

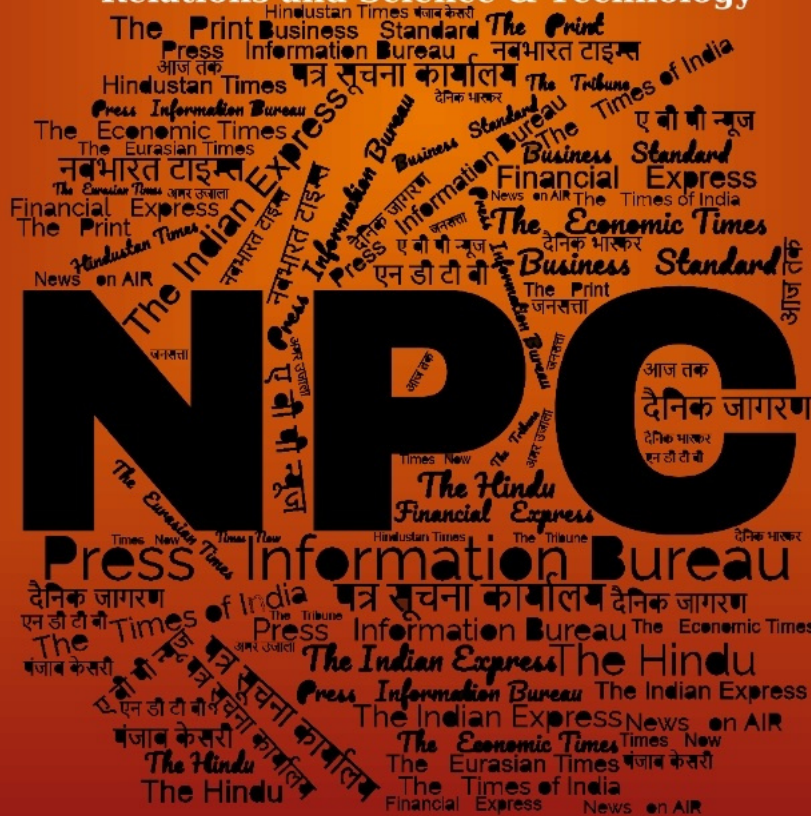
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Press Information Bureau
Government of India

Ministry of Defence

Tue, 07 Jan 2025

INS Tushil Completes Its Visit To Dakar, Senegal

INS Tushil, the Indian Navy's latest guided missile stealth frigate, has completed its inaugural port visit to Dakar, Senegal, enhancing bilateral relations between the two nations. During its three-day stay at Dakar, Captain Peter Varghese engaged with Rear Admiral Abdou Sene, Chief of Staff of the Senegalese Navy, to discuss strengthening naval cooperation and shared maritime security initiatives.

The visit included a Subject Matter Expert Exchange (SMEE), showcasing the Indian Navy's *NISHAR - MITRA* terminal, and a joint Yoga session involving the Yoga Association of Senegal and Navy personnel. The ship welcomed around 150 visitors from the Indian diaspora and local community, illustrating the Indian Navy's growing presence in the region.

INS Tushil concluded the visit by undertaking a Passage Exercise (PASSEX) with the Senegalese naval vessel *PHM Niani* upon departure. This visit highlights the importance of cooperative efforts in promoting regional security and marks a significant step in enhancing interoperability between the two navies.



<https://pib.gov.in/PressReleasePage.aspx?PRID=2090966>



**Press Information Bureau
Government of India**

Ministry of Defence

Tue, 07 Jan 2025

Raksha Mantri Shri Rajnath Singh to meet Defence Minister of Maldives Mr Mohammed Ghassan Maumoon in New Delhi

Raksha Mantri Shri Rajnath Singh will hold a bilateral meeting with the Defence Minister of Maldives Mr Mohammed Ghassan Maumoon in New Delhi on January 08, 2025. During the talks, the two Ministers will review the various facets of bilateral defence cooperation including training, regular exercises, defence projects, workshops and seminars to enhance the capability of the Maldives National Defence Forces as well as supply of defence equipment & stores.

India and the Maldives share spiritual, historical, linguistic and ethnic ties. The Maldives occupies a special place in India's 'Neighbourhood First' policy, which aims to bring stability and prosperity in the Indian Ocean Region (IOR). Also, both nations are key players in maintaining safety and security of IOR, thus contributing to India's vision of Security and Growth for All in the Region (SAGAR).

The Defence Minister of Maldives will be on a three-day visit to India from January 08 to 10, 2025. During his stay, he will also be visiting Goa and Mumbai.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2090788>



**Press Information Bureau
Government of India**

Ministry of Defence

Tue, 07 Jan 2025

Delivery Of Yard 132 (LSAM 22)

Induction ceremony of eighth Ammunition Cum Torpedo Cum Missile (ACTCM) Barge, LSAM 22 (Yard 132) was held on 06 Jan 25 at Naval Dockyard, Mumbai. Chief Guest for the Induction Ceremony was Cmde Vinay Venkataram, Officer-in-Charge, Fleet Maintenance Unit (Mbi).

The contract for construction and delivery of eleven ACTCM Barges was concluded with M/s Suryadipta Projects Pvt. Ltd., Thane on 05 Mar 21, a MSME Shipyard. Seven ACTCM Barges have already been delivered and the shipyard has also been awarded a contract for construction and delivery of four Sullage Barges to the Indian Navy thereby highlighting the Indian Navy's commitment towards encouraging MSMEs.

The Shipyard has indigenously designed these Barges in collaboration with an Indian Ship Designing firm and subsequently model tested at Naval Science and Technological Laboratory, Visakhapatnam, successfully to ensure seaworthiness. These barges are built in accordance with the relevant Naval Rules and Regulations of Indian Register of Shipping (IRS). These Barges are proud flag bearers of *Make in India and Aatmanirbhar Bharat* initiatives of Government of India.

Induction of these Barges would provide impetus to operational commitments of Indian Navy by facilitating Transportation, Embarkation and Disembarkation of articles/ ammunition to Indian Navy platforms both alongside jetties and at outer harbours.



<https://pib.gov.in/PressReleasePage.aspx?PRID=2090784>

THE  HINDU

Tue, 07 Jan 2025

India, U.S. to jointly manufacture interoperable sonobuoys for Navy

In a significant development, India and the U.S. announced cooperation on co-production of U.S. sonobuoys for Undersea Domain Awareness (UDA) for the Indian Navy, a high-end technology that allows tracking submarines in the deep seas and oceans.

This is the latest in a series of cooperation measures between the two countries as both grow wary of the rapid expansion of Chinese naval presence in the Indian Ocean Region.

“Welcoming the advancement of discussions between Ultra Maritime (UM) and Bharat Dynamics Limited (BDL) to enhance undersea domain awareness through a first-of-its-kind partnership on co-production of U.S. sonobuoys in support of the U.S. and Indian defence industrial bases,” said a fact sheet ‘The U.S. and India Committed to Strengthening Strategic Technology Partnership’ issued on January 6 at the end of U.S. National Security Advisor Jake Sullivan’s visit to India on the aspect of deepening defence innovation and industrial cooperation.

Mr. Sullivan, on his final trip to the region as NSA, held a capstone meeting with his Indian counterpart Ajit Doval.

“In line with the U.S.-India Initiative on Critical and Emerging Technologies (ICET) launched in May 2022, the Ultra Maritime and BDL teams will also pursue new sonobuoy technologies to optimize their acoustic performance in the unique environment of the Indian Ocean, enabling wide area search through bespoke multi-static active solutions,” Ultra Marine, a U.S.-based world-leader in the design and production of undersea warfare capabilities, said in a statement.

They will jointly supply and manufacture sonobuoys for the Indian Navy as per U.S. Navy standards, with production split across the U.S. and India, in accordance with ‘Make in India’ principles, it stated.

“The announcement today by NSA Jake Sullivan reflects Ultra Maritime’s commitment to the Indian Navy in partnering with BDL for production and delivery of world-class sonobuoys, and our resolute commitment to continue to develop forward leaning solutions to unique undersea challenges,” said Ultra Maritime CEO Carlo Zaffanella in the statement.

Chairman of BDL Commodore A. Madhavarao (Retd) said that BDL was completely aligned with the Indian Navy to meet the operational demand for ‘Make in India’ sonobuoys and committed to joint production with Ultra Maritime in Vishakhapatnam.

Highlighting the aspect of interoperability, a key focus area, Rear Admiral Mark Kenny (Retd), Senior Vice President at UM for Strategy and Business Development, said: “The UM sonobuoys co-produced in India are interchangeable and interoperable between U.S. Navy, Indian Navy and allied P-8, MH-60R and the MQ-9B Sea Guardian aircraft.”

Significant moveThis is particularly significant as India has over the years acquired a series of military platforms from the U.S. that are also operated by other countries in the region, especially Australia and Japan, all four of which comprise the Quad grouping and also hold the Malabar naval exercise. Indian Navy operates the P-8I long range maritime patrol aircraft, is inducting the MH-60R multi-role helicopters and has two MQ-9A armed High Altitude Long Endurance (HALE) Remotely Piloted Aircraft Systems on lease and signed a \$3.5 bn contract in October 2024 for 31 MQ-9B – 15 Sea Guardians for the Indian Navy and 16 Sky Guardians, eight each for the Army and Air Force, with deliveries to begin from January 2029.

