

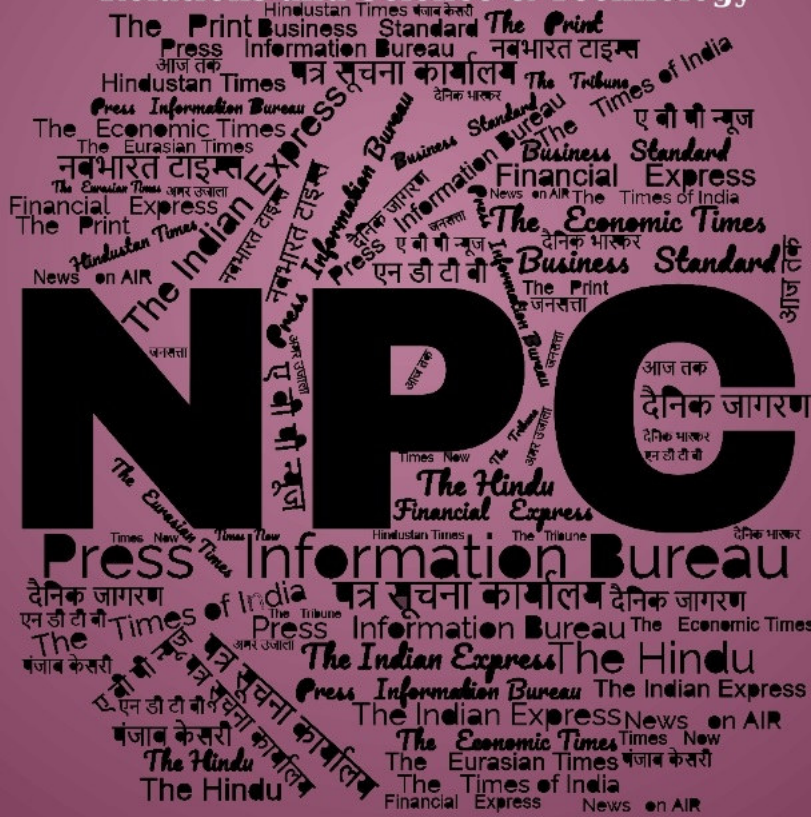
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Government of India

Ministry of Defence

Thu, 24 Oct 2024

Chief of Defence Staff exhorts defence industry, R&D organisations & the Services to embrace fusion & synergy to make India ‘Sashakt, Surakshit & Viksit’

Chief of Defence Staff General Anil Chauhan virtually inaugurated a two-day National Conference on Technology Management (TECHMA 2024) on October 24, 2024. Themed ‘Technology Management in Defence Sector for Vision India @2047’, the conference has been organised by **Defence Research & Development Organisation (DRDO)** at the Institute of Technology Management, Mussoorie. It aims to align the country’s defence technologies with the national objective of becoming self-reliant by 2047.

In his address, the Chief of Defence Staff urged the industry, R&D organisations and the Services to embrace fusion & synergy in order to achieve ‘Aatmanirbharta’ in defence and make India a ‘Sashakt, Surakshit & Viksit Bharat’. Stressing on the need to change the mindset to keep pace with the evolving times, he called for coming up with innovative & unique ideas which can prove to be advantageous to the Armed Forces, and in turn the nation.



The conference began with a roundtable discussion on ‘Harnessing Futuristic Technologies and Strengthening Indigenous Capabilities for Vision India @ 2047’. Secretary, Department of Defence R&D and Chairman, DRDO **Dr Samir V Kamat** attended the inaugural function as Guest of Honor. The themes of TECHMA-2024 are futuristic defence technologies, technology management with strategic vision for 2047, project management excellence in defence & value engineering and commercialisation.

The insights gained from TECHMA-2024 are expected to strengthen India’s indigenous R&D ecosystem, identify multidisciplinary research areas, improve project management processes & develop solutions for future defence technologies to overcome technical, logistical, and implementation challenges, ensuring India becomes a global leader by 2047.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2067733>

Defence News

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Thu, 24 Oct 2024

MoD inks Rs 387.44 crore contract with Chowgule & Company Pvt. Ltd., Goa for six Air Cushion Vehicles for Indian Coast Guard

Ministry of Defence, on October 24, 2024, signed a contract with Chowgule & Company Pvt. Ltd., Goa for procurement of six Air Cushion Vehicles (ACVs) for the Indian Coast Guard at a total cost of Rs 387.44 crore. These amphibious vessels, also called ‘Hovercrafts’, will be procured under the Buy {Indian} category.

These ACVs will be indigenously manufactured in India for the first time in line with the ‘Aatmanirbhar Bharat’ vision of the Government, representing a pivotal step in the nation's shipping landscape. The project will also significantly enhance the technical expertise and growth of indigenous ancillary, especially the MSME sector.

The procurement of these platforms is aimed to boost the Indian Coast Guard's capability and reinforces the increased focus towards maritime security. These modern ACVs will be used for multipurpose maritime roles including high speed coastal patrolling, reconnaissance, interception, search & rescue operations and assistance to ships & crafts in distress.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2067697>



Press Information Bureau
Government of India

Ministry of Defence

Thu, 24 Oct 2024

Maritime Partnership Exercise (MPX) With German Navy (21-23 Oct 24)

Indian Navy's Destroyer INS Delhi, German Navy's Frigate Baden-Württemberg and Tanker Frankfurt Am Main undertook a Maritime Partnership Exercise (MPX) in the Indian Ocean. The exercises conducted include cross deck flying operations, underway replenishment, weapon firing and tactical manoeuvres.

The maiden IN – GN Maritime Partnership Exercise in the Bay of Bengal is aimed at further strengthening the maritime connect between the two nations and interoperability between the navies.

INS Delhi is the lead ship of her class of guided missile destroyers and is part of the Eastern Fleet of the Indian Navy. Baden-Württemberg is the lead ship of the F125 class of German Navy frigates. Frankfurt Am Main is the second ship of the Berlin-class replenishment ships of the German Navy.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2067768>



Press Information Bureau
Government of India

Ministry of Defence

Thu, 24 Oct 2024

Singapore India Maritime Bilateral Exercise (SIMBEX) 2024 - 23 To 29 Oct 24

The 31st edition of the Singapore India Maritime Bilateral Exercise (SIMBEX) is scheduled from 23 to 29 Oct 2024, in the Eastern Naval Command at Visakhapatnam. Republic of Singapore Navy

Ship RSS Tenacious with embarked helicopter, arrived at Visakhapatnam on 23 October 24 for participating in SIMBEX2024.

SIMBEX, which began as 'Exercise Lion King' in 1994, has since evolved into one of the most significant bilateral maritime collaborations between the Indian Navy and the Republic of Singapore Navy (RSN).

The exercise will be conducted in two phases - the Harbour Phase from 23 to 25 October at Visakhapatnam and the Sea Phase from 28 to 29 October in the Bay of Bengal. This year's edition aims to further strengthen the strategic partnership between India and Singapore by enhancing interoperability, improving maritime domain awareness, and fostering cooperation to address common maritime challenges.

The Harbour Phase will include Subject Matter Expert Exchanges (SMEEs), cross-deck visits, sports fixtures, and pre-sail briefings between personnel from both navies. The Sea Phase will witness advanced naval drills, including live weapon firings, anti-submarine warfare (ASW) training, anti-surface and anti-air operations, seamanship evolutions, and tactical manoeuvres.

The opening ceremony to mark the beginning of SIMBEX24 will be conducted on 24 Oct 24, onboard INS Shivalik and will be attended by participating units of the Eastern Fleet and the Singapore Navy.

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Press Information Bureau
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Ministry of Defence

Thu, 24 Oct 2024

Broad India-China consensus to resolve differences in certain areas along LAC is proof that continuous dialogue brings solutions: Raksha Mantri at Chanakya Defence Dialogue 2024

“Govt bridging gap between development & security; Economic development can only flourish when national security is ensured”

“Our self-reliance efforts have linked the defence sector with nation’s progress”

“‘Aatmanirbharta’ does not mean working in isolation; We’re committed to working closely with all nations to promote a fair & just international system”

“The broad consensus achieved by India and China to resolve their differences in certain areas along LAC is proof that continuous dialogue brings solutions,” said Raksha Mantri Shri Rajnath Singh while delivering the keynote address at the Chanakya Defence Dialogue in New Delhi on October 24, 2024. He asserted that the two countries have been involved in talks at diplomatic & military levels, and broad consensus has been achieved to restore the ground situation based on the principles of equal and mutual security. This is the power of engaging in continuous dialogue, he said.

