

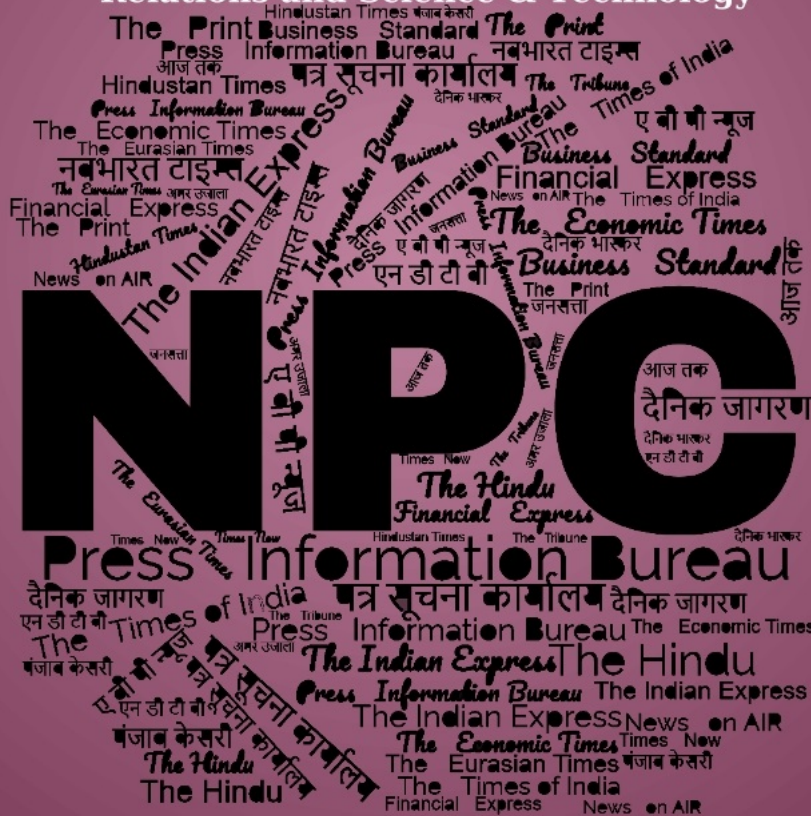
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**Press Information Bureau
Government of India**

Ministry of Defence

Fri, 25 Oct 2024

Two-day DRDO Directors' Conclave 2024 begins in Pune to discuss 'Transforming DRDO for Redefined Defence R&D'

The two-day DRDO Directors' Conclave 2024 commenced at Armament Research & Development Establishment, Pune on October 25, 2024. This annual event of DRDO was inaugurated by Secretary Department of Defence R&D and Chairman DRDO Dr Samir V Kamat. In his address, the DRDO Chairman stressed upon the criticality of technology leadership in today's evolving global scenario. He emphasised the need for DRDO to Reform, Perform and Transform as an organisation to realise Prime Minister Shri Narendra Modi-led Government's vision of Aatmanirbhar and Viksit Bharat.

General Officer Commanding-in-Chief, Southern Command Lt Gen Dhiraj Seth delivered a plenary talk on harnessing next-gen technologies for future conflicts, and the role of DRDO in building a self-reliant defence ecosystem.



Various sessions in line with the theme 'Transforming DRDO for Redefined Defence R&D' are being held during the conclave. The aim is to inform the participants about the series of DRDO reforms that have been implemented or under implementation towards making DRDO a more efficient organisation.

The event features deliberations on developing a robust R&D ecosystem by extensively engaging the industry and the academia towards making the country a leading nation in defence technology. Various brainstorming sessions, and plenary talks for capacity enhancement in defence R&D through the participation of academia and industry are being organised. The conclave will conclude with sharing of ideas and suggestions towards setting a path forward.