After Maritime Domain Awareness, UDA has emerged as a key focus area for India and among the Quad. In October 2021, the then Navy Chief Adm Karambir Singh termed UDA as one of the most critical areas with regard to naval operations. In a related move, last September, Sagar Defence Engineering Private Limited and Liquid Robotics, a Boeing company, announced partnership for

the co-development and co-production of scaled Uncrewed Surface Vehicle (USV) systems for UDA for the Indian Navy with co-produced USVs expected this year.

In February 2024, speaking at an India-US defence conclave, the then Defence Secretary Giridhar Aramane, referring to the threat from China, said that to address common threats, “interoperability” was going to be a very important issue and added, “In Indo-Pacific, especially in the IOR, where we have an emerging threat from an emerging power, it is essential that we have greater collaboration in UDA. It’s going to be crucial to ensure that this part of the region will remain safe and secure for trade, commerce and prosperity.”

<https://www.thehindu.com/news/national/india-us-to-jointly-make-sonobuoys-for-indian-navy/article69071424.ece>

THE ECONOMIC TIMES

Tue, 07 Jan 2025

Citing China's nos. & rapid tech pace, IAF chief bats for private players in aerospace

Making a strong case for upgrading domestic aerospace manufacturing capacity, Air Chief Marshal AP Singh expressed strong support for an increased presence of private sector players in the field and pointed out that China is not only increasing the number of its military platforms at rapid pace but has also made some significant technological advances.

Speaking at a seminar in the capital, the air chief made a strong case for indigenous industry, citing the current geopolitical situation in which friendly nations may be constrained to offer support given their own domestic demands.

"I am very convinced that we need to get some private (sector) players. We need to have competition and we need to have multiple sources (of suppliers). So that people are wary of losing their orders. Otherwise things will not change," the top officer said, in an apparent reference to the current public sector dominance in the aerospace sector.

He also said that research and development loses its relevance in case it is not able to meet time-lines. "Technology delayed is technology denied. There has to be an increased aptitude for acceptance of risks involved and failures in R&D," he said.

He added that India needs to increase its capacity and production agencies need to invest in advanced manufacturing processes to meet current challenges. "The geopolitical situation is such that when the chips are down your so-called friends won't come to your rescue. The only way one can survive is to do things ourselves," he said.

Singh said that the air force also has to look inwards when it comes to support for indigenous efforts of research and development. "I think all of us have been failing, in not being able to take

us to that self-reliant state where we should have been today. We in uniform are no less responsible for this," he said.

The officer outlined several areas where much more efforts are needed, including aero engines, airborne radars, beyond visual range missiles, sensors, unmanned combat aerial vehicles, hypersonic technology and advanced metallurgy.

<https://economictimes.indiatimes.com/news/defence/citing-chinas-nos-rapid-tech-pace-iaf-chief-bats-for-private-players-in-aerospace/articleshow/117032605.cms>

THE ECONOMIC TIMES

Tue, 07 Jan 2025

US NSA Sullivan highlights challenges posed by China's "predatorial industrial strategies" and importance of India-US collaboration

The National Security Advisor of the United States who is on a visit to India, highlighted the challenges posed by China's "predatorial industrial strategies" and the importance of India-US collaboration in overcoming them. Sullivan emphasized the significance of stronger defence cooperation between the US and India, citing its role in enabling greater security across the region during an event at IIT Delhi during the session, 'The United States and India: Building a shared future.'

Speaking about clean energy and the electronics industries, NSA Sullivan said, "We've seen companies struggling to compete against China's predatorial industrial strategies and chips and clean energy and other emerging technologies, and of course, we've seen repeated attacks on industries tied to our critical infrastructure, which is heightening the risks not only to cyber espionage but of destructive sabotage. That's why as we launched ISA, both President Biden and Prime Minister Modi made it a priority to invest in national programmes that are spurring production in sectors that have become overly reliant on a single country, China. These include the US Chips and Science Act, the India Semiconductor mission, and India's production-linked incentive (PLI) programme in areas such as biopharmaceuticals."

Sullivan's remarks at IIT Delhi focused on the Indo-Pacific region and the growth of the India-US defence partnership over the past two decades. He noted that the partnership has evolved from no defence trade relationship 25 years ago to the current collaborative manufacturing of defence systems in India. He observed that the benefits of these programmes are already flowing to both India and the US. Mentioning the American semiconductor company Micron, Sullivan said that it was the first, not just American but global company to partner with India's semiconductor mission, investing hundreds of millions of dollars in new semiconductor packaging facilities aimed at establishing "India as a new hub in the global chip ecosystem."

Sullivan also highlighted the benefits of the US Chips and Science Act, the India Semiconductor mission, and India's production-linked incentive (PLI) program in reducing dependence on single-source suppliers, particularly China. He noted, "India and the United States joined hands with the Republic of Korea, Japan, and Europe to establish a new biopharmaceutical supply chain consortium, the BIO5, that will help reduce dependence on single source suppliers in terms of the supply chain for biopharmaceuticals. We are poised now to expand those efforts into new sectors, most notably commercial space exploration."

Speaking about the Indo-Pacific region and the India-US defence partnership, Sullivan said, "The growth of our defence partnership over the past two decades has been nothing short of remarkable. Consider that 25 years ago, the US and India had no defence trade relationship at all. No frameworks for information sharing or logistics cooperation. No major military exercises to train alongside each other. Today, the US isn't just selling defence systems to India, we are making them here in India and the United States has become a top destination for Indian defence exports".

He mentioned how American and Indian startups are working to bring forth new technologies for our militaries. The US and India are co-producing defence systems, with the US becoming a top destination for Indian defence exports. American and Indian startups are working together to develop new technologies for military applications.

"On top of this, in the past 2 years alone, the Biden administration has approved technology proposals that would enable India to become the first global producer of striker combat vehicles, a leading producer of advanced munition systems, and the first foreign producer of cutting edge maritime systems. We've already announced a ground-breaking initiative to enable India to manufacture jet engines that will power India's future indigenous fighter fleet, and even more work is underway in aviation and sensing and undersea that will come to fruition soon. So many of these initiatives can spread way beyond the US and India to eventually help countries across the Indo-Pacific region upgrade their defensive capabilities as well, because that is a critical goal that unites us to ensure a freer, more secure, more prosperous, and more resilient Indo-Pacific region," Sullivan said.

He mentioned that "through the multinational combined Maritime Forces Coalition, of which India is now a full-time member, we are combating both piracy and trafficking at sea. Through Exercise Malabar, the US, India, Australia, and Japan are training to more rapidly respond to natural disasters across the region. And through historic agreements that allow US Navy vessels to seek repair and maintenance in Indian shipyards in Kochi, Mumbai, and soon Chennai, the United States can more readily train and operate with countries across the Indian Ocean region. At a time when we're seeing more dangerous provocations in the air and at sea, the proliferation of destabilising technologies, and countries attempting to change the status quo by force, our cooperation in technology, in defence and beyond is rapidly becoming one of the core pillars of stability across the Indo-Pacific."

<https://economictimes.indiatimes.com/news/defence/us-nsa-sullivan-highlights-challenges-posed-by-chinas-predatorial-industrial-strategies-and-importance-of-india-us-collaboration/articleshow/117007263.cms>

India-Bangladesh border fencing work going on peacefully in Malda: BSF

The BSF on Tuesday said that fencing work at the border between India and Bangladesh in Malda district was going on in a peaceful manner. BSF South Bengal DIG Nilotpal Kumar Pandey said the Border Guard Bangladesh (BGB) had raised an objection over the matter.

He said that a reply has been given to the BGB by the BSF authorities. "Everything is going on in a peaceful manner," Pandey told reporters in Petrapole in North 24 Parganas district.

Asked about reports in the Bangladeshi press claiming that the BGB has taken control of the 5-km border region situated along the Kodala river in Mohespur upazilla in Jhenaidah, the BSF officer said these reports were totally baseless. He said the area is located opposite to Ranaghat in West Bengal's Nadia district.

"There is no change in the status quo there," Pandey said. "The status quo is there as it was earlier and there is complete peace," he said.

<https://economictimes.indiatimes.com/news/defence/india-bangladesh-border-fencing-work-going-on-peacefully-in-malda-bsf/articleshow/117030065.cms>

THE WEEK

UK's quantum leap: How atomic clock is poised to define future of warfare

In what has been billed as a leap forward in improving intelligence, surveillance and reconnaissance by decreasing the reliance on GPS technology, the Defence Science and Technology Laboratory (DSTL) of the UK developed an atomic clock that will make military operations more secure through experimental quantum technology.

According to UK ministry of defence (MoD), the precision of the clock is so refined that it will lose less than one second over billions of years, allowing scientists to measure time at an unprecedented scale.