Sharing his insights on the topic ‘India’s Vision for Development & Security’, Raksha Mantri stated that ‘development’ and ‘security’ are often viewed from separate perspectives, but are, in actuality, deeply interconnected & mutually reinforcing. “Historically, the study of key factors for economic development such as land, labour, capital and entrepreneurship have been central to economic analysis. The impact of defence and security has traditionally been under explored. This may be because security is often viewed as a necessary but non-economic factor. Defence spending, military infrastructure and national security can significantly affect economic growth and resource allocation, even in non-war periods or in peacetime,” he said.

Shri Rajnath Singh emphasised that a significant portion of any nation’s budget is dedicated to security, with the sector itself making a vital economic contribution through job creation, technological advancements, and infrastructure development. He reiterated Prime Minister Shri Narendra Modi-led Government’s resolve to bridge the gap between ‘development’ and ‘security’, stressing that economic development can only flourish when national security is ensured.

Enumerating the steps being taken by the Government, Raksha Mantri said the vision of border area development is based on bolstering the security apparatus and ensuring socio-economic progress of the regions. This, in turn, fosters economic growth, he stated.

Shri Rajnath Singh also pointed out that indigenous manufacturing of arms and equipment not only strengthens the security infrastructure, but also creates employment opportunities and furthers expertise leading to technological innovation & self-reliance. Additionally, domestic production boosts income generation and stimulates economic activity through supply chains, creating a ripple effect that benefits the entire economy. Initiatives in the name of security often serve as powerful catalysts for broader national development, he said.

Raksha Mantri highlighted that the Government’s consistent efforts to attain ‘Aatmanirbharta’ has directly linked the defence sector with the nation’s development. “If defence had been recognised as an integral component of development and studied more comprehensively in the past, India might have achieved self-reliance in the sector much earlier. The prolonged dependency on imports can be attributed, in part, to the lack of a coordinated approach between defence and development. Consequently, while our defence industry missed out on critical opportunities for growth and innovation, a significant portion of our defence budget flowed into other economies, limiting our ability to strengthen our own capabilities. Addressing this disconnect is essential for fostering a

robust domestic defence industry that can contribute to national security and economic independence,” he said.

Shri Rajnath Singh, however, clarified that self-reliance does not mean working in isolation from the global community; it is the country’s dedication to foster an equitable and inclusive world order. He reasserted India’s commitment to collaborating closely with all nations to promote a fair and just international system.

“Our journey toward self-reliance is not a step toward alienation. Rather, it marks the beginning of a new chapter characterised by collaboration and partnership with the global community. We believe that self-reliance will empower us to contribute more effectively to international efforts, share our expertise, and engage in meaningful exchanges that benefit all. Together, we can build a stronger, more inter-connected world that respects the sovereignty and aspirations of every nation on equal terms,” Raksha Mantri said.

Shri Rajnath Singh underscored the need to examine the impact of the defence sector on key economic indicators, such as income generation, employment creation, regional economic balance, manufacturing growth, investment, research and development, and the expansion of the service sector. “Understanding these dynamics will provide valuable insights for policy formulation, enabling us to create strategies that leverage the defence sector as a catalyst for broader economic progress,” he said.

In his address, Chief of the Army Staff General Upendra Dwivedi brought out the crucial connection between national security and nation building by referring to Chanakya’s ‘Saptang Theory’ to emphasise the importance of development of effective State institutions, an operative governance mechanism, inclusive development, fostering a national identity and progressive transformation of the society as the contemporary paradigm of ‘nation building’. He highlighted that the Army not only provides a secure and safe environment for the people, but contributes immensely in every facet of development and growth story, viz, economy, social cohesion, skill development and environment sustainability etc.

The Chief of the Army Staff termed convergence of technology and security as very important in the current context. He emphasised on ‘Smart Power’- an approach that combines diplomacy and development with military might, is essential for sustainable growth as reflected in the ongoing conflicts.

On the occasion, Raksha Mantri also launched the Green Initiative 1.0 and Digitisation of Indian Army 1.0. Chief of Defence Staff General Anil Chauhan, Chief of the Air Staff Air Chief Marshal AP Singh, DG, Centre for Land Warfare Studies (CLAWS) Lt Gen Dushyant Singh and other senior serving & retired officers of the Armed Forces were present on the occasion.

The two-day Chanakya Defence Dialogue 2024 is the second edition of the flagship international seminar organised by the Indian Army in partnership with the Centre for Land Warfare Studies (CLAWS). The inaugural session of Chanakya Defence Dialogue 2024, themed ‘Drivers in Nation Building: Fueling Growth Through Comprehensive Security’, ignited vital discussions on integrating security dynamics within the broader framework of national and international policymaking.

The event featured prominent speakers from India and countries such as the United States, Russia, Israel, and Sri Lanka, providing a global perspective on the role of security in shaping a nation's development trajectory toward Viksit Bharat @2047. The dialogue aimed not only to reflect on the current landscape but also to craft visionary strategies for sustainable and inclusive growth.

Indian Army has made significant contribution towards decarbonisation and sustainable development. Indian Army is setting examples by adopting green practices, ensuring environmental sustainability while maintaining operational readiness and effectiveness. In recent years, Indian Army has embraced environmentally sustainable practices to combat climate change. These green initiatives are aimed at fostering a deeper connection to the environment and promoting a collective responsibility towards its preservation

Similarly, Indian Army in the Chanakya Defence Dialogue - 2024 is showcasing around 100 initiatives in the field of digitisation & automation, which have transformed the digital landscape of Indian Army. These 100 applications cover only a few of the multiple transformative steps which are being undertaken by the Indian Army to enhance its operational readiness as well as propel it into a future-ready force, capable of meeting both conventional and unconventional challenges. The Indian Army in its thrust towards modernisation has closely aligned its efforts with the Government's ambitious Digital India Mission with a visionary zeal to remain ahead of the curve in leveraging this domain to deliver on the responsibility of guaranteeing National Security for a 'Viksit Bharat'.

The second day of Chanakya Defence Dialogue would be equally insightful with prominent speakers sharing their views on global issues relevant to the theme of Chanakya Defence Dialogue. The second day will also feature special addresses by ISRO Chairman Dr S Somanath and Former Permanent Representative of India to the UN Ms Ruchira Kamboj.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2067822>

THE ECONOMIC TIMES

Thu, 24 Oct 2024

Need to change mindset to keep pace with evolving times: CDS to defence stakeholders

Chief of Defence Staff Gen Anil Chauhan on Thursday told stakeholders in the defence sector that there was a need to change the mindset to keep pace with evolving times, as he urged them to embrace fusion and synergy in order to achieve 'atmanirbharta'.

He said this after virtually inaugurating a two-day national conference on Technology Management (TECHMA 2024). In his address, the CDS urged the industry, R&D organisations and the Services to "embrace fusion and synergy" in order to achieve 'atmanirbharta' in defence and "make India a 'sashakt, surakshit and Viksit Bharat' (capable, secure and developed India)", the defence ministry said in a statement.

Stressing on the need to change the mindset to keep pace with the evolving times, he called for coming up with "innovative and unique ideas" which can prove to be advantageous to the armed forces, and in turn the nation.

Themed 'Technology Management in Defence Sector for Vision India @2047', the conference has been organised by Defence Research & Development Organisation (DRDO) at the Institute of Technology Management, Mussoorie. It aims to align the country's defence technologies with the national objective of becoming self-reliant by 2047. The conference began with a roundtable discussion on 'Harnessing Futuristic Technologies and Strengthening Indigenous Capabilities for Vision India @ 2047', the ministry said.

Secretary, Department of Defence R&D and Chairman, DRDO, Samir V Kamat attended the inaugural function as well. The themes of TECHMA-2024 are futuristic defence technologies, technology management with strategic vision for 2047, project management excellence in defence and value engineering and commercialisation.

indigenous R&D ecosystem, identify multidisciplinary research areas, improve project management processes and develop solutions for future defence technologies to overcome technical, logistical, and implementation challenges, ensuring India becomes a global leader by 2047," the statement said.

