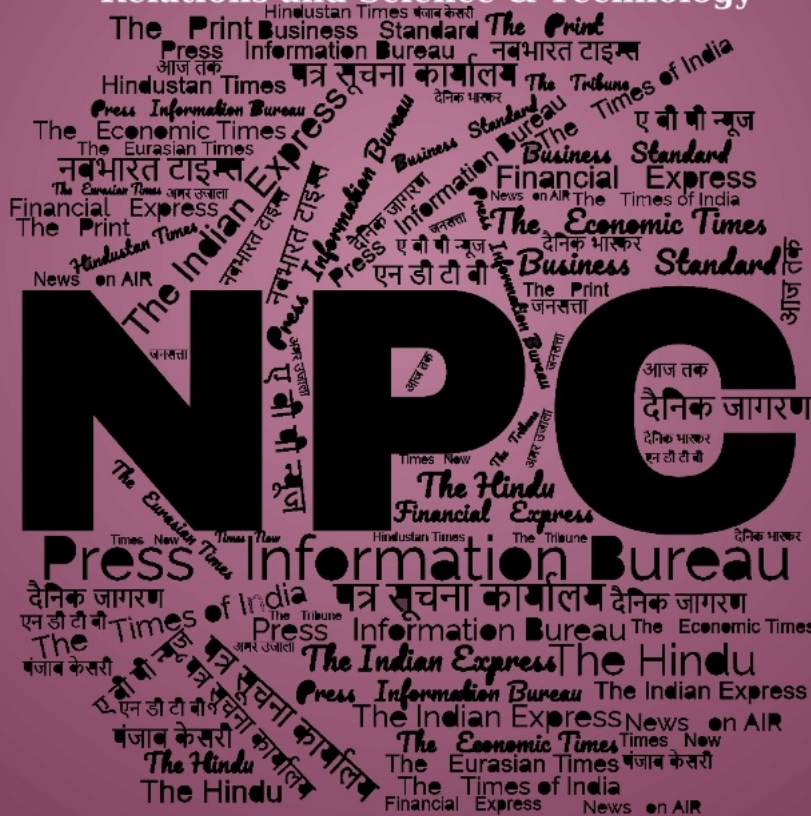
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# समाचार पत्रों से चयनित अंश Newspapers Clippings

डीआरडीओ समुदाय को डीआरडीओ प्रौद्योगिकियों, रक्षा प्रौद्योगिकियों, रक्षा नीतियों, अंतर्राष्ट्रीय संबंधों और विज्ञान एवं प्रौद्योगिकी की नूतन जानकारी से अवगत कराने हेतु दैनिक सेवा

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# Defence News

## Defence Strategic: National/International



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Mon, 21 Oct 2024*

### **Raksha Mantri & his Singaporean counterpart to hold 6th India-Singapore Defence Ministers' Dialogue in New Delhi to further bolster defence ties**

Raksha Mantri Shri Rajnath Singh and Minister of Defence, Singapore Dr Ng Eng Hen will co-chair the sixth India-Singapore Defence Ministers' Dialogue in New Delhi on October 22, 2024. The meeting aims to carry forward defence cooperation between the two countries. Both sides will also exchange views on regional and global issues of shared interest.

India and Singapore share a Comprehensive Strategic Partnership. The bilateral defence relations form a significant pillar to this collaboration. The engagements have diversified to include wide-ranging contacts between the Services, military-to-military exchanges, high-level visits, capacity building and training programmes, cooperation in UN Peacekeeping, ship visits and bilateral exercises.

Singapore is a key pillar of India's Act East Policy, and an important partner of the Indo-Pacific vision. Defence and security partnership between the two countries is an important factor of stability in the Indo-Pacific region.

The Singaporean Defence Minister will be on a visit to India from October 21-23, 2024. The fifth edition of the Defence Ministers' Dialogue took place in January 2021 through virtual teleconference.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2066727>



**Press Information Bureau  
Government of India**

**Ministry of Defence**

*Mon, 21 Oct 2024*

## **Joint Military Training Between Indian Air Force And Republic Of Singapore Air Force Begins At Air Force Base In West Bengal**

On 21st October 2024, the Indian Air Force (IAF) and Republic of Singapore Air Force (RSAF) commenced the 12th edition of the Joint Military Training (JMT) exercise at Air Force Station Kalaikunda, West Bengal.

The bilateral phase of the exercise will be conducted from 13 to 21 November 2024 and is expected to generate intense collaboration between the two forces, as they engage in advanced air combat simulations, joint mission planning and debriefing sessions. The bilateral phase aims to enhance interoperability, sharpen combat readiness and promote the exchange of knowledge between the two Air Forces.

The RSAF is participating with its largest contingent till date, comprising of aircrew and support personnel from F-16, F-15 squadrons alongwith G-550 Airborne Early Warning and Control (AEW&C) and C-130 aircraft. The IAF will be participating with Rafale, Mirage 2000 ITI, Su-30 MKI, Tejas, MiG-29 and Jaguar aircraft.

Since its inception, JMT has been conducted under the ambit of a bilateral agreement signed between the two nations.

JMT exercise comes right after RSAF's participation in one of the largest multinational aerial exercises, Ex-Tarang Shakti hosted by the IAF, which is reflective of a growing professional association between the two Air Forces.