Top officials of DRDO, including DGs of various technology & corporate clusters, Directors and Programme Directors of labs, Corporate Directors of headquarters and Integrated Financial Advisers, are participating in the event.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2068193>

Defence News

Defence Strategic: National/International



**Press Information Bureau
Government of India**

Ministry of Defence

Fri, 25 Oct 2024

Launch Of 'Abhay', Seventh Ship Of ASW SWC (GRSE) Project

'Abhay', the seventh Anti-Submarine Warfare Shallow Water Craft (ASW SWC) being built by M/s GRSE for Indian Navy, was launched on 25 Oct 24 at M/s L&T, Kattupalli. The Launch Ceremony was presided over by VAdm Rajesh Pendharkar, FOC-in-C (East). In keeping with maritime tradition, Mrs Sandhya Pendharkar, President NWWA, Eastern Region, launched the ship.

The contract for building eight ASW SWC ships was signed between MoD and Garden Reach Shipbuilders & Engineers (GRSE), Kolkata in Apr 19. Arnala class of ships will replace the in-service Abhay class ASW Corvettes of Indian Navy and are designed to undertake anti-submarine operations in coastal waters, Low Intensity Maritime Operations (LIMO) and Mine Laying

Operations. The ASW SWC ships are approx 77 m long, with a maximum speed of 25 knots & endurance of 1800 NM.

The launch of Abhay highlights the nation's resolve towards Aatmanirbhar Bharat in shipbuilding. The ASW SWC ships are designed with over 80% indigenous content, thereby ensuring that large scale defence production is executed by Indian manufacturing units, generating employment and capability enhancement within the country.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2068207>



Press Information Bureau
Government of India

Ministry of Defence

Fri, 25 Oct 2024

Chanakya Defence Dialogue 2024 Culminates At New Delhi

The second edition of the Indian Army's flagship international seminar, the Chanakya Defence Dialogue, culminated on 25th October at the Manekshaw Centre in Delhi. This two-day event brought together policymakers, strategic thinkers, academia, defence personnel, veterans, scientists, and subject matter experts from India and abroad to examine India's strategic directions and developmental priorities.

The Chanakya Defence Dialogue 2024, themed "Drivers in Nation Building: Fueling Growth Through Comprehensive Security," sparked essential discussions on the integration of security dynamics within the broader context of national and international policymaking. Prominent speakers from India, the United States, Russia, Israel, and Sri Lanka, offered a global perspective on how security influences our nation's developmental trajectory toward Viksit Bharat @2047. The dialogue aimed not only to analyse the current landscape but also to formulate visionary strategies for sustainable and inclusive growth.

On the second day, the dialogue featured two special addresses. Dr S Somanath, Chairman of ISRO, emphasised on the pivotal role India's space sector plays in strengthening national security. The ISRO Chief discussed the significance of space in modern times, especially given the growing congestion and competition within the realm of satellite communication, navigation, space science, and earth observation.

He noted that space has become a crowded and contested field, with natural, accidental, and intentional hazards like jamming, anti-satellite (ASAT) threats, manoeuvring vehicles, and directed energy weapons creating complex operational risks. Addressing these issues, ISRO is focusing on Space Situational Awareness (SSA), a comprehensive approach involving observation, analysis, and mitigation, to ensure the safety of its assets and national interests in space.

He highlighted advancements in satellite technology, space-based surveillance, and communication systems critical for enhancing the country's defence capabilities and growth in the sector.

Furthermore, the ISRO Chief discussed the importance of enhancing observation capabilities, underscoring the need for satellites with low revisit times and high refresh rates for military use. Privatisation and the launch of additional satellites were also identified as crucial to strengthening India's strategic posture in space.

He also emphasised the growing use of indigenous components in India's space sector, with rockets now comprising 95% and satellites 60% domestically sourced materials. This shift is supported by stringent mechanisms for thoroughly inspecting any foreign-imported components, ensuring quality and security in all equipment.

These advancements mark a substantial step toward achieving 'Atmanirbharta' (self-reliance) in the space domain. As ISRO advances its SSA initiatives and satellite deployment, it is committed to bolstering both national and global space security through innovation and collaboration, ensuring preparedness against emerging space challenges.