<https://economictimes.indiatimes.com/news/defence/need-to-change-mindset-to-keep-pace-with-evolving-times-cds-to-defence-stakeholders/articleshow/114556673.cms>

THE ECONOMIC TIMES

Thu, 24 Oct 2024

India's launches its latest nuclear submarine with 75% indigenous tech: Here's what the new S4 means for regional security

India marked a significant step in its strategic defence program by launching its fourth nuclear-powered ballistic missile submarine (SSBN), codenamed S4*, at the Ship Building Center (SBC) in Visakhapatnam. This development further strengthens India's nuclear deterrence capabilities, signaling its growing emphasis on securing its maritime boundaries in a volatile geopolitical environment.

The quiet launch of S4* this week follows the commissioning of India's second SSBN, INS Arighaat, by Defence Minister Rajnath Singh on August 29, 2024. The third SSBN, INS Aridhaman, is expected to be commissioned next year, further adding to the country's sea-based nuclear deterrence.

Advanced Capabilities of S4*

The newly launched S4* SSBN is a crucial upgrade from its predecessors. It carries only K-4 nuclear ballistic missiles, which have a range of 3,500 kilometers and can be launched through vertical systems. Unlike the first SSBN, INS Arihant, which carries K-15 nuclear missiles with a range of 750 kilometers, the new generation of SSBNs, including S4*, have significantly enhanced missile range and firepower.

The submarine boasts nearly 75% indigenous content, showcasing India's progress in defence manufacturing. Its operational capabilities, including unlimited range and endurance, are constrained only by food supplies, crew fatigue, and maintenance needs, making it a formidable asset in the Indian Navy's arsenal.

Both INS Arihant and INS Arighaat are already on deep-sea patrols, contributing to India's maritime security. Additionally, India is set to acquire a Russian Akula-class nuclear-powered attack submarine on lease by 2028, further expanding its nuclear fleet.

Rajnath Singh's Message on Maritime Security

In parallel with the S4* launch, Defence Minister Rajnath Singh emphasized the importance of regional cooperation in maintaining maritime security.

Addressing India's neighboring countries with shared maritime borders, Singh said, "Maintaining peace in the Bay of Bengal and Indian Ocean Region should be top priority. Cooperation of India's friendly nations is essential in this effort, as even if one country is left out, the nation's security wheel breaks." His remarks underlined India's commitment to working collaboratively with friendly nations to ensure stability in the region.

Singh also warned against the involvement of external forces, noting that inviting "outside forces" could undermine the region's unity and security. His comments were made amid growing tensions in the Indo-Pacific and reflect India's proactive stance on safeguarding its strategic interests.

Bolstering India's Maritime defence

India's focus on submarine-based deterrence is becoming increasingly evident. On October 9, 2024, the Cabinet Committee on Security (CCS) cleared plans for the construction of two additional nuclear-powered attack submarines. These submarines are designed to strengthen India's presence in the Indo-Pacific, particularly as rival powers, such as China, continue to expand their naval activities in the region.

The decision to prioritize nuclear submarines over a third aircraft carrier is a strategic response to evolving threats. China's long-range missiles, like the Dong Feng-21 and Dong Feng-26, pose a significant risk to aircraft carriers, making nuclear-powered submarines a more reliable defence option. With their ability to operate for extended periods underwater, these submarines offer enhanced survivability and operational flexibility, crucial in modern naval warfare.

In addition to its nuclear-powered fleet, India is also focusing on conventional submarine deterrence. The sixth diesel-electric Kalvari-class submarine, INS Vagsheer, is expected to be commissioned in December 2024. These conventional submarines complement India's nuclear fleet and will play a vital role in defending the Indian Ocean Region (IOR), where Chinese warships have been increasingly active.

India's Strategic Submarine Program

India's SSBN program has seen steady development since the introduction of its first leased nuclear-powered attack submarine, INS Chakra, designated S1. Following this, India launched its indigenous SSBNs, INS Arihant (S2), INS Arighaat (S3), and INS Aridhaman (S4). The latest addition, S4*, is part of this lineage, with its formal name yet to be announced. According to reports, future classes of Indian SSBNs are expected to have a displacement of 6,000 tons, double that of the Arihant class.

These advanced submarines will carry nuclear missiles with ranges exceeding 5,000 kilometers, further enhancing India's strategic reach. The Indian Navy's focus on nuclear submarines reflects the Modi government's broader strategy of strengthening sea-based deterrence against powerful adversaries like China. As the Indian Ocean Region (IOR) becomes increasingly contested, India's strategic submarines will be crucial in ensuring the country's defence and maintaining a stable balance of power.

INS Vagsheer and Future Submarine Plans

In addition to its nuclear-powered fleet, India is expanding its conventional submarine capabilities. INS Vagsheer, the sixth and final submarine of the Kalvari-class, is expected to be commissioned by the end of 2024.

The Kalvariclass submarines are diesel-electric attack submarines, which offer a costeffective and efficient complement to India's nuclear fleet. The Modi government has also approved the construction of three advanced diesel attack submarines at Mazagon Dockyards, in collaboration with the French Naval Group. These submarines will feature state-of-the-art technology and are expected to significantly enhance India's ability to defend the IOR, especially in light of increasing patrols by PLA warships in the region.

Strengthening defence in the Indo-Pacific

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Strengthening defence in the Indo-Pacific

India's decision to prioritize its nuclear-powered submarine fleet over the construction of a third aircraft carrier is a clear reflection of its evolving defence priorities. With China's expanding presence in the Indian Ocean and the potential threat posed by long-range missiles, India's strategic submarine fleet is set to play a key role in maintaining security in the Indo-Pacific.

As part of these efforts, the government has also ramped up investments in communication infrastructure for the Navy. On October 15, 2024, Defence Minister Singh inaugurated a Very Low Frequency (VLF) Naval Station in the Damagundam forest area of Vikarabad district, Telangana.

This station will facilitate command, control, and communications with India's strategic naval assets, ensuring seamless coordination during critical operations. India's continued focus on strengthening its submarine fleet, both nuclear and conventional, underlines its commitment to ensuring maritime security in an increasingly challenging geopolitical landscape.

The launch of S4* represents another step toward securing India's maritime interests and maintaining its position as a regional power in the Indo-Pacific.

<https://economictimes.indiatimes.com/news/defence/indias-launches-its-latest-nuclear-submarine-with-75-indigenous-tech-heres-what-the-new-s4-means-for-regional-security/articleshow/114547188.cms>



Thu, 24 Oct 2024

Russia boosting North Korea's nuclear arsenal? What's Pyongyang getting in return for supplying troops for Ukraine war?

Even as Moscow and Pyongyang denied the presence of North Korean troops in the conflict against Ukraine, the increasing military cooperation between the two countries worries analysts as they fear Russia could offer technical assistance to North Korea's missile and nuclear weapons programmes. Multiple reports have said apart from sending troops to aid Russia in its conflict against Ukraine, North Korea is also offering antiquated but effective rocket launchers, antitank

and anti-aircraft missiles, short-range ballistic missiles, tank artillery rounds, and field artillery pieces to Russia.

Secretary of Defense Lloyd J. Austin III had recently confirmed the presence of North Korean troops in Russia, saying, "We are seeing evidence that there are North Korean troops that have gone to ... Russia...What exactly they are doing is left to be seen. These are things that we need to sort out."

"If they're co-belligerents — (if) their intention is to participate in this war on Russia's behalf — that is a very, very serious issue," he added.

US National Security Council spokesperson John Kirby confirmed that 3,000 North Korean soldiers are deployed in eastern Russia where they are undergoing intensive training.

Even as some see the move by Russia to turn to North Korea for assistance with troops as a sign of weakness, others are worried about this growing military cooperation.

South Korean President Yoon Suk Yeol had said his government won't sit idle as North Korea allegedly sends troops to support Russia's war on Ukraine. We agreed that North Korea's troop deployment to Russia, which is in direct violation of the UN charter and UN Security Council resolutions, is a provocation that threatens global security, Yoon had said.

South Korea claimed that North Korea offered 6,700 containers of military equipment, which can accommodate three million rounds of 152 mm artillery shells or more than 500,000 rounds of 122 mm multiple rocket launchers, to Russia.