In addition to air operations, the personnel of the two air forces will exchange best practices, as they interact during a multitude of sports and cultural activities over the next seven weeks.

JMT-2024 highlights the strong bilateral defence relationship built over years of collaboration and joint exercises, as well as the mutual respect between India and Singapore.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2066701>



**Press Information Bureau  
Government of India**

**Ministry of Defence**

*Mon, 21 Oct 2024*

## **Admiral Dinesh K Tripathi, Chief Of The Naval Staff On An Official Visit To United Arab Emirates**

Adm Dinesh K Tripathi, Chief of the Naval Staff (CNS) is visiting UAE from 21 – 24 October 2024. This visit aims to strengthen the defence cooperation between the two countries, in line with the deepening Comprehensive Strategic Partnership across all sectors, and consolidate bilateral maritime relations between India and UAE, and to explore new avenues of cooperation between the two navies.

The CNS is scheduled to hold discussions with Rear Admiral Pilot Saeed Bin Hamdan Al Nahyan, Commander of the UAE Naval Forces and other senior Government officials of UAE. He is also scheduled to visit the National Defence College of UAE, where he will interact with the Student Officers. During the visit, the CNS will also witness the conduct of 3rd Edition of India-UAE Bilateral Naval Exercise.

The cooperative engagements between the Indian Navy and the UAE Navy include Operational interactions through Port Calls, Bilateral Naval Exercise & reciprocal visits, Navy-to-Navy Staff Talks, as well as Joint Defence Cooperation Committee (JDCC).

<https://pib.gov.in/PressReleasePage.aspx?PRID=2066585>



*Tue, 22 Oct 2024*

## **LAC conundrum at 2 key points resolved**

India and China have achieved a breakthrough in negotiations to resolve their stand-off in Depsang Plains and Demchok, the two remaining flashpoints in eastern Ladakh where the two armies have been eyeball-to-eyeball for almost four-and-a-half years, with external affairs minister S Jaishankar on Monday announcing that the disengagement process with China has been completed “and we have gone back to where the situation was in 2020”.

The disengagement is expected to lead to de-escalation of lingering conflict in the sensitive theatre and the eventual de-induction of rival soldiers through further talks, HT learns.

Jaishankar’s remarks came shortly after foreign secretary Vikram Misri told a news conference that the two countries have arrived at an agreement on “patrolling arrangements” along the Line of

Actual Control (LAC) in the India-China border areas, “leading to disengagement and a resolution of the issues that had arisen in these areas in 2020”.

This means the Indian Army will be able to resume its patrolling activity in areas that had been cut off because of the Chinese People’s Liberation Army’s (PLA) forward presence in Depsang and Demchok, officials aware of the matter said, asking not to be named.

The development will allow the army and PLA get past a two-year impasse in negotiations to narrow down differences and find a resolution of outstanding issues along LAC — the fourth and last round of disengagement from Patrolling Point-15 in the Gogra-Hot Springs area took place in September 2022 after which the talks were deadlocked.

The details of the patrolling arrangements that have been formulated are still sketchy, but it’s a big breakthrough as the impasse in negotiations has been broken, said former Northern Army commander Lieutenant General DS Hooda (retd).

“Since we are talking about an agreement on patrolling arrangements, we will now have access to areas we could not visit earlier. It’s a positive development,” he said.

India made the announcement on the 62nd anniversary of the 1962 war with China which began on October 20.

The talks thus far resulted in four rounds of disengagement from Galwan Valley, Pangong Tso, Gogra (PP-17A) and Hot Springs (PP-15), areas where so-called buffer zones (extending up to 4km) were created to temporarily restrict the patrolling activities of both armies in the region. The zones of separation were aimed at eliminating the possibility of violent face-offs.

The moratorium on patrolling these areas by both sides is also expected to be lifted as the government has said the two sides have gone back to where the situation was in 2020, the officials said. To be sure, both armies still have tens of thousands of troops each and advanced weaponry deployed in the Ladakh theatre.

On October 1, army chief General Upendra Dwivedi described the situation along the contested LAC in eastern Ladakh as “stable but sensitive,” pointing out that trust between the Indian Army and PLA was “the biggest casualty” of the military standoff. Positive signalling is coming from the diplomatic side but military commanders on both sides have to execute the options on the ground to take things forward, he said.

“What we must understand is that the diplomatic side gives you options and possibilities. But when it comes to execution on the ground, it is dependent on the military commanders on both sides to take those decisions.”

The Working Mechanism for Consultation and Coordination (WMCC) on India-China border affairs met in Beijing on August 29 for the 17th time since the start of the face-off on in May 2020. The two armies have thus far held 21 rounds of corps commander-level talks to cool tensions along LAC with the aim of restoring the status quo ante of April 2020.

“What are we wanting? We want the situation that was there pre-April 2020 to be restored, whether it is the ground occupation situation, buffer zones or patrolling. Till the time that situation is not



restored, as far as we are concerned, we are fully operationally ready for any contingency,” the army chief said then.

Going by what Jaishankar said (that the disengagement has been completed and the situation of 2020 restored), it appears that goal has been achieved.

The government did not give out details of the latest disengagement.