Besides, it is also expected to support navigation systems, secure communication networks, and increase the accuracy of advanced weaponry. By decreasing the reliance on GPS technology—which can be disrupted and blocked by adversaries—the atomic clock will strengthen national security, making it less vulnerable to disruptions through various techniques.

Further improvement to GPS accuracy could transform global navigation systems, aiding in everything from satellite communication to aircraft navigation.

Some of the key benefits of the technology include enabling more precise and independent navigation systems, reducing reliance on GPS satellites, which are vulnerable to jamming or destruction in conflict scenarios; secure communications systems, such as encrypted military networks, which depend on highly synchronised timekeeping; enhancing the accuracy of advanced weapon systems, like guided missiles, which rely on accurate timing to calculate trajectories and coordinate attacks; and allow UK armed forces to gain an edge over adversaries in timing-critical operations, especially in areas like cyber warfare, where milliseconds can make a difference.

"Integrating cutting-edge technology into existing capabilities exemplifies the government's commitment to innovation in the defence sector, and to ensuring our armed forces have the best kit possible to keep us secure at home and strong abroad," said Maria Eagle, Minister for Defence Procurement and Industry. The trial of this emerging, groundbreaking technology could not only strengthen our operational capability, but also drive progress in industry, bolster our science sector and support high-skilled jobs, she said.

"Quantum is really important to the UK especially from a defence perspective. If you look at what's happening in the world at the moment, it's becoming increasingly obvious that we need better and more robust position navigation and timing services, and that's something that quantum is uniquely placed to be able to provide," a technical leader for industry partner Inflection has been quoted as saying.

<https://www.theweek.in/news/defence/2025/01/07/uk-quantum-leap-how-atomic-clock-is-poised-to-define-future-of-warfare.html>



Tue, 07 Jan 2025

Chinese troops getting more oxygen than Indian soldiers in high-altitude areas? Here's the reason

In what could provide China with a strategic edge over India in high-altitude warfare, the troops of Chinese People's Liberation Army (PLA) Xinjiang Military Command stationed on the Karakoram Plateau, which spans across parts of Pakistan, India, Afghanistan, and China, will have improved access to oxygen with the setting up of a 20-kilometer oxygen supply zone. The Xinjiang Military Command is part of the broader Western Theater Command of PLA responsible for managing potential conflicts along borders with India, Pakistan, Afghanistan, and Central Asia.

The soldiers of Hotan Military sub-command of the Xinjiang Military Command, stationed at an altitude of 5,380 meters, used to manage with oxygen content less than 40 per cent available in the plains.

According to Global Times, PLA has been making efforts to provide more oxygen to troops with oxygen production cabins, pressurised oxygen chambers, and portable oxygen cylinders or individual oxygen generators.

According to a soldier, in 2010, the fifth-generation barracks were equipped with oxygen systems which ensured that at least an hour daily, soldiers inhale oxygen, helping them increase the oxygen levels in the bloodstream.

There have been further improvements since then, including an oxygen-enriched indoor training facility equipped with heating, humidifiers, and oxygen generators. This initiative was followed by indoor gyms with treadmills and spin bikes.

According to PLA Daily, in 2020, oxygen production cabins were set up in the region. In the next year, an oxygen therapy chamber was established, helping the troops breathe oxygen under normal atmospheric pressure.

"Compared with self-inhalation of oxygen, the chamber provides more controllable, targeted and scientific health care functions," PLA Daily quoted a military doctor as saying.

Increased availability of oxygen in high altitude areas would ensure that there is a major reduction in altitude sickness leading to enhanced combat capabilities. Health Bureau of the CMC Logistic Support Department stated that soon, oxygen generators and individual oxygen supply devices will be set up in such high altitude areas, enhancing the war-readiness of the troops.

<https://www.theweek.in/news/defence/2025/01/07/chinese-troops-getting-more-oxygen-than-indian-soldiers-in-high-altitude-areas-heres-the-reason.html>

The Tribune

Wed, 08 Jan 2025

The pitfalls of elevating CDS to five-star rank

An incipient debate is underway in defence and security circles on further streamlining the stature and responsibilities of the Chief of Defence Staff (CDS). The CDS was first appointed five years ago to construct jointness and integration amongst the armed forces.

One of these deliberations centres on whether the CDS should be accorded the rank of a five-star officer to elevate his authority and reinforce his role at the apex of India's military hierarchy.

The current CDS, General Anil Chauhan, and Gen Bipin Rawat before him were four-star appointees — like the three service chiefs. Proposals to upgrade the rank are aimed at enhancing its operational clout and aligning its standing with international practices.

India has traditionally reserved five-star ranks for those who have rendered extraordinary military service, like Field Marshals Sam Manekshaw and KM Cariappa and Marshal of the Air Force Arjan Singh.

Consequently, a cross-section of service veterans argues that bestowing such an elevated status upon a CDS might just end up 'diluting' its exclusivity during peacetime. But the possibility of such an event transpiring anyhow augurs a mix of opportunities, challenges and many implications for the armed forces and civil-military ties.

The CDS' position came into being nearly two decades after the Kargil Review Committee recommendations, which emphasised the need for a single-point military adviser to the government and to forge military 'jointness'.

The CDS also doubles as the Permanent Chairman of the Chiefs of Staff Committee in addition to heading the Department of Military Affairs, established under the Ministry of Defence (MoD). Additionally, he executes numerous other tasks, like force modernisation and prioritising materiel purchases.

However, despite these myriad responsibilities, the CDS is equal in rank to the service chiefs, albeit deemed the first among equals. Many insiders believe that this creates internal and, at times, antagonistic ambiguities in his authority.

Hence, elevating him to a five-star rank could provide the CDS overarching clout to enforce decisions across the services and augment his capacity to ensure smoother execution of joint operations and reforms, particularly in the ongoing endeavour of establishing Integrated Theatre Commands (ITCs). The inference is that as a five-star officer, he could mitigate inter-service rivalries and be an effective interlocutor between the armed forces and political leadership, ensuring that military advice featured adequately in governmental strategic decisions.

But such an elevation is not without complications and the potential of disrupting delicate service hierarches, which are still in the process of familiarising themselves with a CDS. Perforce, it would generate further trepidation among the three service chiefs.

They would perceive it as a further diminishment of their long-established autonomy, which, in any event, was likely to be notably reduced merely to recruiting and training of manpower and providing logistic support under the proposed ITC model, at present under governmental review.

Consequently, many veterans, fearful of a rupture in inter-service cooperation, maintain that the challenge in this regard lies in ensuring that a higher ranked CDS does not morph into 'over-centralisation' of power, thereby endangering collaborative decision-making. Many argue that this needs political oversight and sagacity on the part of both the government and Opposition, which though presently non-existent, could emerge in the future with tactful management.

Critics of creating a five-star CDS argue that such an elevated rank would largely be symbolic and in no way enhance his operational effectiveness. This, in any case, would be managed by ITC heads, who, too, are expected to be four-star officers. The naysayers also contend that the CDS' ability to institute reforms and foster integration depends less on his stars and more on institutional support, consensus-building, resource allocation and political will. And, though a five-star designation would add lustre to the post, it could also detract focus from the substantive challenges of swift modernisation that confronts India's military.

Moreover, a five-star rank would necessitate protocol changes, additional staff and resources, potentially diverting funds from other critical areas at a juncture when defence budgets are at an

all-time low and beset with bitter competing priorities. Addressing entrenched systemic challenges, including bureaucratic hurdles, are other obstacles in the CDS' rank upgrade that would necessitate deft navigation.

Apart from its multiple complex implications within the services, the CDS' possible elevation is almost certain to precipitate hostile consequences for the MoD's civilian hierarchy. For, a five-star CDS would indisputably 'downgrade' not only the Defence Secretary's authority but also that of the Defence Research and Development Organisation and render uncertain the functioning of establishments like the Indian Coast Guard and possibly even the Border Roads Organisation, amongst others.

In short, elevating the CDS could trigger a dire pushback from the civilian establishment, potentially complicating decision-making and further perpetuating unaffordable delays.

Countries like the US and UK have adopted diverse approaches to structuring their higher military leadership, exercising significant influence over their respective national security policies. The US Chairman of the Joint Chiefs of Staff functions as the highest-ranking four-star officer, advising the President and Secretary of Defence, but without possessing operational command, while the UK's four-star CDS is tasked with overseeing strategic defence issues.

India could draw lessons from these models, focussing on empowering the CDS through institutional mechanisms rather than pursuing a feudal approach and opting for rank elevation. For, there is little doubt that while five-stars would symbolically, but fleetingly, enhance the CDS' stature, it was not a panacea for the enduring tribulations of nurturing force 'jointness' and modernisation.

Instead, the focus needs to remain on aligning military reforms with the objectives outlined in a codified and, as yet, un-enunciated National Security Strategy. All decisions on the CDS' possible rank elevation must weigh its strategic benefits against potential risks to ensure that it gainfully serves the long-term interests of India's defence architecture.