According to analysts, apart from hard currency, raw materials, food support, and diplomatic backing that North Korea is getting in return, Pyongyang is likely to be seeking more modern equipment in exchange for the short-term older equipment it is offering.

"Moscow may become a source of some critical weapons and technologies, such as reconnaissance satellites and fighter jets, where North Korea's gap with the South is especially glaring," according to an analyst.

According to Robert Peters, a Research Fellow for Nuclear Deterrence and Missile Defense in Heritage's Allison Center for National Security, "there is concern that North Korea could receive technologies that would enable it to launch large quantities of maneuverable cruise missiles to overwhelm US and South Korean missile defenses."

In a report that he wrote for American conservative think tank The Heritage Foundation, Peters said Russia could help North Korea to develop and produce a new generation of maneuverable cruise missiles, modernise its Hwasal family of missiles, and offer assistance in miniaturising nuclear warheads as Russia has been investing heavily in producing miniaturised warheads.

Seoul too is worried about the possibility of North Korea seeking major technology transfers in return for sending troops, including Russian know-how on intercontinental ballistic missiles and submarines that would advance the threat posed by Kim's nuclear arsenal.

<https://www.theweek.in/news/defence/2024/10/24/russia-boosting-north-koreas-nuclear-arsenal-whats-pyongyang-getting-in-return-for-supplying-troop-for-ukraine-war.html>

Thu, 24 Oct 2024

US destroyer fires first Naval Strike Missile, US Navy confirms

Naval Surface Warfare Center, Port Hueneme Division (NSWC PHD) was able to conduct the first demonstration firing of a Naval Strike Missile (NSM) from a US Navy (USN) destroyer, the USN confirmed on 23 October. Arleigh Burke-class guided-missile destroyer USS Fitzgerald (DDG 62) fired the first NSM on 18 July while the ship participated in Exercise 'Rim of the Pacific' (RIMPAC) 2024, USN officials said.

NSWC PHD and its partners installed the first long-range surface-to-surface warfare Over-The-Horizon (OTH) Weapon System on a DDG in time for it to launch the NSM at a decommissioned ship during the exercise, USN officials said. The navy has been searching for ways to increase its firepower by augmenting missile payloads and launching options.

The navy has installed OTH systems on "about a dozen" Independence-variant littoral combat ships (LCSs) over the past five years, the USN noted. The Office of the Chief of Naval Operations started to push naval engineers in September 2023 to install OTH on Fitzgerald in time to do the 'RIMPAC 2024' demonstration.

Typically, this type of first-of-class installation takes at least two years, Robert Honeycutt, Alteration Installation Team manager at NSWC PHD's Virginia Beach Detachment in Virginia, noted in a statement. The main components of the system are the launcher and an operator interface console, USN officials said, adding that to make it compatible with the destroyer, the system also required a navigation adapter.

<https://www.janes.com/osint-insights/defence-news/defence/us-destroyer-fires-first-naval-strike-missile-us-navy-confirms>

Thu, 24 Oct 2024

Chinese company unveils 'large' cargo UAV

A Chinese aviation startup has announced the roll-out of a new cargo-carrying unmanned aerial vehicle (UAV), which the company describes as the largest transport UAV in the country.

The W5000 is a product of Air White Whale, a company based in Changzhou, eastern China. The aircraft was unveiled on 22 October at the company's Changzhou production factory. According to

Air White Whale, the W5000 is a twin-turboprop aircraft with a maximum take-off weight (MTOW) of 10.8 tonnes, a payload capacity of five tonnes, and an inner cargo space of more than 65 m³.



The UAV is about 22.9 m long and has a wingspan of 22.7 m, the company said. Specifications previously published by the company show the UAV is being developed to achieve a range of 2,600 km and a cruising speed of 526 kt and operate at a maximum service ceiling of 6,000 m.

The company said it has applied for an airworthiness certification for the W5000 from China's Civil Aviation Administration of China (CAAC). The first model is expected to be delivered to its user in 2026, the company told state-owned media.

According to Chinese media reports, Air White Whale announced that the W5000 received CNY120 million (USD16 million) during a Series-A funding round in June 2024. It will use the funding to conduct ground-based testing and building assembly capacity while further developing the W5000 prototype, the company added.

The company has previously said the W5000 project was launched in 2021. Images released on Chinese social media in 2023 show the company using a scaled-down model of the W5000 for initial flight-testing.

<https://www.janes.com/osint-insights/defence-news/air/chinese-company-unveils-large-cargo-uav>

Germany and India Deepen Strategic Partnership in Trade and Defence

As the 18th Asia-Pacific Conference of the German Economy (APK) unfolds in New Delhi, the spotlight is on Germany and India's strategic and economic partnership. The conference, which gathers leaders from politics and business across the Asia-Pacific region, serves as a platform for both nations to explore new avenues of cooperation, with a strong focus on trade. One of the key topics is the ongoing negotiations surrounding the EU-India Free Trade Agreement (FTA), which have faced significant challenges.

Germany's Vice Chancellor and Federal Minister for Economic Affairs and Climate Protection, Robert Habeck, addressed the complexity of the FTA negotiations during his remarks at a press conference in New Delhi late Thursday evening (Oct 24, 2024).

He identified agriculture as the most significant hurdle in reaching an agreement, pointing out the vast differences between the agricultural systems of Germany and India. "In Germany, for example, only 2% of people work in agriculture, while in India, it's around 60%, and in some regions, as high as 80%," Habeck noted, emphasizing that opening markets fully under a free trade agreement would be highly disruptive to India's agricultural economy.

EU-India FTA: Struggles and Progress

Habeck acknowledged that finding a balance in negotiations is crucial, particularly when considering the impact on India's rural economy. He explained that while free trade agreements (FTAs) typically require comprehensive market access, the realities of India's agricultural sector necessitate a more cautious approach. "If we were to fully open markets, the destruction of India's agricultural markets would be enormous," he said, highlighting the sensitivity of the issue.

Despite these challenges, Habeck remains optimistic about the potential to reach an agreement, even if progress comes in smaller steps. "Perhaps we can find a solution that diverges from what the European Union has traditionally done over the past 20 years," he suggested, signalling a willingness to adapt the usual approach to FTA negotiations.

While there have been rumours of nearing the end of negotiations, Habeck was cautious in his assessment. "These rumours have surfaced before, even 10 years ago," he remarked, alluding to the long and complex history of the talks. However, he stressed the importance of focusing on industrial markets in the immediate term as a practical way to move forward. "It's better to take the steps, even if they are small, rather than standing still and not moving forward," Habeck emphasized, advocating for incremental progress in the negotiations.

Shifting Geopolitical Dynamics: Defence and Trade

Habeck's comments on the EU-India FTA were part of a broader discussion on Germany's evolving economic and strategic relationship with India. One notable area of change is Germany's stance on defence exports to India. Historically reliant on Russian military supplies, India is now seeking to reduce its dependency on Moscow, opening the door for greater German involvement in India's defence sector.

"India no longer wants to source all its military goods from Russia," Habeck stated as a reply to a question of German defence exports to India, reflecting Germany's readiness to support India's defence needs. Although defence exports are a separate issue from broader trade relations, they are indirectly connected to the strategic partnership between the two nations. Habeck pointed out, "Since India does not live in a completely peaceful region, it needs weapons for self-defense, including submarines. And if we don't want Russia to be the only supplier and for this dependency to grow even larger or for the relationship between the two to be continuously strengthened, then action must be taken accordingly."

Indo-German Cooperation at APK 2024

The APK 2024 provides a critical platform for Germany and India to strengthen their ties amid a rapidly changing global economic landscape. The Indo-Pacific region, according to Habeck, is "the most dynamic economic area in the world," offering immense opportunities for German businesses to contribute to shaping the global economy of tomorrow. With the region at the center of global value chains, Germany is keen to expand its partnerships in areas such as technology, digital transformation, and sustainable development.

The Asia-Pacific region, including India, is becoming increasingly important for Germany's trade strategy. As the EU continues to negotiate trade agreements with key players in the region, including India, Japan, and Australia, the potential for further economic integration remains high. The participation of key figures like Indian Prime Minister Narendra Modi and German Chancellor Olaf Scholz at APK 2024 underscores the importance of this conference in fostering deeper Indo-German cooperation.