This is usually a complicated process that involves rigorous verification to monitor the joint withdrawal of troops from friction points. The disengagement effort involves rival troops pulling back a specified distance from face-off sites, with further retreat taking place in phases as the complex plan progresses on a verifiable basis on the ground by both sides. It also entails the phased withdrawal of weapons and equipment to a mutually agreed distance, and finally the restoration of status quo ante (early April 2020).

In the past, the verification process has involved the use of unmanned aerial vehicles, other aerial means of surveillance and satellite imagery of the areas.

<https://www.hindustantimes.com/india-news/lac-conundrum-at-2-key-points-resolved-101729536977017.html>



*Tue, 22 Oct 2024*

## **India launches 4th nuclear-missile submarine**

In the midst of a diplomatic spat with Canada, India quietly launched its fourth nuclear powered ballistic missile (SSBN) submarine at Ship Building Center (SBC) in Visakhapatnam this week to strength its nuclear deterrence against its adversaries.

While India's second SSBN INS Arighaat was commissioned by Defence Minister Rajnath Singh on August 29, 2024, the third SSBN INS Aridhaman will be commissioned next year. On October 9, the Cabinet Committee on Security (CCS) cleared the Indian Navy's plans for construction of two nuclear powered attack submarines to deter any adversaries in the Indo-Pacific.

Although the Modi government is tight-lipped on nuclear deterrence, the fourth SSBN, codenamed S4\*, was launched on October 16, a day after Defence Minister Rajnath Singh inaugurated Very Low Frequency Naval Station in Damagundam forest area of Vikarabad district in Telangana for command, control and communications with strategic assets of the Indian Navy.

The newly launched S4\* SSBN has nearly 75% indigenous content and is equipped only with 3,500km range K-4 nuclear ballistic missiles, which can be fired through vertical launching systems. While the first of its class INS Arihant carries 750 km range K-15 nuclear missiles, its successors are all upgrades of the previous ones and carry only K-4 ballistic missiles. With unlimited range and endurance, the SSBN is constrained only by food supplies, crew fatigue and

maintenance. Both INS Arihant and INS Arighaat are already on deep sea patrols and a nuclear powered attack submarine of Russian Akula class is set to join the force on lease in 2028.

### **INS Aridhaman was named S4\***

Since national security planners named India's first leased nuclear attack submarine INS Chakra as S1, INS Arihant was named S2, INS Arighaat S3, INS Aridhaman S4 and hence the newly launched one is the last of its class, S4\* with the formal name yet to be given. The next class of Indian SSBNs will be double the 6,000 ton displacement of Arihant class and will be carrying nuclear missiles upwards of the range of 5,000 kilometers and beyond.

The focus of the Narendra Modi government on sea based submarine deterrence against powerful adversaries such as China is based on the fact that aircraft carriers are vulnerable to long range PLA missiles like Dong Feng-21 and Dong Feng-26 and could be sitting ducks in worst case scenarios. It is for this very reason that the government has given priority to nuclear attack and ballistic missile submarines over the third aircraft carrier for the Indian Navy. The government has also stepped up conventional submarine deterrence with the sixth of the diesel attack Kalvari class submarine INS Vagsheer to be commissioned in December this year.

In the meantime, the government will give a go ahead to the construction of three more advanced diesel attack submarines at Mazagon Dockyards in collaboration with the French Naval Group. With 10-11 PLA warships in the Indian Ocean every month since last year and carrier based long range patrols expected in 2025-26, strategic submarines are all set to play a major role in defending India and dominate the Indian Ocean Region (IOR).

<https://www.hindustantimes.com/india-news/india-launches-4th-nuclear-missile-submarine-101729560730642.html>

## **THE ECONOMIC TIMES**

*Mon, 21 Oct 2024*

### **Indian Navy's INS Kalpeni arrives in Colombo, to boost maritime cooperation with Sri Lanka**

The Indian Navy's INS Kalpeni arrived in Colombo, Sri Lanka on Saturday and received a warm welcome from the Sri Lankan Navy. This visit is aimed at bolstering maritime cooperation between the two countries, aligning with India's Security and Growth for All in the Region (SAGAR) vision.

Sharing a post on X, the Indian Navy wrote, "Indian Navy's Water Jet Fast Attack Craft INS Kalpeni arrived at Colombo, Sri Lanka, October 19, 2024."

"The ship was accorded a warm welcome by the @srilanka\_navy. The visit aims to further strengthen #maritime cooperation between the two Navies in keeping with the vision of



#SAGAR," the post added. The Indian Navy also said that it will engage with Sri Lankan Navy during the port call.

In another post, it said, "During the port call, the ship's crew will engage with #SLN through official interactions and social engagements."

Earlier in a statement, the High Commission of India in Sri Lanka had said that the INS Kalpeni was warmly welcomed by the Sri Lanka Navy in accordance with naval traditions. "The Commanding Officer, Commander Sunil Kulhari will call on Commander, Western Naval Area, Rear Admiral Chinthaka Kumarasinghe during the stay," it said.

Notably, INS Kalpeni is a Car Nicobar class Waterjet FAC of the Indian Navy commissioned on October 14, 2010. The ship is named after Kalpeni Island in the Lakshadweep group of Islands.

The ship is based in Kochi with the primary role of Coastal Surveillance and Defence. The ship specialises in anti-smuggling, vessel boarding search and seizure along with search and rescue operations.