<https://www.tribuneindia.com/news/comment/the-pitfalls-of-elevating-cds-to-five-star-rank/>



Wed, 08 Jan 2025

C Raja Mohan writes: India, US and the atomic second wind

The US National Security Advisor Jake Sullivan's visit to India — the last of his foreign visits as the top official of President Joe Biden's security establishment — highlights three important features of the bilateral relationship. First is the expansive commitment of the Biden Administration — including the special contribution of Sullivan and his team at the White House — to take the relationship with India to a higher level and the determination to prevent unanticipated crises from derailing the India-US strategic partnership.

Second, is the special effort by the Biden Administration to deepen advanced technology cooperation between the two nations. The Biden Administration has gone beyond the phase of government-to-government engagement on tech issues and launched a new era of techno-industrial collaboration in sectors like AI, semiconductors, space, and biotechnology that are set to dominate the global economy this decade and beyond. This has involved drawing in industry, start-ups and research communities from both sides.

The policy instrument for this has been the initiative on Critical and Emerging Technologies (iCET) that was unveiled by Sullivan and the Indian National Security Adviser, Ajit Doval, in January 2023. The iCET has involved massive and detailed negotiations on a range of complicated issues and several difficult bureaucracies in Delhi and Washington. It will endure as an important legacy of the Biden years for India-US relations.

The iCET is at the very heart of Biden's larger strategy. It seeks to rearrange the global economy by derisking from the massive dependence on China that emerged over the last four decades, build new technology partnerships with allies and partners, and create a structure of regional balance of power in the Indo-Pacific that will limit the Chinese dominance in Asia and its waters.

Technology has been at the heart of modern India's imagination of America since the late 19th century. It became the central focus of independent India's engagement with the US. America played a key role in the early development of India's nuclear and space programmes. It was a critical factor in modernising India's agriculture and contributed to the development of scientific and technological education.

If the early decades of independence saw expansive bilateral cooperation in technology, the 1970s saw the collapse of that cooperation, thanks to the new non-proliferation laws that came into force in the United States and new global norms on preventing the spread of nuclear weapons.

By remaining a non-nuclear power in the 1960s, Delhi made itself a target of the expansive sanctions that were unleashed by the US and the advanced industrial powers, including the Soviet Union in the name of non-proliferation. (Legend has it that US President John F Kennedy had offered to help India build nuclear weapons in the early 1960s, but Prime Minister Jawaharlal Nehru declined the offer.)

Despite the non-proliferation challenge, Prime Ministers Indira Gandhi and Rajiv Gandhi sought to find some common technological ground with the US during the 1980s. But the 1990s saw a strengthening of the non-proliferation controls against India. Atal Bihari Vajpayee's nuclear tests of May 1998 provided a new basis for India-US engagement and a big push to resolve the nuclear and related technological disputes.

The breakthrough came with the India-US civil nuclear initiative that was negotiated between President George W Bush and Prime Minister Manmohan Singh during 2005-08. In Washington, Barack Obama and Donald Trump have continued to clear the ground for deeper technological cooperation. Biden and Prime Minister Narendra Modi have taken it to a whole new level with the iCET.

Despite much progress, there have been lingering issues preventing the full realisation of the benefits of the excellent progress in tech cooperation over the last two decades. In Delhi, Sullivan

announced on Monday that several existing restrictions on civilian space cooperation with India are being lifted. He also cited continuing work in the Biden Administration to remove key atomic energy centres in India from the US black list to facilitate bilateral civilian nuclear energy cooperation. (President Biden and the executive branch can make policy decisions right up to January 19, and they are being made every day).

India too has work to do — especially in modifying the provisions of The Civil Liability for Nuclear Damage Act, 2010 that have prevented US and Indian companies from investing in the nuclear energy sector. It's indeed a pity that nearly 20 years after the nuclear deal was unveiled, there have been no deals to build nuclear power plants with international suppliers other than Russia.

Policymakers in Delhi and Washington know that nuclear energy is back in the reckoning, thanks to an entirely unexpected source of demand — the AI industry. Data centres for AI require massive amounts of clean energy, and most companies in the field are turning to nuclear energy. As atomic power, long moribund, gets a second wind, it is in India's interest to create the regulatory environment for its accelerated development.

Biden leaves behind a solid foundation for the incoming administration of Trump and the government of Modi to build an enduring edifice of techno-industrial collaboration driven by shared geoeconomic and geopolitical considerations.

Will this expansive framework endure under Trump?

There are several reasons to be optimistic. It might be worth noting that reclaiming US technological leadership and rebooting advanced manufacturing are goals that Trump shares with Biden. America's contestation with China — both economic and technological — is likely to endure. This, in turn, demands deeper cooperation with trusted partners like India. Delhi's interest in boosting its advanced technology sectors remains a high priority for the Modi government.

The enduring convergence of objective interests between Delhi and Washington and the long record of political commitment in both capitals for deeper cooperation in advanced technologies does not mean it will automatically continue under Trump. Sustaining India-US high-tech cooperation demands continuing diplomatic and political efforts.

Sullivan's consultations with the Indian leadership this week, external affairs minister S Jaishankar's visit to Washington last week, and his meeting with the incoming national security advisor Michael Waltz are part of the ongoing effort to facilitate a smooth transition on advanced technological cooperation between the two countries.

Trump, however, might bring a different approach to advanced technology development in America. Delhi must be prepared to deal with the consequences. That discussion must wait until this column returns next week.

<https://indianexpress.com/article/opinion/columns/c-raja-mohan-writes-india-us-and-the-atomic-second-wind-9765883/>

Third Coast Guard chopper crash in less than 2 years: why are there repeated concerns over HAL's indigenous military helicopter?

On January 5, an indigenous Advanced Light Helicopter (ALH) Mark-III of the Indian Coast Guard crashed at the Coast Guard Air Enclave in Porbandar, Gujarat, during a training sortie, killing all three persons on board. This was the second fatal crash of a Coast Guard ALH Mark-III in four months; the previous crash in September, during a medical evacuation mission off the Porbandar coast, had also claimed three lives.

Earlier in March 2023, an ALH of the Coast Guard crashed shortly after take-off in Kochi. There were no fatalities.

What safety concerns about the helicopters have these crashes raised?

The specific causes of the Coast Guard ALH crashes remain under investigation. The Coast Guard has initiated Boards of Inquiry to determine the reasons for these incidents, with focus on aspects such as the helicopter's flying controls and transmission systems.

Military aviation veterans have expressed concern over the safety record of the helicopter, designed and developed by Hindustan Aeronautics Ltd (HAL), and sought independent inquiries into the crashes. Each of the crashes has been followed by safety audits and temporary groundings in order to carry out detailed inspections. Following Sunday's crash, the entire fleet of around 300 ALH helicopters has been grounded for safety checks.

Issues identified in the past include design flaws, particularly with the booster control rods, which could affect control over the helicopter. HAL had initiated a replacement program, installing more durable steel rods in newer ALH models.

Have there been crashes of other variants of ALH too?

There have been crashes in the past involving the ALH Rudra WSI, the attack helicopter version of the platform, as well as the ALH in service with the Army. In January 2021, an Army ALH crashed due to a technical snag near Lakhanpur in Jammu and Kashmir, close to the border with Punjab.

In August that year, an ALH Rudra crashed into the water near Ranjit Sagar Dam in Pathankot, Punjab, killing both pilots whose remains were discovered after a long and difficult search by divers from the Indian Navy. In October 2022, an ALH Rudra crashed in Arunachal Pradesh, killing two pilots and three soldiers on board. And in May 2023, an Army ALH crashed in Kishtwar in J&K killing a soldier on board.

What are the key elements of the design of the HAL ALH?

The design and development of the HAL Dhruv started in 1984, with the aim of replacing the aging fleet of Chetak and Cheetah helicopters from the inventory of the defence services. Dhruv was meant to be a multi-role, multi-mission helicopter.

Significant portions of the aircraft, including the airframe, are manufactured in India. While the overall design is indigenous, certain critical components like the engines (the Shakti engines, which are a joint development with Turbomeca, now Safran Helicopter Engines, of France), some avionics, and a few other systems were initially sourced from abroad or developed in collaboration with foreign companies.

The level of indigenisation has increased over time, with more parts and systems being produced in India. The ALH Dhruv has received certification from the Directorate General of Civil Aviation (DGCA), which is an affirmation of its capabilities meeting international standards. HAL has continuously worked on indigenous upgrades and variants of the ALH, enhancing its capabilities through local research and development.

<https://indianexpress.com/article/explained/concerns-hal-indigenous-military-helicopter-9765403/lite/>



Tue, 07 Jan 2025

Historic Joint Military Expedition to Mt. Aconcagua: A Milestone in India-Argentina Defence Relations

For the first time ever, the Indian Army, in partnership with the Argentine Army, has embarked on a historic joint military expedition to Mt. Aconcagua, the highest peak in both the Americas, standing at 6,995 meters. Running from January 3 to 20, 2025, this groundbreaking expedition signifies the growing bilateral defense cooperation between India and Argentina. “It also highlights the importance of this collaborative effort in enhancing mutual trust, fostering deeper military ties, and strengthening both nations’ strategic partnerships,” sources in the defence and security establishment told Financial Express Online.