<https://www.financialexpress.com/business/defence-germany-and-india-deepen-strategic-partnership-in-trade-and-defence-3649073/>



Fri, 25 Oct 2024

US made 'great progress' in bolstering defence ties with India: Pentagon

The US has made great progress in bolstering its defence relationship with India and the Pentagon is looking forward to making further progress in military-to-military ties in 2024, a senior official has said.

“In terms of the relationship between the US and India, you know, with obvious focus on the Department of Defence, I think it has been a very good year. I think we've made great progress in terms of further bolstering our relationship and cooperation,” Pentagon Press Secretary Pat Ryder told reporters at a news conference here.

“You've heard us talk about things like INDUS-X and working on defence cooperation efforts to include in the industrial base as far as developing things like jet engines in India, working collaboratively to produce armoured vehicles in India, the ability of our ships to go to India -- our Navy ships to go to India to be repaired,” he said in response to a question on Tuesday.

“So all of this working toward the common vision of a free and open Indo-Pacific region where sovereignty is respected, and countries can operate in international airspace, sail the international waterways freely and without harassment. We will continue to work closely with our partner, India. And we look forward to further progress in 2024,” Ryder said.

<https://www.deccanherald.com/world/us-made-great-progress-in-bolstering-defence-ties-with-india-pentagon-2-2809003>



Fri, 25 Oct 2024

Washington Is Delusional; India Will Not Fight China At Behest Of The US; Delhi To Play Balancing Role: OPED

Perhaps India's success under the Modi government has not been as compellingly evident as it has been in foreign policy. Delicately balancing pressure from the West to preserve and strengthen the national interest, the Modi government has managed to maintain an independent stance that has begun to attract attention and respect the world over.

Whether it be the issue of purchasing Russian crude in the face of Western sanctions, unequivocal support for Israel to combat global terrorism, building and consolidating India's trade ties with the Middle East, navigating India's relations with Palestine, isolating Pakistan and exposing its role in promoting terrorism on the global stage, pushing the Chinese back in four posts on the border, maintaining ties with Ukraine and assisting in concluding a peace deal to end the war with Russia, co-opting Africa into the G-20, maintaining an independent stance on several touchy issues with both the United States and Europe, reconstituting relations with the Maldives, taking concrete steps to firm up energy security by striking deals with Qatar, Saudi Arabia, the UAE and the kingdom of Brunei and playing an instrumental role in the QUAD; all these initiatives have helped India strengthen its claim for a permanent seat in the Security Council and helped to establish its reputation as a leader of the global South.

India's Foreign Minister, Subrahmanyam Jaishankar, has done a spectacular job of articulating the Indian weltanschauung or world view on the global stage. We want to be friends with all those who want to be friends with us. We do not want to be branded as with the West or against the West.

As he once very eloquently expressed, "India is not anti-West; it is non-West." The honorable Minister was highlighting the fact that India chose a non-Western route to industrialization and modernity. This was a civilizational choice and one that was not governed by the classical route to modernity (Western Europe), the erstwhile communist route (USSR, China, and Eastern Europe), or the state-sponsored route (Japan and Germany).

Professor Jeffrey Sachs is the Director of the Center for Sustainable Development at Columbia University. He is one of the few voices in the West known for trenchant observations on global affairs, especially the war in Ukraine and the West's culpability in triggering this global disaster. In a recent conversation with Professor John Mearsheimer, Distinguished Service Professor of Political Science at the University of Chicago, who is known for his insights into the dark side of world geopolitics, Professor Sachs was asked about India's role in world affairs. This was in response to Professor Mersheimer's view that India was an ally of the United States.

This is what Jeffrey Sachs had to say: "I do not believe India is an ally of the United States. India is a superpower; India is not going to be an ally of the United States; India is going to have its own very distinctive interests. I happen to like India enormously and admire their policies, but the idea that India is going to ally with the United States against China is somebody's dream in Washington. It is the delusion of somebody in Washington. They must get a passport and see the world." Professor Sachs is absolutely right.

So, what was Prime Minister Modi's recent visit to the United States about, and why were Western nations propping up India as the leader of the QUAD? The West is puzzled by India's simultaneous membership in the QUAD, BRICS, and SCO. As India's Foreign Minister explains, "We are not being all things to all people, but we are being ourselves to all people." It is an important distinction. Membership of one conglomerate does not exclude the other. India's purpose in joining the QUAD is to help ensure free and open maritime traffic in the Indo-Pacific.

During his visit to the US, Modi highlighted India's role as an important economic hub. Addressing a group of senior tech executives, he encouraged them to invest in India and outlined a vision to develop it into a major technology power. He reached out to companies looking to move their production and investment out of China. The timing of this announcement is particularly important. On the sidelines of the QUAD Summit, the marketing of India as a reliable alternative to China is a significant development that cannot be overlooked.

At a broader level, Modi used the visit to reiterate India's stance on global issues. He unequivocally said that India is "not against anyone" and strongly supports the preservation of a 'rules-based international order.' This echoes Modi's messaging during his visit to Russia and Ukraine, where he argued that India would be on the side of peace. At the same time, the strong messaging against Chinese aggression in Southeast Asia cannot be overlooked. In the same speech, Modi also called on all parties to respect the principles of sovereignty and peaceful existence. There was also a direct reference to an 'open and inclusive' Asia Pacific, a message clearly targeted at the Chinese.

Modi's speech at the UN highlighted India's commitment to a rule-based international order. At a time when questions are being raised about the future of multilateral forums like the UN, the Prime Minister stressed the importance of such institutions.

He argued that the UN and other multilateral forms are essential elements of the rules-based international order. This posturing yielded results, with the US, UK, France, and Russia backing India's bid for a permanent seat in the UNSC. Over the last three months, Modi's foreign policy activities have provided important indications of India's foreign policy objectives. The meeting with Putin and then with Zelensky highlighted India's willingness to take a pragmatic and neutral stance, which is in India's best interest.

At the same time, India sees opportunities to cooperate with the West, particularly in the economy and in South East Asia. With regard to the economy, there is a clear push to bring in investment and lure some of the MNCs looking to move away from China. In South East Asia, India will have an important role to play in containing Chinese expansionism. In general, it would be correct to say that India is against the unfettered Western domination of the world order. It has expressed its displeasure on this matter in no uncertain terms several times. It is time the Western world stopped treating the world as an exclusive preserve of the G-7 countries.

India is likely to play a stellar role in democratizing the world order and its institutions, creating an equitable world where the goals of economic development and the exigencies of geopolitics can be reconciled to establish an enduring balance between both. From a larger point of view, there is little doubt that we are entering a period of pronounced global uncertainty and instability with a strong possibility of a global war on the horizon.

Hotspots are growing in number, including Taiwan, Iran, Yemen, Lebanon, Ukraine, Pakistan, Afghanistan, Bangladesh, and the Philippines in Southeast Asia. China has border claims on just about any of its neighbors, including Japan. Any of these hotspots could morph into a war of global proportions. India is likely to tread cautiously in this troubled terrain, balancing its developmental goals and its security concerns amid growing geopolitical tensions.

<https://www.eurasiantimes.com/guest-article-indias-role-in-the-indo-pacific/>



Thu, 24 Oct 2024

Nuclear Attack On China — Scientists Conduct Doomsday Experiment; Test Resilience Of Beijing's Comm System

In response to escalating global nuclear tensions, Chinese scientists have reportedly conducted a doomsday experiment to assess the resilience of their communication equipment and determine its ability to withstand such a scenario.

Chinese researchers have subjected data link hardware to a “doomsday” test, according to a report by the South China Morning Post. The experiments, which exceeded standard military specifications, aimed to ensure China’s ability to maintain crucial communications in the event of a nuclear strike. Engineers involved in the project stated that the equipment was pushed far beyond current military standards during the trial.

China’s Doomsday Test

It’s important to consider that China is a signatory to the no-first-use policy regarding nuclear weapons. Therefore, the experiment’s objective was to ensure that communication systems remain functional should the country face a nuclear strike, allowing China’s retaliatory forces to survive an initial assault.

According to the report, researchers simulated a scenario in which a nuclear explosion occurs in the stratosphere—known as a high-altitude electromagnetic pulse (HEMP) attack—to determine whether their equipment could withstand the devastating effects such an explosion would create. A representative from the PLA Air Force equipment department was present to observe the test, though the exact date remains classified.