The ship is on a port call from October 19-21, 2024, termed as Operational Turn Around. The ship has brought in essential technical support tools, which will be handed over to the Sri Lanka Navy. In addition to taking in replenishment, the ship's crew will visit places of importance in and around Colombo, the release added.

The visit further strengthens the bilateral cooperation and camaraderie between the two Navies in keeping with India's 'Neighbourhood First' policy and the Prime Minister's vision of SAGAR, as per the release.

Earlier, INS Kabra, a similar class of ship, visited Colombo in January 2024 and handed over spares to the Sri Lanka Navy and Air Force.

<https://economictimes.indiatimes.com/news/defence/indian-navys-ins-kalpeni-arrived-in-colombo-to-boost-maritime-cooperation-with-sri-lanka/articleshow/114415567.cms>

## THE ECONOMIC TIMES

Mon, 21 Oct 2024

### **India engages with Central Asian countries over diplomatic, military trainings**

The 3rd Special Course for Diplomats from Central Asia (SCDCA) is taking place at the Sushma Swaraj Institute of Foreign Service (SSIFS), under the Ministry of External Affairs, New Delhi, from October 14 to 25, 2024.

Twenty-eight diplomats from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan are attending the two-week program. Amb Raj Kumar Srivastava, Dean of SSIFS, inaugurated the course and highlighted the guiding principles of India's foreign policy in his opening remarks.

India shares historical and civilization linkages with the five Central Asian Republics. These have been strengthened through high level visits, regular exchanges and expanding development cooperation.

The special course encompasses modules covering areas of mutual significance such as: India's Relations with Central Asia including cultural & historical links; Global political and economic landscapes; Reform of Multilateral Institutions; Defence & Security Partnership and Civil Use of Nuclear Energy; Sustainable development partnerships between India & the Global South; Climate Change and Sustainable Practices in water management, renewable energy, Tourism, Food and Agriculture; Digital Public Infrastructure & Responsible AI for all and Yoga and Ayurveda.

At the same time, two high-level delegations are visiting Kazakhstan and Uzbekistan. In a post, the Indian Embassy in Kazakhstan wrote: "The exercise aims to enhance teamwork, improve interoperability, refine tactical expertise, and strengthen Defence Cooperation between the two nations."

"The Indian Army and Kazakhstan Army are actively engaged in the 8th edition of Exercise KAZIND 2024, honing their skills through tactical and combat drills. This crucial training focuses on Counter-Terrorism Operations in a sub-conventional environment under the United Nations Mandate."

Continuing their study tour in Almaty, a delegation from the Indian Army War College visited prestigious military educational institutions and defence industrial establishments at Almaty. Delegation from the Indian Army War College during their study tour visited the Embassy of India, interacted with Ambassador TV Nagendra Prasad. They also visited the National Defence University and prominent defence industrial establishments at Astana.

The 8th edition of India-Kazakhstan Joint Military Exercise KAZIND-2024 was held from September 30, 2024, at Surya Foreign Training Node, Auli, Uttarakhand. The exercise is scheduled to be conducted from 30th September to 13th October 2024. Joint Exercise KAZIND-2024 has been held annually since 2016. Last edition of the Joint Exercise was held at Otar, Kazakhstan from 30th October to 11th November 2023. The Indian Armed Forces, comprising 120 personnel, are being represented by a battalion of the KUMAON Regiment of the Indian Army, along with other arms and services, as well as personnel from the Indian Air Force.

The Kazakhstan contingent will be represented mainly by personnel from Land Forces and Airborne Assault Troopers. Aim of the Joint Exercise is to enhance joint military capability of both sides to undertake counter terrorism operations in a sub conventional scenario under Chapter VII of the United Nations Charter. The Joint Exercise will focus on operations in the semi-urban and mountainous terrain. Objectives to be achieved from the Joint Exercise are high degree of physical fitness, rehearsing and refining drills for operations at tactical level and sharing of best practices.

Tactical drills to be rehearsed during the Joint Exercise include joint response to a terrorist action, establishment of a Joint Command Post, establishment of an Intelligence and Surveillance Centre, securing of helipad / landing site, combat free fall, Special Heliborne Operations, Cordon and Search operations, besides employment of drones and counter drone systems among others. Joint Exercise KAZIND-2024 will enable both sides to share best practices in tactics, techniques and

procedures of conducting joint operations. It will facilitate developing interoperability, bonhomie and camaraderie between the two armies.

The Joint Exercise will also enhance defence cooperation, further augmenting bilateral relations between the two friendly nations. Another similar delegation of officers of the Higher Defence Management Course visited the Academy of Armed forces and the Centre for Strategy Development of Uzbekistan and had meaningful discussions with the faculty at these institutions. A 22-member delegation of the officers led by Commodore Prashant Sidhaye from Higher Defence Management Course is visiting the country.

The delegation of the officers of 20th Higher Defence Management Course called on the officials of the Ministry of Defence of Uzbekistan to have discussions related to India-Uzbekistan bilateral defence ties. India has longstanding and wide-ranging cooperation with Uzbekistan in the field of defence. Bilateral defence cooperation is carried out through the Joint Working Group format, established in 2019 and the fourth JWG meeting was held in Uzbekistan in April 2024.