A Symbol of Strengthened Bilateral Relations

This joint military venture is an important step in the evolving relationship between India and Argentina. While both countries have long shared a positive diplomatic rapport, this expedition marks a new chapter in their defense cooperation. By combining their expertise in high-altitude mountaineering, the two armies are not only forging a stronger military bond but also setting the stage for deeper engagement in a range of defense-related activities, according to sources.

The significance of the Aconcagua expedition lies in its broader implications for bilateral defense relations. Both nations stand to gain valuable insights into high-altitude operations, including specialized training techniques, shared knowledge, and best practices that can enhance the

operational capabilities of their respective armies. More importantly, the expedition serves as a platform for establishing trust and camaraderie, as soldiers from both nations collaborate in challenging and extreme conditions.

India's Growing Global Influence and Strategic Partnerships

India's involvement in this expedition underscores its increasing role as a global power, particularly in South America. The expedition not only reinforces India's commitment to international peace and security but also enhances its defense footprint in the region. As India continues to build strategic alliances across continents, this joint effort with Argentina becomes an important symbol of India's growing influence and its dedication to fostering multilateral cooperation, sources told Financial Express Online.

India's presence in South America is relatively new in terms of military engagement, and this historic expedition to Mt. Aconcagua is a clear demonstration of India's desire to extend its defense diplomacy and collaborate with countries beyond its immediate region. It reflects India's recognition of South America as an area of emerging strategic importance, according to sources.

Enhancing Future Cooperation

The success of this joint expedition is expected to lay the groundwork for future collaborations between the Indian and Argentine armies. Several key areas for expansion are already being considered:

- **Regular Joint Expeditions:** Building on the momentum from this first endeavor, both countries aim to organize regular joint expeditions and training exercises. This will not only refine their skills in challenging terrains but also create a foundation for continued engagement, sources suggest.
- **Defence Dialogues:** Formalizing a framework for defense dialogues will enable the two nations to regularly assess and plan future military cooperation, fostering a structured approach to their growing strategic partnership.
- **Capacity Building:** Both armies stand to benefit from enhanced capacity building in areas such as high-altitude warfare, disaster response, and peacekeeping operations, key components of modern military engagement, sources add.

Bottomline

The joint military expedition to Mt. Aconcagua represents a historic milestone in India-Argentina relations, one that symbolizes a deeper commitment to mutual defense cooperation and international collaboration. It also underscores India's ambition to strengthen its global position through strategic alliances, especially in regions like South America.

The success of this expedition will not only contribute to the operational readiness of both armies but also serve as a model for future military engagements, setting the stage for continued growth in defense relations and regional stability.

This expedition is more than just an adventure on a mountain—it is a testament to the potential of international military cooperation and a clear reflection of India’s expanding role in the global defense landscape.

<https://www.financialexpress.com/business/defence-historic-joint-military-expedition-to-mt-aconcagua-a-milestone-in-india-argentina-defence-relations-3708780/>

THE ECONOMIC TIMES

Tue, 07 Jan 2025

North Korea successfully tests new intermediate-range missile, state media says

North Korean leader Kim Jong Un oversaw a successful test of a new intermediate-range hypersonic ballistic missile (IRBM) on Monday, state media KCNA said on Tuesday, pledging to accelerate the country's nuclear and missile capabilities.

It was North Korea's first missile launch since Nov. 5, and coincided with a visit to South Korea by U.S. Secretary of State Antony Blinken, in which he pledged bilateral and trilateral cooperation, including with Japan, to respond to Pyongyang's growing military threats.

The test occurred less than two weeks before U.S. President-elect Donald Trump, who held unprecedented summits with Kim during his first term and has touted their personal rapport, returns to office.

The missile was fired from the outskirts of Pyongyang and flew about 1,500 km (932 miles) at 12 times the speed of sound, reaching an altitude of nearly 100 km before descending to a "second peak" of 42.5 km and manoeuvring to an accurate landing on a target off the east coast, KCNA said.

South Korea's military said the KCNA report was most likely exaggerated, estimating the range at around 1,100 km and saying there was no second peak detected, though detailed analysis would be conducted with the United States. A "second peak" would imply the missile could change course and maintain altitude rather than descending on a ballistic trajectory.

New carbon fibre composite materials were used in the missile's engine section, KCNA said; carbon fibre is lighter and stronger than other aerospace materials such as aluminium, but is more difficult to manufacture. KCNA said the missile could "effectively penetrate any dense defence barrier and inflict a serious military blow on the opponent," it said.

Kim hailed the missile as a powerful weapon against security threats posed by hostile forces and the changing regional environment. KCNA released photos of Kim monitoring the launch via teleconference alongside his young daughter, and a missile lifting off from a field.

"The development of new-type hypersonic missile is mainly aimed to steadily put the country's nuclear war deterrent on an advanced basis," he said, according to KCNA.

Blinken condemned and South Korean Foreign Minister Cho Tae-yul condemned the launch, and warned of Pyongyang's deepening ties with Moscow, including illicit cooperation on space and satellite technology.

North Korea has been developing a new solid-fuel IRBM amid an intensifying race for the next generation of long-range rockets that are difficult to track and intercept.

Last year's tests featured a new solid-fuel design and carried what Pyongyang said was a hypersonic glide vehicle, a warhead designed to be able to manoeuvre and evade missile defences.

Lee Sung-jun, a spokesman for South Korea's military, said that the latest launch appeared to be an extension of last year's test.

<https://economictimes.indiatimes.com/news/defence/north-korea-successfully-tests-new-intermediate-range-missile-state-media-says/articleshow/117008005.cms>



Tue, 07 Jan 2025

Russia's "Nasty" Kamikaze Drone, Kub-10E, Makes Combat Debut In Ukraine War; Kalashnikov Releases Video

A video of the first use of the kamikaze drone was published by its manufacturer, Kalashnikov Concern, on its official Telegram channel. The footage has since been posted to social media site X by Russian military bloggers. Kalashnikov states that with its increased range, accuracy, and combat efficacy, this cutting-edge drone significantly improves Kalashnikov's unmanned aerial capabilities.

Some reports published in Ukrainian media suggested that the drone was deployed to Kursk on January 2, days after it was officially unveiled. EurAsian Times could not independently corroborate these claims. As recently reported by EurAsian Times, the Ukrainian tanks and infantry were said to have targeted positions in Kursk, pushing into the village of Bolshoye Soldatskoye, located approximately 15 miles northeast of Sudzha, a Ukrainian stronghold in the region.

Both Russian and Ukrainian officials have confirmed the offensive, which was likely launched to strengthen Kyiv's position before any peace negotiations. The attack, coming in the dead of winter, points to a calculated move by Ukraine to show its resolve and challenge Russian control over Kursk.

As the day progressed, one of the most prominent Russian military bloggers, Rybar, reported that the Russian troops had managed to destroy one of the British Challenger tanks rolling into Kursk. Subsequently, footage of the claimed destruction was also shared, which suggested that the tank was hit by a drone.

“It was destroyed by drone crews from the 155th Guards Marine Brigade of the Pacific Fleet,” Rybar reported. There is no information on the drone that purportedly attacked Ukraine’s tank, and it could not be independently confirmed whether it was indeed a British-origin Challenger-2 that had been hit. Nonetheless, EurAsian Times understands that the deployment of an advanced drone like the Kub-10E could prove to be extremely significant for Russia’s pushback against the Ukrainian forces.

What Do We Know About The Kub-10E?

A long-range kamikaze drone of the Kub-series of UAVs developed by Kalashnikov, the Kub-10E is likely to have a significant impact on the course of the Russian attacks on Ukraine. The UAV was officially unveiled by Kalashnikov in late December last year along with footage that showed the launch of the Kub-10E using catapults. It was accompanied by its predecessor, the Kub-BLA kamikaze drone.

At the time, Kalashnikov CEO Alan Lushnikov said in an interview: “We have developed several new products in the Cube line. The permits for one of them are already ready, so I can tell you briefly about our new product. This is the Kub-10E strike drone. It is designed to destroy enemy unarmored military equipment and armored personnel carriers, command posts, air defense and missile defense facilities, electronic reconnaissance and electronic warfare, and rear support facilities.”

The Kub-10E ostensibly builds upon the capabilities of the Kub-BLA, although it does not feature a flying-wing design and is significantly larger in comparison. “Based on visual comparisons of the drones and their launch equipment, the Kub-10E appears to be approximately five times larger in volume than the Kub-BLA,” states Squadron Leader Vijaiinder K. Thakur (ret), former Indian Air Force officer and a renowned military expert.

The KUB-10E UAV is built for quick deployment and precision strikes. The manufacturer claims that its combat capabilities and flight range greatly outperform those of earlier drones in the series. The drone has an operational altitude range of 100 to 2,500 meters and a cruising speed of up to 100 kilometers/hour.

A Kalashnikov official earlier stated, “The flight range and combat power of the new guided munition significantly exceed the performance of previous models in the series.”

Thakur earlier predicted, “Based on its size and aerodynamically efficient design, the Kub-10E could potentially have a range of several hundred kilometers. Its large, straight wings would have a high lift coefficient, suggesting its range could rival or surpass that of the Geran-2 drones.”