Standard military guidelines in both China and the U.S. stipulate that any HEMP-proof equipment must operate after exposure to an electric field of 50 kilovolts per meter. However, for this experiment, as reported by the South China Morning Post (SCMP), Chinese researchers increased this threshold to 80 kilovolts per meter to simulate the electromagnetic pulses generated by a nuclear explosion. The report stated that test results indicated that the equipment functioned after a brief delay, with the data link communication network remaining intact.

According to the SCMP, engineers from the China Electronics Technology Group Corporation (CETC) enhanced the data link hardware’s robustness. CETC is also the primary supplier of electronic warfare equipment for the People’s Liberation Army (PLA). As noted in the report, the findings were published in a peer-reviewed paper in the Chinese academic journal *Wireless Communication Technology* in September.

The Threat Of Nuclear Attack

These tests come amid heightened international nuclear concerns. Since the end of the Cold War, the role of nuclear weapons has only intensified, with many nuclear states actively modernizing and strengthening their arsenals. Earlier this year, the United Nations issued a stark warning that the threat of a nuclear attack has reached levels not seen since the Cold War’s conclusion.

UN Secretary-General António Guterres highlighted this concern during a June 2024 conference of the Arms Control Association, stating, “Nuclear blackmail has re-emerged, with some recklessly threatening nuclear catastrophe. Meanwhile, the regime designed to prevent the use, testing, and proliferation of nuclear weapons is weakening.”

In June 2024, outgoing NATO Secretary-General Jens Stoltenberg announced that the alliance was discussing plans to deploy more nuclear weapons, taking them out of storage and placing them on standby. Furthermore, In September 2024, as the US and its allies discussed permitting Ukraine to launch longer-range attacks into Russia, Russia’s President Putin unveiled a new nuclear doctrine that explicitly outlined the conditions for potential nuclear weapon use. Sources within the

Kremlin indicated that this policy would allow for the deployment of Russia's substantial nuclear arsenal in response to perceived aggression. Additionally, ongoing conflicts in the Middle East have raised concerns about potential attacks involving nuclear weapons and threats to nuclear energy facilities.

Many will recall that in 2019, Robert C. O'Brien, a former national security advisor to President Donald Trump, urged for nuclear tests if Trump secured a second term, arguing it would help the US "maintain technical and numerical superiority over the combined Chinese and Russian nuclear stockpiles." In light of these developments, Chinese scientists are taking every step to safeguard their homeland against any eventuality.

Nuclear Hardening Of Electronics

Since the first atomic bomb detonation, nuclear hardening of electronics against radiation and electromagnetic pulses (EMPs) has been a focus. This process enhances the resilience of electronic components to radiation and EMP damage. These specialized components serve crucial roles in Aerospace systems, Defense infrastructure, GPS networks, Weather monitoring systems, and Nuclear testing programs.

Engineers achieve radiation hardening through specialized design techniques and shielding that protect sensitive components from both radiation and electromagnetic pulses. These protective measures have become increasingly sophisticated as nuclear technology has advanced.

Nuclear Preparedness & Rising Stakes

As tensions have grown among the U.S., China, and Russia in recent years, the long-standing international consensus around nuclear nonproliferation has shown signs of strain. Nuclear technology has emerged as a critical factor in the ongoing competition for strategic superiority among these major powers.

China's enhanced testing protocols reflect this shifting landscape, demonstrating a broader international trend toward strengthening nuclear preparedness. While China maintains its no-first-use policy, its military has intensified efforts to ensure communication systems can withstand worst-case scenarios. These preparations, alongside similar initiatives by other nuclear powers, underscore a complex new chapter in global strategic relations where nuclear capability and resilience have taken center stage.

<https://www.eurasiantimes.com/countdown-to-catastrophe-chinas-nuclear/>

NASA sends key equipment for ISRO's NISAR mission: All you need to know about the satellite launching next year

NASA has delivered a crucial component for the NISAR (NASA-ISRO Synthetic Aperture Radar) satellite to the Indian Space Research Organisation (ISRO). The radar antenna reflector, essential for the mission, arrived in Bengaluru on October 23, 2024.

This reflector plays a key role in focusing microwave signals sent to and from Earth's surface, allowing NISAR to scan almost all of the planet's land and ice surfaces every 12 days to gather scientific data. After its arrival aboard a NASA C-130 cargo plane, the radar antenna was transported to ISRO's Spacecraft Integration and Test Establishment for reintegration with the NISAR spacecraft.

The satellite is scheduled for further testing in preparation for its launch from the Satish Dhawan Space Centre on India's southeastern coast in early 2025. NASA and ISRO will coordinate to finalize the official launch date.

All about NISAR Mission:

NISAR is a joint Earth observation mission developed by NASA and ISRO. It aims to enhance global understanding of changes in Earth's surface, including ice sheets, glaciers, forests, wetlands, and tectonic activity.

NISAR will also support disaster response by providing before-and-after data on natural disasters such as earthquakes and landslides. NISAR will orbit Earth every 12 days, capturing high-resolution images of its surface, monitoring environmental changes, sea levels, and natural hazards.

Operating on both L-band and S-band frequencies, NISAR is the first radarimaging satellite of its kind. Its SAR technology can penetrate clouds and operate in darkness, enabling continuous observation regardless of weather conditions.

The NISAR satellite, originally set for an earlier launch, faced delays when a minor issue was detected in the radar antenna reflector. NASA sent the component back to the U.S. for thermal coating to protect it from higher-than-expected temperatures in space. The coated reflector has now arrived for reintegration into the satellite, ensuring smooth operations once launched.

The NISAR mission is expected to provide crucial data on Earth's dynamic surface, helping scientists monitor environmental changes and respond to natural disasters. Once launched, it may

revolutionize Earth observation with its advanced radar technology, contributing to global research and disaster mitigation efforts.

<https://economictimes.indiatimes.com/news/science/nasa-sends-key-equipment-for-isros-nisar-mission-all-you-need-to-know-about-the-satellite-launching-next-year/articleshow/114541453.cms>

THE ECONOMIC TIMES

Thu, 24 Oct 2024

Cabinet approves Rs 1000 crore Venture Capital fund in boost to space sector focused startups

The Union Cabinet approved a ₹1,000 crore venture capital fund under the IN-SPACe program on Thursday to support space-sector focused startups in India. Union Minister Ashwini Vaishnaw announced the decision. The proposed ₹1,000 crore fund is set to have a deployment period of up to five years from the start date of its operations. Each year, the average amount deployed is expected to range between ₹150 crore and ₹250 crore, depending on available investment opportunities and the needs of the fund. The proposed investment range is set between ₹10 crore and ₹60 crore, depending on the company's stage, growth potential, and its impact on national space capabilities. The indicative equity investment ranges are as follows:

- Growth stage: ₹10 crore – ₹30 crore
- Late growth stage: ₹30 crore – ₹60 crore

With this investment strategy, the fund aims to support around 40 startups. "This fund is strategically designed to enhance India's space sector, aligning with national priorities and fostering innovation and economic growth through several key initiatives," the government in a press release detailing the Cabinet meet's outcomes.

The Narendra Modi-led Centre aims to bring in the following changes and advancements in the Indian economy with this fund:

- Capital Infusion
- Retaining Companies in India
- Growing the Space Economy
- Accelerating Space Technology Development
- Boosting Global Competitiveness
- Supporting Atmanirbhar Bharat
- Creating a Vibrant Innovation Ecosystem
- Driving Economic Growth and Job Creation

- Ensuring Long-Term Sustainability

By addressing these objectives, the fund seeks to position India as a leading player in the global space economy, the government said.

"The proposed fund is expected to boost employment in the Indian space sector by supporting startups across the entire space supply chain—upstream, midstream, and downstream. It will help businesses scale, invest in R&D, and expand their workforce. Each investment could generate hundreds of direct jobs in fields like engineering, software development, data analysis, and manufacturing, along with thousands of indirect jobs in supply chains, logistics, and professional services," the government said in its press release.

The fund aims to not only generate employment but also cultivate a skilled workforce, driving innovation and boosting India's competitiveness in the global space market.