India & Uzbekistan regularly participate in joint military exercises "DUSTLIK", with the fifth edition held in April 2024 and attended by COAS General Manoj Pande during his visit to Uzbekistan. Defence cooperation has acquired a new level of intensity following the visit of the then Defence Minister of Uzbekistan Maj. Gen. Abdusalam Azizov from 4-7 September 2018 and the visit of Indian Defence Minister Rajnath Singh to Uzbekistan on 1-3 November 2019. An MoU on Military Medicine was signed.

As a follow up of MoU on Military Education signed in October 2018, two institutional level MoUs were also signed for cooperation in training and capacity building. RM inaugurated the first-ever joint military exercise between India and Uzbekistan from 4-14 November 2019. India and Uzbekistan share common perspectives on a number of security issues, including on terrorism, trans-national organized crime, illegal trafficking and smuggling, etc. The main focus of our engagement in this sphere has been to provide assistance to Uzbek security agencies through training and capacity building.

<https://economictimes.indiatimes.com/news/defence/india-engages-with-central-asian-countries-over-diplomatic-military-trainings/articleshow/114431445.cms>



*Mon, 21 Oct 2024*

## **UK demonstrates new infrared countermeasures capability**

The UK has completed end-to-end tests of a new infrared (IR) countermeasures capability intended to protect Royal Air Force (RAF) aircraft against IR-guided manportable air-defence systems (MANPADSs).

Disclosing details on 20 October, the UK Ministry of Defence (MoD) said the combination of the Thales Elix-IR threat warning system (IRTWS) and Leonardo Miysis directed infrared countermeasure (DIRCM) system successfully defeated all threats during a trial conducted at the Vidsel Test Range in Sweden. Testing was conducted in conjunction with the MoD's Defence Science and Technology Laboratory (Dstl) under the umbrella of Team Pellonia.

Sensing in the mid-wave IR band, Elix-IR uses complex algorithms to filter out background clutter so that only valid threats are tracked, classified, and declared. Following track handover, the Miysis DIRCM directs a modulated laser beam (using a Dstl jamming waveform) onto the seeker of the approaching MANPADS so as to break target lock.

The latest trials at Vidsel saw the Elix-IR and Miysis systems installed in a box enclosure fitted to a six-axis linear motion platform. According to the MoD, “[the] operational system defeated a range of infrared heat-seeking missiles being fired simultaneously,” adding, “100% of threats were quickly defeated.”

Established in 2022, Team Pellonia is an enterprise-level partnership bringing together Leonardo, Thales, Chemring Countermeasures, and Dstl. It was set up to serve as a government/industry ‘enterprise’ to deliver self-protection systems for UK air platforms, while at the same time maintaining core sovereign intellectual and industrial capability and contributing to wider prosperity through exports.

<https://www.janes.com/osint-insights/defence-news/air/uk-demonstrates-new-infrared-countermeasures-capability>



*Tue, 22 Oct 2024*

## **China’s Struggle With Aero-Engine Keeps PLA On The Backfoot Despite Impressive Fleet Of Warplanes: OPED**

China’s defense policies underscore its commitment to self-reliance and the relentless pursuit of advanced technology, aiming to reduce dependence on foreign sources. The country’s defense industry, a critical component of its national strategy, is one of the largest and most advanced in the world. It is a testament to China’s significant investments in military modernization and technological innovation, which have bolstered its military might and global influence.

The roots of China’s defense industry can be traced back to the 1950s when the People’s Republic of China was established. Over the decades, it has evolved from focusing on basic weaponry to a more sophisticated and diversified military production capability, with a strong emphasis on advanced technology. The industry is primarily state-owned and heavily regulated by the Chinese government.

**Defence Aviation Industry**

The military aviation sector is part of China's broader defense industry and is critical for the People's Liberation Army Air Force (PLAAF). China's military aviation industry has rapidly evolved over the past few decades, reflecting its growing emphasis on modernizing its armed forces and enhancing its defense capabilities.

The industry focuses on producing a range of military aircraft, including fighter jets, transport planes, helicopters, and unmanned aerial vehicles (UAVs). The Chinese military has undertaken extensive modernization efforts, including developing advanced fighter jets (Chengdu J-20 and J-31, fifth-generation stealth fighters). However, China faces several challenges in developing advanced fighter aircraft engines, which are critical for enhancing the capabilities of its military aviation.

### **Aero Engine Corporation Of China**

The Aero Engine Corporation of China (AECC) is a Chinese state-owned enterprise focused on developing, manufacturing, and servicing aircraft engines. It was officially established in August 2016 in response to China's growing need to develop its indigenous aero-engine technology for military and civilian aircraft.

The company merged parts of AVIC (Aviation Industry Corporation of China) and other related entities to consolidate China's aerospace engine research, development, and production capabilities. Developing advanced Indigenous engines is a strategic priority for China, both for the defense sector and the expanding commercial aviation industry (e.g., China's domestically developed C919 airliner).

AECC aims to reduce China's reliance on foreign engine manufacturers and to enhance China's aerospace capabilities, especially in the context of its military modernization and commercial aviation expansion.