The Kub-10E combines inertial and satellite navigation for precision targeting. Currently, it lacks an optical sensor, probably because hitting stationary targets that are dispersed geographically deep within the interior doesn’t require target recognition. Moreover, this drone can function in a variety of weather conditions, such as circumstances with temperatures between -30°C and +40°C and wind gusts of up to 15 meters/second.

As noted by Thakur, the Kub-10E seems to have been developed by Russia in response to the shortcomings in the Geran-2 drone, which is based on the Iranian Shahed-136 platform. These restrictions include the usage of components of Western origin that need to be substituted through

alternative procurement, as well as a smaller warhead. Notably, with this, the Kub-10E becomes the latest unmanned aerial vehicle (UAV) to debut on the battlefield, which has been a testing ground for cutting-edge weapons.

<https://www.eurasiantimes.com/russias-nasty-kamikaze-drone-kub-10e-makes-combat-debut-in-ukraine-war-kalashnikov-releases-video/>



Wed, 08 Jan 2025

Israeli PULS “Defeats” U.S. HIMARS In Another European Deal; Here’s Why Israeli Rockets Are Zooming Ahead

The deal, worth approximately €65 million (US\$68 million), is the latest in a series of high-profile defense procurements. It follows Germany’s previous multi-billion-dollar agreement to acquire Israel’s Arrow-3 missile defense system. Speaking to Defense News, the German Ministry of Defense reportedly confirmed that the decision to purchase comes after months of deliberation. This confirmation ends a highly competitive selection process for Germany’s next-generation multiple-rocket launcher system.

Elbit’s PULS, offered in partnership with German-French defense contractor KNDS, outpaced the proposal from Lockheed Martin and Rheinmetall. In partnership with German defense contractor Rheinmetall, Lockheed Martin pitched the GMARS system, based on Lockheed’s High Mobility Artillery Rocket Systems (HIMARS), to replace Germany’s aging MARS 2 systems.

However, the Lockheed-Rheinmetall proposal was ultimately rejected because it did not meet Germany’s timeline, and no usable prototype was available at the time. As a result, the PULS system decisively won the competition, which has already demonstrated its capabilities in other European countries. The approval to procure the PULS systems is part of a larger raft of funding allocations for the German military.

The PULS system, which allows for the deployment of various types of munitions, is expected to give Germany greater flexibility in its artillery capabilities. It is designed to be integrated with national fire-control systems, allowing user countries to choose and use their own munitions. While it remains unclear whether Germany will integrate GMLRS (Guided Multiple Launch Rocket System) rockets, which Ukraine currently uses and is available in many NATO nations’ stocks, Elbit has assured Berlin that PULS can be configured to launch the Unitary variant of GMLRS rockets.

However, the potential integration of GMLRS rockets is contingent on securing political approval from the United States, a process that German defense officials are currently pursuing. Washington’s approval is necessary for Germany to use US-made munitions with the PULS system. On the other hand, Lockheed Martin has previously suggested that its munitions, including

the GMLRS rockets and the newer Precision Strike Missile, will not be compatible with the PULS system.

Lockheed's Vice President of Strategy and Business Development for Land Forces, Howard Bromberg, emphasized this point during last year's Eurosatory defense trade show in Paris. Germany is not the only European country investing in Israeli-built PULS systems. Serbia has recently finalized the procurement of Israeli-made PULS artillery rocket systems.

The Netherlands awarded Israel a US\$305 million contract in May 2023 for 20 PULS units. Deliveries are expected to be completed by 2026. Denmark has already received its full complement of eight systems, while Spain placed an order for 16 units in October 2023. The presence of nearby allies using the same systems can drive efficiencies by establishing a "use group" that consolidates spare parts, training, and munitions.

HIMARS Vs. PULS

Following the success of the US-made M142 HIMARS in Ukraine, European nations have been keen to invest in similar multiple rocket launchers. HIMARS made a huge impact during its early deployment, particularly in July and August 2022, when long-range strikes destroyed multiple Russian artillery ammunition depots and killed several high-ranking officers in command centers. This effectiveness played a role in slowing down Russia's initially aggressive summer offensive.

The success of HIMARS and security concerns following Russia's invasion have led to a surge in orders for the system. Countries such as Australia, Estonia, Latvia, Lithuania, and Poland have placed significant orders, with Poland increasing its initial request from 20 units to potentially 486.

Pre-existing orders from Taiwan and Romania have also expanded. However, the growing backlog of orders for HIMARS led some countries to look for alternatives. The PULS system, produced by Elbit Systems, has proven to be a viable alternative to HIMARS. For example, the Netherlands selected PULS because it offered a quicker delivery timeline than HIMARS. Moreover, the Israeli system offers similar capabilities at a more affordable price and with additional features.

Unlike HIMARS, which uses a single rocket-launching pod, PULS can mount two pods, allowing for greater firepower. After launching, a new pod can be fitted in under 10 minutes, offering faster operational readiness. Another advantage of the PULS system is its versatility. While HIMARS is designed for a specific vehicle, PULS can be mounted on various platforms, enabling it to integrate with existing logistics.

The PULS system was originally developed from the Israeli Military Industry's 6×6 Lynx multiple-rocket-launcher truck and is currently used by the Israeli Defense Forces on Oshkosh 8×8 HEMTT trucks under the designation Lahav. PULS is considerably larger and heavier than HIMARS, with a length of 34 feet and a weight of 38 tons, compared to HIMARS' 18-ton combat-loaded weight. This larger size, however, allows PULS to carry more rockets, with two pods capable of launching up to 12 rockets in 60 seconds, depending on the munitions.

HIMARS, in comparison, uses one pod that can launch six GMLRS rockets or one long-range ATACMS missile. While the cost of a PULS system has not been disclosed, HIMARS is priced at nearly US\$5 million per launcher, with each GMLRS rocket costing over US\$100,000.

PULS is also more versatile in terms of the types of munitions it can fire. It can launch a range of European and PULS-specific rockets, including Accular 122-mm and 160-mm rockets, EXTRA extended-range rockets, and Predator Hawk missiles. The PULS system is also touted as adaptable to future missiles, with both KNDS and Elbit promoting its potential to evolve and integrate with various missile providers. According to the Defense expert Sébastien Roblin, “Israel’s PULS units can also launch the subsonic Delilah cruise missile, flying much lower and slower, out to 155 miles and with even greater accuracy. The Delilah, however, doesn’t seem to be up for export.” He pointed out, “Side by side, PULS can deliver eight 300-millimeter rockets compared to HIMARS’s six 227-millimeter ones. Or it can carry four tactical missiles instead of HIMARS’s one.”

Roblin added, “And compared to Soviet-era artillery systems, the PULS can deliver effects similar to the BM-21, BM-27, and BM-30 rocket systems as well as the older OTR-21 Tochka ballistic missile. That means the same launcher can be used for a wide range of different missions, from precision strikes targeting depots, air defense, and HQs behind enemy lines, to point targets near the frontline and old-school saturation bombardments across a broad area.” In summary, PULS’s affordability, flexibility, and ability to carry out a wide array of missions have made it an attractive alternative to HIMARS for European countries seeking to increase their military capabilities.

<https://www.eurasiantimes.com/after-arrow-air-defense-system-germany-approved/>

Science & Technology News



Wed, 08 Jan 2025

V. Narayanan appointed new Space Secretary and ISRO chief

Dr. V. Narayanan has been appointed the new Space Secretary. Dr. Narayanan, who is currently the Director of Liquid Propulsion Systems Centre (LPSC), will also be the new ISRO Chairman and he will take over from incumbent S. Somanath from January 14.

“The Appointments Committee of the Cabinet has approved appointment of V. Narayanan, Director, Liquid Propulsion Systems Centre, Valiamala as Secretary, Department of Space, and Chairman, Space Commission for a period of two years with effect from 14.01.2025, or until further orders, whichever is earlier,” stated an order from Appointments Committee of the Cabinet, Ministry of Personnel and Training.

Dr. Narayanan, who is a rocket and spacecraft propulsion expert, joined the ISRO in 1984 and functioned in various capacities before becoming director of the LPSC.

During the initial phase of his career he worked in the Solid Propulsion area of Sounding Rockets and Augmented Satellite Launch Vehicle (ASLV) and Polar Satellite Launch Vehicle (PSLV). He

has also contributed significantly for ISRO's Geosynchronous launch vehicles namely GSLV Mk-II & GSLV Mk-III.



“As the Chairman of the National Expert Committee constituted to study the reasons for hardlanding of Chandrayaan-2 landership, contributed in pinpointing the reasons and corrective actions required to overcome the observations. Realised and delivered all the Propulsion Systems for Chandrayaan-3,” states Dr. Narayanan's profile.

He takes over from Mr. Somanath who oversaw landmark launches like Chandrayaan-3, Aditya L1 and first developmental flight of the Gaganyaan mission.