IN-SPACe

As part of its 2020 space sector reforms, the Government of India established IN-SPACe to encourage and regulate private sector involvement in space activities. IN-SPACe had proposed a ₹1,000 crore venture capital fund aimed at fostering the growth of India's space economy, which is currently valued at \$8.4 billion and targeted to reach \$44 billion by 2033.

This fund seeks to address the critical need for risk capital, particularly since traditional lenders are often reluctant to invest in this high-tech sector. With nearly 250 space startups emerging across the value chain, timely financial support is essential for their growth and to prevent the loss of talent to other countries.

The proposed government-backed fund will enhance investor confidence, attract private capital, and demonstrate the government's commitment to advancing space reforms. It will operate as an Alternative Investment Fund under SEBI regulations, providing early-stage equity to startups and enabling them to scale up for further private equity investments.

<https://economictimes.indiatimes.com/news/science/cabinet-approves-rs-1000-crore-venture-capital-fund-in-boost-to-space-sector-focused-startups/articleshow/114544053.cms>



Thu, 24 Oct 2024

Researchers meld AI and genomics to find thousands of new viruses

For most of modern history, people have overlooked viruses even though they are the most abundant biological entity on the planet and carry immense ecological significance. Viruses are found in every nook and corner of the world — from soil and water to the atmosphere and even extreme environments like hot springs and hydrothermal vents.

Viruses are obligate parasites: they require a host to infect and replicate. This relationship goes both ways. Thanks to advances in research, scientists are increasingly recognising viruses as agents of disease but also as being integral components of ecosystems. Viruses drive genetic evolution through horizontal gene transfer, control microbial population balance, and even affect biogeochemical cycles.

They essay critical roles in maintaining biodiversity and may even influence climate regulation. Understanding their influence is thus key to unravelling the complexities of life on the earth. Yet only a small fraction of the roughly 100 million to a trillion viral species has been identified to date.

The unknown-unknown threat

Beyond their environmental roles, understanding viruses is crucial for us to anticipate emerging infectious diseases. Some studies have estimated there are around 300,000 mammalian viruses yet to be discovered, many of which pose zoonotic threats. Unlike microbes, which scientists have studied using culture-based methods, viruses have remained understudied because of challenges to culturing them.

The rapidly improving scale and declining costs of nucleotide sequencing has resulted in the widespread use of genome-sequencing approaches to understand microbes in the environment, particularly in metagenomics studies. These approaches have transformed our ability to explore the vast diversity of microbes and viruses in the last decade. In a metagenomic study, researchers analyse genetic material directly from environmental samples, allowing them to identify and study an organism without the need for culturing organic material like tissues in an intermediate step.

Buggier but faster

In recent years, metagenomics has helped scientists identify a staggering number of previously unknown microbes in diverse environments. These discoveries have significantly expanded our understanding of microbial ecosystems. As sequencing technologies continue to improve — becoming more accurate, faster, and more affordable — alongside better global data-sharing practices, scientists are beginning to unlock the secrets of the microbial world at an unprecedented pace.

In this regard, RNA viruses are of especial significance primarily because they mutate rapidly and adapt quickly to new conditions. More specifically, DNA viruses have more stable genomes and their genome-replicating mechanism makes fewer ‘mistakes’ when they proliferate — whereas RNA viruses replicate faster with higher error rates. This characteristic is also particularly relevant in the context of emerging infectious diseases: COVID-19, Ebola, and influenza are all caused by RNA viruses.

Serratus ups the ante

One way to identify an RNA virus is to track down and isolate fragments of a specific gene that is essential for the virus to replicate: RNA-dependent RNA polymerase, or RdRP. RdRP is one of the most ancient of genes, so much so that many researchers believe it was among the world’s first genes. RdRP proteins have regions that are well-conserved (i.e. which the organism preserves as it evolves) and motifs in the protein that are essential for its function, which is to replicate RNA

using a template. In 2022, Canadian researchers led by Artem Babaian built an open source tool called Serratus.

When scientists sequenced a gene, Serratus could match the sequence data with sequences known to be related to viral RdRP proteins. The researchers collected more than 10 petabytes of sequencing data encompassing 5.7 million sequencing libraries from diverse ecologies. When they fed this dataset to Serratus, it uncovered the presence of more than 100,000 viruses, considerably expanding the diversity of viruses known to humankind.

Their findings were published in Nature in January 2022. In another study published in Science in the same year, U.S. researchers led by Ahmad Zayed at the University of Ohio used computational tools to sift through the terabytes RNA sequence data to identify thousands of new RNA virus species. In particular, this team identified a new viral species to fill an important gap in our scientists' understanding of RNA virus evolution; a new species that dominated the oceans; and another species that could infect mitochondria (organelles in cellular organisms that serve as the energy source, believed to have originated from microbes).

A transformative effect

An important shortcoming of the metagenomic approach is that computational algorithms typically look for proteins very similar to sequences already in databases. As a result they risk missing proteins that have evolved and changed form. This risk may not hold for long, however. In a recent study, researchers from multiple Chinese research organisations combined genomics with a transformer.

In deep-learning, a transformer is a type of machine learning model known for its ability to train rapidly to identify specific patterns. In the study, researchers fed genome-sequencing data and data from ESMFold, another machine-learning model adept at predicting the structures of proteins, to their transformer and trained it to spot genetic patterns corresponding to RdRP.

Then they used the transformer to analyse large tranches of metagenomic data, where it identified more than 160,000 new RNA viruses. More than half of these viruses were described for the first time and many came from unique and/or extreme environmental niches, including hot springs, salt lakes, and air. Their findings are to be published in a forthcoming issue of Cell. Because transformers look for patterns rather than amino-acid sequences, they can find proteins even when they have diverged significantly.

They can also help computers design proteins based on these patterns, to perform functions that no natural proteins can. The discovery of new RNA viruses from new places in the environment is also important to our understanding of public health. Each new discovery better our ability to identify and characterise similar viruses better, teaches us what to keep an eye out for and how/where to improve our methods, and helps us discover more species faster.

Fighting pandemics ere they begin

On the ground, a key advantage of such discoveries is with regards to pandemic preparedness. As sequencing technology becomes more widespread and data-sharing increasingly the norm, we are equipped better than ever to identify pathogenic viruses with zoonotic potential — i.e. those that could spill over from animals to humans — long before they pose a significant threat.

Early detection allows us the opportunity for timely intervention and even the chance to prevent large-scale outbreaks. Looking ahead, the deeper understanding of viruses and their evolution through genomics, with help from ecological surveillance and machine-learning, will enhance our preparedness against pandemics.

By continuously mapping viral diversity in nature and improving our understanding of viral-host interactions, we can also develop machine-learning models that can anticipate and mitigate viral spillovers. This future holds the promise of not only managing emerging viruses but also tackling the risk of pandemics at the microscopic rather than at the planetary scale.

<https://www.thehindu.com/sci-tech/science/researchers-combine-transformer-model-genomics-discover-thousands-new-viruses/article68785679.ece>



Fri, 25 Oct 2024

New rocket, plus moon and Venus missions, herald new beginnings

The Indian government recently signed off on numerous new projects, including work on a new rocket and new moon and Venus missions. The space programme is thus on the cusp of important new beginnings. India is also preparing to launch the NISAR and Proba-3 satellites, and has received some good news from Astrosat. The private sector is also working on satellite projects of its own.

A slew of approvals

The Union Cabinet on September 18 approved four missions under the ‘Gaganyaan’ human spaceflight programme and four missions to test technologies for India’s first space station, the Bharatiya Antariksh Station 1, by 2028. The Indian Space Research Organisation (ISRO) also added one uncrewed Gaganyaan flight in addition to the planned two.

The Cabinet approved an additional funding of Rs 11,170 crore for the four Station-related missions and the additional Gaganyaan flight. The Cabinet also approved ISRO’s development of the Next Generation Launch Vehicle (NGLV) for Rs 8,240 crore. This includes the cost of the rocket’s first three development flights.

ISRO is expected to develop the vehicle in collaboration with industry, so that industry players can seamlessly take over for operational flights when the rocket is tested and ready. A Polar Satellite Launch Vehicle (PSLV) built by Hindustan Aeronautics, Ltd. and Larsen & Toubro is expected to launch at the end of 2024 or early 2025.