### **Current State Of Development**

Historically, China has relied on foreign-sourced engines, and AECC is central to the effort to change that. AECC is focused on developing turbofan and turboprop engines for military jets, such as the WS-10 series (for fighter aircraft) and the WS-15 (for China's next-generation stealth fighter).

It is also developing high-bypass turbofan engines for commercial aircraft, aiming to rival global engine makers General Electric and Rolls-Royce.

- WS-10 “Taihang” Engine:** The 13-14 ton thrust WS-10, a product of several years of dedicated development, represents China's first successful attempt at producing a modern turbofan engine for its advanced fighters. This achievement, intended for use in the J-10 and J-11 fighter jets, is a testament to China's progress in engine development. While early versions faced reliability issues, newer variants, such as the WS-10B and WS-10C, have reportedly improved significantly in thrust and performance, instilling optimism about China's future in aviation technology.

- WS-13 “Tianshan” Engine:** A turbofan engine (8.5-9 ton thrust), primarily designed for the FC-1/JF-17 fighter, a joint Chinese-Pakistani light fighter aircraft. The WS-13 is a

lighter engine designed for smaller fighters and is an alternative to the Russian-made RD-93 engine used in earlier JF-17 models.

•**The WS-15 “Emei” Engine:** A next-generation turbofan engine with an estimated 18 tons of thrust is a significant milestone in China’s fighter engine development. Designed to power the J-20 stealth fighter jet, the WS-15 is strategically important as it aims to provide the thrust and performance required for fifth-generation fighter jets, particularly for China’s J-20 stealth fighter. Its potential to achieve super cruise capability (sustained supersonic flight without afterburners) underscores the strategic implications of China’s advancements in fighter engine development. Despite facing delays and challenges in achieving the desired performance standards, the WS-15 represents a promising future for China’s military aviation capabilities (Timelines for the development of this engine are attached).

•**WS-18:** It is a high-thrust turbofan engine for heavy transport aircraft like the Y-20 and may be used in future bomber or tanker aircraft. The WS-18 is intended to replace foreign engines in China’s large transport aircraft, such as the Y-20, which initially relied on Russian D-30KP engines.

•**WS-20 Engine:** A high bypass turbofan engine designed for the Y-20 transport aircraft, the WS-20 represents another step in China’s efforts to enhance its engine technology and reduce reliance on imports.

### **China’s Challenges In Fighter Aircraft Engine Development**

The complex process of developing reliable, high-performance aero engines presents a significant challenge for AECC. Multifaceted challenges encompassing technological, material, and geopolitical factors hinder China’s quest to catch up with global leaders in engine technology.

While the country has made notable strides in recent years, overcoming these challenges is crucial for enhancing its military aviation capabilities and achieving greater self-sufficiency in defense technology.

•**Technological Challenges:** Developing advanced jet engines involves advanced knowledge and complex engineering challenges, including materials science, aerodynamics, and thermodynamics. Achieving high thrust-to-weight ratios, fuel efficiency, and durability while maintaining stealth capabilities requires innovative design solutions, advanced materials, and cutting-edge technology that has taken years to develop.

•**Material Limitations:** Engine components must withstand extreme temperatures and stresses. Developing high-performance materials that can endure these conditions is crucial. China needs to catch up in producing advanced alloys and composite materials required for next-generation engines. Advanced manufacturing methods, such as precision casting and 3D printing, are essential for creating complex engine parts. While China has progressed in this area, ensuring quality control remains challenging.

•**Reliability and Quality:** Rigorous testing and quality assurance are vital to ensuring engine reliability. Despite advancements, Chinese engines have struggled with quality and reliability issues compared to their Western counterparts. Early versions of domestically produced engines, like the WS-10, experienced reliability issues that needed to be



addressed through ongoing refinements and improvements. There have been concerns about durability and performance under extreme conditions.

•**Research and Development Challenges:** Building a skilled workforce with expertise in aerospace engineering and related fields is critical. While China has many engineering graduates, there is a need for more specialized training and experience in aerospace propulsion systems. Although the Chinese government has significantly increased investments in aerospace R&D, various sectors still compete for resources. Prioritizing engine development over other military technologies can be a challenge.

•**Dependency on Foreign Technology:** Historically, China has relied on foreign technology and imports for advanced aircraft engines and critical engine components, especially from Russia. This dependency has limited China's ability to develop fully indigenous capabilities in this crucial area. For instance, China's early fighter jets, such as the J-11, used Russian engines (AL-31F), which affected operational independence. While efforts are underway to develop indigenous capabilities, breaking this dependency takes time. Attempts to acquire foreign technology through partnerships and joint ventures have often faced political hurdles, leading to limited access to advanced engine technologies.

•**Geopolitical Pressures:** Geopolitical tensions, particularly with Western nations, lead to sanctions that limit China's access to advanced aerospace technologies. This slows down development and innovation in the aviation sector. Competing with established aerospace powerhouses like the United States and Russia, which have decades of experience and technological advancements in engine development, poses another significant challenge.

•**Intellectual Property Concerns:** Efforts to reverse-engineer foreign engines have raised intellectual property issues, leading to tensions with countries that view these actions as unfair competition.