<https://www.thehindu.com/sci-tech/science/v-narayanan-appointed-new-space-secretary-and-isro-chief/article69073962.ece>

THE  **HINDU**

Wed, 08 Jan 2025

How curiosity-driven research in a worm won four Nobel Prizes

Victor Ambros and Gary Ruvkun won the 2024 Nobel Prize in Physiology or Medicine for discovering microRNAs and their role in controlling gene expression. This pioneering discovery was made using the roundworm *Caenorhabditis elegans*. This 1-mm long, slender, and transparent nematode has been the star of many pathbreaking discoveries in biology, four of which have won Nobel Prizes.

How did *C. elegans*, a tiny invertebrate, become such a crucial tool for biological research? What insights did this worm yield? What is the value of such research for society when one can argue that our focus should be on studying human biology?

This is the story of *C. elegans*. In brief, advances necessary for human health and welfare often arise from solving fundamental biological problems. One major difficulty isn't just finding the right question to ask but also finding the right place to ask it where it can be solved. *C. elegans* provides exactly such a setting: a relatively simple but versatile model for biological investigations whose results often reveal general principles that remain valid or have parallels in other organisms, including humans. The worm's story also highlights how breakthroughs can arise from research driven by curiosity.

Humble beginningsIn 1963, biologist Sydney Brenner wrote to his peer Max Perutz his thoughts on research in the fields of development and neurobiology. He believed that, as the nature of problems in these areas wasn't clearly defined, there was a gap in identifying the right experimental approach that would lead to "defining unitary steps of any given process".

Brenner suggested the use of genetic analysis in defining such unitary steps in both animal development and the nervous system. He also indicated his choice of using a metazoan organism, which was likely to be the roundworm *Caenorhabditis briggsae*. But Brenner later chose the nematode *C. elegans*, a close relative of *C. briggsae*, for a number of reasons such as its small size, short life cycle (~3.5 days), small genome, transparent body, and its small number of 302 neurons — unlike the billions of neurons in the human brain. Additionally, *C. elegans* has several organ systems akin to those found in humans, allowing a chance to identify principles in development.

Ellsworth Dougherty was among the early scientists to realise and use the potential of free-living nematodes in genetics research. In 1963, Brenner requested Dougherty for a culture of *C. elegans* and also sought his guidance on its growth conditions. This collaboration sowed the seeds for building a community that shared resources and collectively contributed to advancing biology research. This culture of sharing resources and unpublished information continues to this day.

Cell deathBrenner shared the 2002 Nobel Prize for medicine with H. Robert Horvitz and John Sulston "for their discoveries concerning genetic regulation of organ development and programmed cell death". In his award ceremony, Brenner said, "Without doubt the fourth winner of the Nobel Prize this year is *Caenorhabditis elegans*: it deserves all of the honour but, of course, it will not be able to share the monetary award". Brenner established *C. elegans* as a genetic model and demonstrated that genes in the worm could be mutated, resulting in observable changes in development and behaviour.

Extending Brenner's work, Sulston in 1976 elucidated the cell lineage of *C. elegans*, which is the developmental history of all cells of this nematode. He tracked cell divisions from the fertilised single cell to the final 959 cells in the adult organism. This was possible because of the transparency of the worm, but nonetheless was a daunting task.

While mapping the lineage, Sulston observed that some cells of a lineage died at specific time points during the normal development of a healthy worm. He showed that precisely 131 of the 1,090 cells born died during development and that cell death was genetically controlled. He

described the steps involved in programmed cell death, where healthy cells killed themselves. He also identified a gene responsible for degrading the DNA of the dying cells.

The genes required for the initial steps of programmed cell death were still unknown. Horvitz continued to identify genes essential for cell death and genes that prevented cell death through mutant generation followed by genetic analyses. He found that the process of cell death arose from interactions among key genes and followed a specific molecular pathway.

His team's work in *C. elegans* showed that many genes involved in cell death also have counterparts in humans. Research in *C. elegans* was particularly important in advancing understanding of the role of programmed cell death in human development, e.g. of fingers and the nervous system as well as in some cancers.

Ageing and genome sequencing Work in *C. elegans* also led to an understanding of the pathways that regulate ageing. The early work from Michael Klass, Tom Johnson, and Cynthia Kenyon in the 1980s and 1990s identified some of the genes leading to longer lifespan than seen in normal worms. Further work in this direction led to the appreciation of the role of insulin signaling pathways in ageing. The insulin signaling pathway plays the same role in ageing in flies and mice and is associated with longevity in humans. This has led to *C. elegans* being used as a key model for discovering the molecular mechanisms of ageing and as a test bed for drugs that might influence this process.

The genome information of any organism is invaluable in linking phenotypes, i.e. observable characteristics, to a particular gene. Sequencing the *C. elegans* genome started in 1990 and was an exemplar for the larger Human Genome Project. The whole genome sequence of *C. elegans* was carried out by a consortium working together across continents. It was led by Robert Waterston at the Genome Sequencing Center at Washington University in the USA and Richard Durbin at the Sanger Centre in the UK.

The technology and the software tools developed for sequencing the *C. elegans* genome led the way in achieving the scale and efficiency critical for sequencing of larger genomes. It was debated if human whole-genome sequencing data should be publicly available as private sequencing efforts wished to patent some of the genes. The open sharing of *C. elegans* data and community feedback on annotation provided a model for the public human genome sequencing effort. Gene silencing A geneticist's dream is to control gene expression, which is the ability to turn genes 'on' or 'off' in a controlled manner. The traditional way to begin by finding suitable mutants is often time-consuming.

In a landmark 1998 paper, Andrew Fire and Craig Mello discovered RNA interference, several of its salient features, and its potential as a major research tool, one that biologists now use every day. Fire and Mello found that in *C. elegans*, double-stranded RNA (dsRNA) was more effective at causing uncoordinated movement of the worm than single-stranded RNA. Injecting a small amount of dsRNA could lead to destruction of a much larger amount of the corresponding cellular RNA, suggesting dsRNA was a catalyst for RNA interference.

For their work, Fire and Mello jointly received the 2006 Nobel Prize for medicine. The most common application of RNAi is to reveal genes' functions. This technology led to efforts for whole

genome RNAi in *C. elegans*, more defined efforts against gene subsets in other organisms, and has become a staple in the biologist's toolkit to study gene function. The discovery of RNAi also led to technologies for a highly specific approach to gene-silencing that work in all known organisms. They also have applications in therapeutics for cancer and some inherited gene disorders.

Glowing worms

Another dream of biologists is to track biological processes and gene products in living cells. The green fluorescent protein (GFP) has revolutionised our ability to do this. How this came about is another success story of curiosity-based research.

It started with Osamu Shimomura, who was trying to understand why jellyfish are fluorescent. He identified bioluminescent proteins like GFP from the jellyfish *Aequorea victoria* in the 1960s. In the late 1980s, Martin Chalfie learnt of Shimomura's discovery about jellyfish while listening to a seminar by another scientist and immediately wanted to try using GFP to locate where some important genes were expressed.

Until then, this effort was labour-intensive and required the organism to be killed. In 1994, Chalfie was able to introduce GFP into live *C. elegans*. The transparency of the organism meant easy visualisation: he saw green glowing cells when the organism was illuminated by blue light. GFP was soon widely used in many organisms and cells and has transformed biological research. Together with Roger Tsien's success in making a 'rainbow' of fluorescent proteins of multiple colours, today scientists can follow multiple processes and proteins simultaneously in a wide variety of organisms.

Shimomura, Chalfie, and Tsien received the 2008 Nobel Prize in chemistry for developing GFP. An adult *C. elegans* worm glows after a GFP coding sequence was inserted into it. An adult *C. elegans* worm glows after a GFP coding sequence was inserted into it.

The discovery of microRNAs (miRNA) challenged the central dogma, which said RNAs were mere conduits of information, from DNA to proteins. We now know that miRNAs are a class of regulatory molecules that turn off gene expression at the right time and place. This fundamental advance, which won a Nobel Prize in 2024, is another example of an unexpected finding arising from curiosity.

The story starts with the study of *lin-4* and *lin-14*, two genes with opposing effects on developmental timing in *C. elegans*. In the 1990s, Victor Ambros was studying the molecular nature of *lin-4* and Gary Ruvkun, that of *lin-14*. Ambros found that *lin-4* makes a tiny RNA (later called miRNA) which is itself important for gene function and which doesn't make protein at all. He and Ruvkun together realised that this miRNA could bind to *lin-14*.

Ruvkun went on to show that the *lin-4* miRNA regulates *lin-14* by reducing the latter's protein expression, providing the first demonstration of a regulatory role for a miRNA. Ruvkun also identified *let-7*, another miRNA that controls developmental timing and is evolutionarily conserved across the animal kingdom.

The sequenced *C. elegans* genome, RNAi, and computational approaches together led to the identification of several other miRNA genes. It's established that gene regulation by miRNAs is an essential process during development and for normal physiological processes of organisms. RNAi

and miRNAs use related pathways to make small RNA fragments that control gene expression. As work in this area has exploded, miRNAs have also been shown to activate genes and move between cells. With the expanding role of miRNAs there is recognition of potential applications in diagnostics and therapeutics.