Likewise, New Space India, Ltd. is expected to select a private entity to commercialise the LVM-3 rocket. The Cabinet has also approved a scientific mission to Venus and the next Chandrayaan mission to the Moon. The Venus Orbiter Mission is expected to be launched in a window available

in March 2028 and will cost Rs 1,236 crore. With the mission, scientists hope to study the planet's acerbic surface and atmosphere to understand how different planets of the Solar System evolved.

Chandrayaan-4 and LUPEX

Chandrayaan-4 will be a sample-return mission. Its components will be launched on two separate LVM-3 launch vehicles; they will dock in earth orbit before going to the moon, and land on the surface near the location of Chandrayaan 3. There the mission will scoop up some samples of moon soil and rock and send them back to the earth onboard a bespoke canister. The mission is expected to be launched by 2027 and cost Rs 2,104 crore.

The Space Commission also approved a joint moon mission with Japan called the Lunar Polar Exploration Mission (LUPEX). For LUPEX, ISRO is developing a different moon lander than the one it used for Chandrayaan-3, and which it hopes can be used in crewed lunar missions in future. The Commission also signed off on the development of a third launch pad at Sriharikota, which ISRO will need to test and launch the NGLV.

SBS and Axiom-4

The Cabinet Committee on Security approved the third phase of the Space Based Surveillance (SBS) missions on October 11. For this, ISRO will build 21 satellites and private companies will build another 31, for Rs 26,968 crore in all. This is a significant improvement over the four satellites ISRO built for SBS-1 in 2001 and six for SBS-2 in 2013. India's astronaut-designate Sudhanshu Shukla had his space suit measured and also underwent pressurisation tests at the SpaceX headquarters. The event marks the official start of his 10-day training programme before he will fly to the International Space Station aboard the Axiom-4 mission next year.

Satellites en route to India

The NASA-ISRO Synthetic Aperture Radar (NISAR) is an earth-observation satellite whose radar antenna reflector recently landed in India from the Jet Propulsion Lab in California. Earlier, tests in India had revealed it may experience higher temperatures than expected during its launch. It had to be flown back to receive a protective coating.

ISRO is expected to launch NISAR in early 2025 on board a Geosynchronous Satellite Launch Vehicle. The other mission, Proba-3 from Europe, will study the Sun's corona. It will have two satellites flying in formation: one will gaze at the Sun while the other will block the first satellite's view of the Sun's central area, like creating an eclipse, leaving only light from the corona to hit the cameras.

The European Space Agency has said Proba 3 is expected to launch on board a PSLV-XL vehicle on November 29. India previously launched Proba-1 on the PSLVC3 mission, in 2001.

From the private sector

Manastu Space signed an agreement with Dhruva Space to test its green propulsion technology to power the latter's Launching Expeditions for Aspiring Payloads (LEAP-3) mission. LEAP-3 will carry payloads from different companies in 2025. Manastu is developing a green propulsion system using a hydrogen-peroxide-based fuel. It first tested LEAP on the PSLV-C58 mission on January 1 this year.

Bellatrix Aerospace unveiled 'Project 200', a prototype for a satellite that can fly at an altitude of 200 km. a.k.a. The ultra-low earth orbit. Ananth Technologies became the first private Indian company to assemble, integrate, and test two Space Docking Experiment (SpaDEx) satellites for ISRO at the company's facility in Bengaluru. The satellite was then sent to the U.R. Rao Satellite Center (URSC) in the same city.

Space science

Scientists have found that the crater where Chandrayaan-3 landed is older than the South Pole Aitken Basin, itself 4.2-4.3 billion years old. This was based on data from the Optical High-Resolution Camera onboard the Chandrayaan-2 orbiter and navigational cameras on board Pragyaa, the Chandrayaan-3 rover.

Astrosat, India's first multi-wavelength space observatory, was built with a mission life of five years but has now operated for nine. Based on fuel readings, it is expected to last for another two years. The data collected by the observatory has been the basis for more than 400 published papers.

<https://www.thehindu.com/sci-tech/science/new-isro-rocket-nglv-moon-venus-missions-new-beginnings/article68789942.ece>



Fri, 25 Oct 2024

RRI team use quantum magnetometry to make more precise atomic clocks

A Raman Research Institute (RRI) team working with cold Rydberg atoms have used quantum magnetometry to help atomic clocks and magnetometers used for precise timekeeping in navigation, telecommunication and aviation, achieve higher precision and make them additionally robust.

According to the Department of Science and Technology, a Rydberg atom is an "excited atom with one or more electrons" that have a very high principal quantum number. This state of excitation is measured with a spectroscopic method called the Electromagnetically Induced Transparency (EIT).

RRI researchers have leveraged the Doppler effect to their advantage and achieved a ten-time enhanced response to the magnetic field while performing quantum magnetometry (phenomenon exploiting the quantum nature of light and atoms for precision measurement of magnetic fields) on thermal rubidium atoms using Rydberg EIT in a room temperaturebased environment. Deploying Rydberg EIT, the researchers detected atoms in their highly excited (Rydberg) states.

"When the Rydberg EIT was observed in an unconventional configuration of the probe and the coupling beam, where the Doppler shift was not compensated, an enhanced response to the magnetic field was observed. It is the Doppler shift which causes a larger response of the Rydberg EIT signal to an externally applied magnetic field," said Sanjukta Roy, head of Quantum Optics

with Rydberg Atoms Lab (QuORAL) at RRI Generally, Doppler shift is perceived as the change in frequency of a wave by a moving observer.

When a laser beam flashes on atoms, their thermal motion leads to a Doppler shift – an atom moving towards the laser beam sees a higher frequency, whereas one moving away sees a lower frequency. This effect is generally assumed to be detrimental to sensing.

The RRI team, in the paper published recently in New Journal of Physics, have demonstrated and successfully harnessed the quantum effects at room temperature by effectively using this Doppler effect to their advantage. They have also explained their experimental observations using theoretical modeling and simulations in collaboration with Shovan Dutta, Theoretical Physics group, RRI.

<https://www.thehindu.com/sci-tech/science/rri-team-use-quantum-magnetometry-to-make-more-precise-atomic-clocks/article68791771.ece>



Thu, 24 Oct 2024

DNA ‘Printing Press’ Set to Revolutionise Data Storage System

Science has gone further to improve the procedure for storing data by using the technique of moving type at the molecular level, and this has helped to improve the rate at which information can be keyed into the DNA. This was elaborated in a recent article in Nature that revolutionise the DNA data storage field and will make it possible to store valuable information for long periods at lower costs.

Trillions of bits of information can be stored in a single gram of DNA, about as much information as 10 million hours of high-definition video. Contained in an amazing amount of genetic material that can be stored in just a few pickup trucks, it is at least an order of magnitude greater than traditional electronic hard drives that degrade within years. Further, it is found that DNA molecules are robust and can persist into thousands of years if protected correctly.

However, writing data in DNA has emerged with challenges; these include: the prior techniques of synthesising DNA strands involve forming them letter by letter; the modern techniques allow only 320 million bytes of DNA per day. Even at this rate, writing a gram of DNA would require nearly 2 million years and is therefore more costly than conventional hard discs.

Techniques Derived from History

The research team of Long Qian of Peking University borrowed from the movable type printing press, an invention that broke the information barrier in the Renaissance period. In this way, they

built from enzymes long, standardised templates of single-stranded DNAs as a base and hundreds of short single-stranded DNA “bricks.”

Every one of them was intended to adhere to specific areas of the template as a typesetter would choose letters from type cases. The researchers used methylation, a naturally occurring process, to add methyl groups to the DNA bricks to write binary code. It helps to catalyse these methyl groups to go on the DNA template for effective writing, followed by effective reading of the encoded information.

Future Developments

The first proof-attempt demonstrated writing and reading of files and from drives using nearly 270000 bits to store, which are sufficient to store highresolution images. At the present time, it costs roughly \$0.003 to write a bit using this technique. But Qian expects that commercial uses could bring the costs down significantly and increase writing speeds to as much as 2 terabytes a day—iit would be 6,000 times faster than existing synthesisers.

In the future, the research team plans to refine this method, advancing from this general one, by identifying more chemical markers that can expand data encoding potential and improve speed of writing. This relatively new approach, if successful, may form a new revolution in the history of data storage technology like the revolution of movable type.

<https://www.news9live.com/science/dna-printing-press-set-to-revolutionise-data-storage-system-2732234>