•**Present Status:** China has been making significant strides in developing indigenous fighter aircraft engines. The country aims to reduce its reliance on foreign-made engines, mainly from Russia, and to enhance its domestic military aviation capabilities. China's fighter aircraft engine development has advanced significantly in recent years, reflecting the country's growing ambitions in military aviation. Chinese engineers have made strides in materials science, advanced manufacturing techniques, and thrust vectoring technology, enhancing engine performance and reliability. China has sought to acquire foreign technology to bolster its capabilities. Collaborations with countries like Russia have facilitated knowledge transfer, especially in engine design and testing.

### **Future Prospects**

China is likely to increase its investment in R&D to improve its engine technology further. The goal is to achieve greater self-sufficiency and enhance the performance of its fighter aircraft. The exploration of next-generation technologies, including AI-driven engine management systems, adaptive cycle engines, and environmentally sustainable fuels, could shape the future of Chinese military aviation. Developing advanced fighter aircraft engines is crucial for China's military

modernization efforts. As tensions rise in the Asia-Pacific region, the ability to produce competitive engines will play a vital role in enhancing China's defense capabilities.

### **Strategic Implications**

China's struggles with fighter aircraft engine development have strategic implications, particularly in its military modernization efforts and aspirations to become a global aerospace leader. Achieving self-sufficiency in engine technology is crucial for ensuring operational independence and enhancing the capabilities of its air force. Continued efforts in this area will be essential for China to strengthen its military aviation capabilities and achieve its broader defense objectives.

### **Timeline Of WS-15 Engine Development.**

Estimates vary on when WS-15 development began.

- 1990: Preliminary steps initiated.
- 2005: The blueprint for the WS-15 began to materialize
- 2006: A preliminary image of the WS-15 engine emerged five years before the J-20 prototype was unveiled.
- 2010: The first WS-15 prototypes entered the ground testing phase
- 2012: The full-scale demonstration project was completed, and extensive trials followed.
- 2013: The WS-15 development program started achieving significant milestones.
- July 2018: The Chinese academic overseeing aviation engine R&D in Beijing, Liu Daxiang, announced that WS-15 development was progressing rapidly and would be fully completed within three years.
- 2019: The Russian AL-31 powering the J-20 was replaced by the domestic WS-10C engine.
- 2021: the WS-15 was nearing operational readiness.
- 2022: One WS-15 engine was flown on the jet along with another older version of the engine for testing purposes.
- March 2023: The WS-15 engine achieved full operational capability. WS-15 project Chief Chang Young at the AECC Beijing Institute of Aeronautical Materials announced at the 7th Chinese Aviation Innovation and Entrepreneurship Competition (CAIEC) that the WS-15 engine is now ready for mass production.
- 29th June 2023: Chengdu Aircraft Corporation (CAC) conducted the maiden flight of the new variant J-20 fighter, fitted with two WS-15 turbofan engines.
- As of late August 2024, the Chinese WS-15 engine reportedly encounters several significant hurdles impacting its deployment and operational efficiency. One major issue involves supply chain disruptions related to the advanced alloys needed for the engine's production.

### **Conclusion**

China's fighter aircraft engine development is critical to its broader military modernization strategy. While significant progress has been made, ongoing challenges remain. China's emphasis on indigenous production, technological innovation, and strategic partnerships will be essential for enhancing its position in the global military aviation landscape. Monitoring these developments as the situation evolves will be crucial for understanding their implications for regional and global security dynamics.

<https://www.eurasiantimes.com/chinas-struggle-with-aero-engines-keep/>

## Science & Technology News

# THE ECONOMIC TIMES

Mon, 21 Oct 2024

### **These tiny worms account for at least 4 Nobel Prizes**

When scientists win the Nobel Prize in physiology or medicine, they typically thank family and colleagues, maybe their universities or whoever funded their research. This year, as molecular biologist Gary Ruvkun accepted the most prestigious award of his career, he spent a few minutes lauding his experimental subject: a tiny worm named *Caenorhabditis elegans*, which he called "badass."

"No one ever thought to use that term for a worm," he said during a news conference. "We are asserting ourselves now, and I was asserting this before the Nobel-stinking-Prize."

This isn't the worm's first brush with international stardom nor is it the first time *C. elegans* has been thanked for aiding award-winning work. Ruvkun's award was actually the fourth Nobel Prize resulting from *C. elegans* research, cementing the lowly soil worm's outsize role in scientific discovery.

The 1-millimeter nematode has helped scientists understand how healthy cells are instructed to kill themselves and how the process goes awry in AIDS, strokes and degenerative diseases. (That work was the subject of the 2002 Nobel Prize in physiology or medicine.)

Self-proclaimed "worm people" were recognized by the Nobel committee in 2006 for discovering gene silencing, which became the basis for an entirely new class of drugs. Two years later, the chemistry prize went to scientists who used nematodes to help invent cellular "lanterns" that allowed biologists to see the inner workings of a cell.

For each prize, a laureate made sure to thank the worm for its contributions, though perhaps the most famous nod came from Sydney Brenner, who won the first "worm Nobel." "Without doubt,

the fourth winner of the Nobel Prize this year is *Caenorhabditis elegans*," he said in his lecture in Stockholm.

"It deserves all of the honor, but of course it will not be able to share the monetary award."

Brenner, often thought of as the father of *C. elegans* research, is the closest thing there is to a worm celebrity. He is credited with popularizing *C. elegans* in laboratories worldwide, after spending almost a decade hunting for the perfect research model. Worm scientists sometimes define themselves by how removed they are from Brenner's lab -- "first generation" researchers worked with him directly, while the "second generation" worked with scientists who worked with him.