There are interesting human aspects to this story, including a connection with Indian science. Ambros and Ruvkun both began their work as postdoctoral fellows in the laboratory of Horvitz, the 2002 laureate, and continued to discuss their work when they had their own independent laboratories. They discovered the direct connection of lin-4 miRNA with lin-14 in a late night phone call, when they both read out the gene sequences of lin-4 and lin-14 to each other.

The mutant gene lin-4 was isolated in the lab of fellow 2002 laureate Sydney Brenner. The variant that Ambros pursued (e912) was isolated by P. Babu, a faculty member at the Tata Institute of Fundamental Research, Mumbai, who was visiting Brenner. Babu went on to set up the first *C. elegans* lab in India at the institute. A prize for neuronal circuits Even though *C. elegans* has just 302 neurons, it still exhibits complex behaviour. Thus it offers a promising model to study a nervous system that is simple enough to analyse while still yielding valuable lessons about general principles.

Naturally, a very useful step is to look for a layout of all its neurons. Brenner began such a reconstruction of the *C. elegans* nervous system with all its connections in the 1970s. It was a formidable challenge, never attempted before. John White, Brenner's PhD student, set up a computer system for neuron reconstructions from electron micrographs. He stayed on after his PhD to reconstruct the *C. elegans* connectome — a map of all neuronal connections — and published it in a 1984 monograph, 'The Mind of the Worm'.

This was done well before modern technological tools were available and was the first such effort for any organism. To highlight the scale of difficulties: only in the last two years have we built the connectome of the fruit fly (*Drosophila melanogaster*) and of a 1 cubic mm chunk of the human brain. The connectome immediately opened the door to questions about how neural circuits function. For example, in the 1980s, Chalfie (the 2008 laureate for GFP) used laser-based neuron-killing experiments to determine the circuit for the escape response to touch.

We can ask questions more broadly about the relationship between the genetics of neural circuits and behaviour. The answers, when we can find them in specific contexts, are difficult to obtain, extremely complex, and yet vital for our understanding. Cornelia Bargmann won the 2013 Breakthrough Prize in Life Sciences for her research on the olfactory system of *C. elegans*. The sense of smell is very important for many organisms. *C. elegans* has a large number of olfactory receptors and uses complex machinery to sense smells, and respond, adapt, and learn.

Bargmann conducted a determined assault on this complex problem, achieving remarkable insights in all these aspects by conducting elegant experiments. As a postdoctoral fellow with Horvitz, she identified smell neurons in *C. elegans*. In her own laboratory, she took a molecular genetic approach and identified proteins involved in sensing odours. Her lab also showed that despite there being a fixed template for sensing attractive and repulsive cues, there was great flexibility in the olfactory circuit, achieved via individual genetic variation as well as the ability to integrate environmental cues.

Several of these findings hold true in organisms like mice, with promise for understanding the human brain.

The worm's story *C. elegans* research was launched by Brenner in the intellectually fertile and exciting environment at the Laboratory of Molecular Biology at the University of Cambridge. In its early years the programme attracted Chalfie, Fire, Horvitz, Kenyon, Sulston, Waterston, White, and other talented young people. These early researchers and those they trained made major contributions to worm research and, thanks to the universality of biology across organisms, fueled major scientific discoveries. These researchers also built a culture of curiosity-driven science and a community with open scientific exchange.

There are many thrust areas where *C. elegans* research continues to make contributions, such as network behaviour of the nervous system, ageing, and the innate immune response. While it is hard to predict where the next major scientific breakthroughs will arise, the *C. elegans* story illustrates how curiosity can lead to them, with potentially significant lessons for our understanding of nature and benefits for humankind.

<https://www.thehindu.com/sci-tech/science/curiosity-driven-research-caenorhabditis-elegans-won-four-nobel-prizes/article69069396.ece>

THE ECONOMIC TIMES

Tue, 07 Jan 2025

NASA says this enormous construction in China is slowing down Earth

Recent research by NASA has revealed a surprising connection between human engineering and planetary dynamics. China's Three Gorges Dam, the largest hydroelectric project in the world, has been found to slightly slow Earth's rotation by 0.06 microseconds per day. This phenomenon arises from the dam's massive reservoir, which redistributes Earth's mass and subtly alters its moment of inertia. This finding underscores the profound and often unforeseen consequences of large-scale human activities on natural systems.

How the Dam Affects Earth's Rotation

The Three Gorges Dam's reservoir holds an immense 40 billion cubic metres of water, causing a significant redistribution of mass on Earth. As this water accumulates, it changes the distribution of weight across the planet's surface, altering its rotational dynamics. Benjamin Fong Chao, a NASA scientist, explained, "Redistribution of mass within the Earth's system produces an effect on Earth's rotation. While the delay of 0.06 microseconds per day may seem negligible, it is a measurable consequence of this redistribution." The effect follows the principle that moving mass closer to the poles speeds up Earth's rotation, while shifting it toward the equator slows it down.

Engineering Marvel with Global Implications

The Three Gorges Dam stands as a testament to human ingenuity, towering 185 metres above the Yangtze River and spanning over 2 kilometres. It generates an astounding 22,500 megawatts of electricity, a capacity surpassing many nations' energy production. In 2020, it set a record by producing 112 terawatt-hours of electricity, solidifying its status as a key contributor to renewable energy. However, its impact extends far beyond energy generation, influencing Earth's physical attributes, including its rotation.

Earth's moment of inertia is a measure of its ability to spin, which depends on the distribution of its mass relative to its axis of rotation. When mass shifts toward the equator, the planet's rotation slows; conversely, moving mass toward the poles accelerates rotation. The Three Gorges Dam's vast reservoir exemplifies how human engineering can influence this delicate balance. Such changes, while small, are significant in understanding the interplay between anthropogenic activities and natural systems.

Human Activities Reshaping Natural Systems

The impact of the Three Gorges Dam is part of a broader trend of human activities altering Earth's physical properties. Large-scale infrastructure projects, such as dams and groundwater extraction, can influence sea levels, tilt Earth's axis, and redistribute mass. For example, the 2004 Indonesian tsunami, a natural event, shifted the North Pole by 2.5 centimetres, illustrating how both natural and human-induced phenomena interact with Earth's dynamics.

While the Three Gorges Dam showcases the potential of human innovation, it also raises questions about long-term environmental impacts. The subtle slowing of Earth's rotation highlights the intricate relationship between human engineering and planetary systems. "This effect of the dam on Earth's rotation is as inevitable as it is subtle," Chao remarked, emphasising the importance of recognising humanity's growing influence on natural processes. Such projects call for careful consideration of their broader implications, ensuring sustainable and responsible development.

<https://economictimes.indiatimes.com/news/science/nasa-says-this-enormous-construction-in-china-is-slowing-down-earth/articleshow/117013223.cms>



Tue, 07 Jan 2025

Mercury's frozen secrets: BepiColombo set to uncover the secrets of the scorching planet

The ESA/JAXA BepiColombo mission will enter a critical phase on 8th January 2025, when it performs its sixth and final encounter with Mercury. Scheduled to pass just 295 km above the planet's surface at 06:59 CET (05:59 UTC), the spacecraft will take high-resolution pictures and perform scientific measurements on the surface and surrounding airspace of Mercury. This manoeuvre is important to adjust the spacecraft's flight path and to put the instruments on board

through their final check before the start of the scientific operations in late 2026 when BepiColombo will be in the Mercury orbit.

This is not the first time that Messenger has flown past the Earth, Venus, and five earlier flybys of Mercury in its eight-year mission. In this pass, BepiColombo will fly on the night side of Mercury and then go to the sunlit side, which will help researchers study Mercury's darkness and the illuminated areas. Scientists believe that the mission should provide stunning imagery and new information about the least explored terrestrial planet.

Navigating Mercury's Shadow

One of the big risks of this flyby is that BepiColombo will be in Mercury's shadow for more than 23 minutes, and therefore it will be using only its batteries. To achieve this, the mission operators at ESOC will warm up the spacecraft before it goes into the shadow to help save energy, as there will be little that the onboard heaters can do to keep things warm. The Italian Spring Accelerometer (ISA) will measure the spacecraft accelerations in this phase and provide details on gravitational influences and temperature fluctuations.

Exploring Mercury's North Pole

The flyby will bring BepiColombo above Mercury's north pole so it can look at the craters that are always in the shade. These regions are thought to contain water ice even though the temperature on Mercury can reach daytime highs. The monitoring cameras of the spacecraft are likely to take pictures of famous craters such as Prokofiev, Kandinsky, and Tolkien, among others, besides features like the largest known impact basin, the Caloris Basin, and the large plain, Borealis Planitia.

Sampling Magnetic and Particle Environments

The specific path of BepiColombo will allow it to study areas of Mercury's magnetic and particle field that have not been studied before. Particle analysers and magnetometers on board will investigate the magnetic tail of the planet and the polar cusps where solar particles precipitate on the surface. The information acquired in this flyby will improve knowledge of Mercury's harsh conditions and prepare for the main science phase of the mission.

This flyby is a big leap in the understanding of Mercury's mysteries through BepiColombo and the changes it has in store with regards to the planet's surface, magnetic field, and possibility of water ice.

<https://www.news9live.com/science/isro-has-a-new-chairman-v-narayanan-2791576>