*C. elegans* is named after the Latin word for "elegant" because of the way it moves in graceful, sinusoidal waves. One of the animal's virtues is its simplicity, which allows scientists to test hypotheses about fundamental biological concepts in a model that is easy to understand. The nematodes have just 959 cells -- a remarkably manageable number, compared with our trillions of cells -- each of which scientists have named and charted from fertilization to death.

"This is probably the best-understood multicellular organism on the planet," said Howard Ferris, a nematologist at the University of California, Davis. The destiny of each cell is easy to map, since the worms become translucent under the light of a microscope and cycle through all developmental stages in about three days. The nematode was the first animal to have its genome entirely deciphered -- in 1998, years before scientists were able to do the same for flies and mice. The worm is also inexpensive, easy to store and entirely self-sufficient when it comes to reproduction; female *C. elegans* have functional sperm that allow them to inseminate themselves.

"It's an experimental dream," said Judith Kimble, a nematode researcher at the University of Wisconsin, Madison.

"The more we do with it, the more of a wonderful dream it becomes."

Even when scientists come to nematology for the worms, they often stay for the tightly knit, offbeat community. Since its inception, the field has had a tradition of collaboration. Researchers created a newsletter in 1975 called the *Worm Breeder's Gazette* to share the results of their experiments before they were published. Kimble attributes much of the research success to the fact that worm-bonded scientists tend to share their resources and cooperate, a value she wishes the rest of the country would adopt.

Ruvkun, of the Harvard Medical School, and his co-winner, Victor Ambros, a professor of molecular medicine at UMass Chan Medical School, shared their findings with each other, allowing them to piece together the mechanics of microRNA.

Had they not, their prizewinning work might have been delayed years, even decades. The *C. elegans* research community comes together every other year at the International Worm Convention, where the scientists traipse about in their signature garb: sweatshirts, shorts and Birkenstocks.

There are nematode-friendly comedy performances and art competitions, where scientists have entered ceramic, wool, wooden and 3D-printed tributes to their favorite organism. At night, there are dance parties where, yes, some scientists have been known to do the worm. This collective

spirit stands in stark contrast to some other corners of biology, like fly research, where scientists tend to guard their research and compete with one another, said Cathy Savage-Dunn, who studies cell signaling in *C. elegans* at the City University of New York.

Indeed, there is something of a rivalry between fly researchers and worm scientists. The latter are fond of saying that flies are too complex and fly science conferences too stuffy. But the two groups agree that their research is dismissed by mammal scientists, who reside on top of the unspoken lab animal hierarchy and often believe that experiments on invertebrates are irrelevant to humans.

In fact, the discovery of microRNA was first met with silence outside the *C. elegans* community, in part because other scientists thought the original findings were just a quirk of worms. It wasn't until years later, when Ruvkun proved that microRNA was present in a wide array of animals, including humans, that the wider research community finally acquiesced.

Even though worms are leagues simpler than the human body, we have more in common than we might believe, said Robert Waterston, a geneticist at the University of Washington in Seattle. "If we understand the worm, we understand life," he said

<https://economictimes.indiatimes.com/news/science/these-tiny-worms-account-for-at-least-4-nobel-prizes/articleshow/114415452.cms>



*Tue, 22 Oct 2024*

## **India China cooperation in Space**

After multiple rounds of diplomatic and military discussions, India and China are advancing along the process of disengagement after the situation along the Line of Actual Control (LAC) between the two nations reverted to its pre-2020 state.

The relations between India and China had turned sour following a violent clash in Galwan Valley in June 2020. The disengagement opens up the possibility of India and China working closely together, including in the space domain.

The two countries actually have a long history of cooperation in space. On 13 December, 1991, India and China signed an agreement for bilateral cooperation in space research, technology and applications. The agreement was signed by the then Chariman of the Space Commission, UR Rao and the Chinese counterpart, the Vice-Minister for Aerospace, Liu Jiyuan.

The agreement was signed in the presence of the then India Prime Minister PV Narasimha Rao and the China Prime Minister Li Peng. On 18 September, 2014, a Memorandum of Understanding was signed between ISRO and the China National Space Agency (CNSA) on the peaceful use of outer space.

The agreement covered research and development of satellites, launch and tracking control services, development of ground systems, and research in the fields of space, atmospheric sciences, microgravity testing and radio astronomy.

### **International collaborations to benefit mankind**

At the IAC 24, China reiterated its intentions to work closely with countries around the world, including emerging economies, for cultivating a thriving spacefaring community. India too, has previously committed to collaborate with other nations for the benefit of all humans of Earth, and keeping space free of conflict.

Speaking at the Centre for Contemporary China Studies at Sushma Swaraj Bhavan in New Delhi last year, Space Minister Jitendra Singh said, “We have consistently adhered to the principles of transparency, accountability and peaceful uses of Space. And therefore we urge upon every other nation including China to engage in open dialogue with others so that we share each other’s missions, ventures without being secretive or suspicious and also ensure that we preserve a secure, safe and stable environment.”

<https://www.news9live.com/science/india-china-cooperation-in-space-2729575>