The second special address by Ms Ruchira Kamboj, Former Permanent Representative of India to the UN, was on India's evolving and influential role in shaping today's multilateral world. The lecture covered six important themes: India's historical role as a UN founding member; its tenure on the UN Security Council under the 5S framework articulated by the Hon'ble Prime Minister Narendra Modi; a strong anti-terrorism stance; significant contributions to UN peacekeeping; the call for essential reforms in the UNSC; and India's soft power stance, which supports the Global South through initiatives like yoga, climate-resilient crops, and a commitment to peace and multilateralism.

She highlighted nation's consistent advocacy for reforming global governance structures to make them more representative and equitable. She also underlined India's leadership in addressing pressing global challenges such as climate change, sustainable development, and global health crises, while also championing the rights of developing nations.

She stressed upon the importance of safeguarding India's strategic interests by leveraging its diplomatic clout, actively participating in peacekeeping operations, and fostering global partnerships. Additionally, she pointed to India's push for a permanent seat in the UN Security Council, showcasing its growing stature as a responsible and constructive global actor, committed to promoting a rules-based international order and ensuring the voices of the Global South are heard in shaping future multilateral frameworks.

The second day of Chanakya Defence Dialogue 2024 was structured into three sessions, covering key aspects of comprehensive security, with prominent speakers sharing their insights: -

Session 1: Social Cohesion and Inclusive Growth: Pillars of a Secure Nation.

The session was chaired by Shri RR Swain (IPS), Former DGP, Jammu & Kashmir Police, in his Address, he emphasised the vital link between a secure environment and economic growth, investment and social progress. He shed light on separatist politics, noting that false narratives spread by terrorist factions are part of a "well-oiled machine" aimed at destabilising India through a "battle of narratives."

Swain highlighted the significant improvements in governance over the past decade, emphasising efforts toward equality and fairness across communities without discrimination. Yet, he

acknowledged ongoing challenges, particularly in promoting social growth, countering substance abuse, and dispelling terrorist propaganda that suggests nothing positive can come from the region. These remain critical areas of focus to ensure sustained peace and progress in Jammu and Kashmir.

This session delved into internal security, legal frameworks, and the importance of societal unity. Panelists Dr. Sudhanshu Trivedi (MP), Ms. Meenakshi Lekhi (Former MP and lawyer), and Gen. V K Singh (Retd) discussed how India can strengthen its security structures through enhanced social unity, equitable economic development, and fostering institutional trust. Dr. Trivedi highlighted the role of a cohesive society, emphasising that India's nationalistic spirit bolsters resilience in its armed forces and strengthens individual resolve.

He cited the Kargil War as an example of India's unified approach, in contrast to other nations, and underscored the Agnipath scheme's role in fostering cohesion. Ms. Lekhi spoke to the role of law enforcement and justice as pillars of stability, noting challenges like political interference, resource limitations, and the need for technology enhancements.

Advocating for accountability, equality, and community engagement, she reinforced India's zero-tolerance approach to terrorism, describing state-sponsored activities like the Khalistan movement as serious threats. Gen. V K Singh emphasised the need for synergy across security agencies to prevent fragmented efforts, proposing a framework for convergence that includes timely intelligence integration, resource coordination, and capability building. He highlighted the need for control over false narratives on social media and deliberated upon the internal security as every citizen's responsibility.

The panel collectively underscored that India's security requires a robust integration across social, legal, and defense domains, each reinforcing the other to strengthen India against internal and external threats. The panel also proposed evidence-based policies for equitable resource distribution and inclusive economic growth, addressing disparities and reinforcing national unity. Best practices for reforming law enforcement and judicial systems were discussed, including community-engaged policing, judicial impartiality, and anti-corruption measures to boost public trust.

Strategies for cultivating a shared national identity, enhancing social cohesion through inclusive education, and balancing security with social development were also explored. Finally, the session addressed ways to tackle insurgency and terrorism through socio-economic and political reforms, improve intelligence sharing, and enhance coordination between security agencies.

Session 2: Blurring Frontiers: The Convergence of Technology & Security.

Chaired by Lt Gen Raj Shukla (Retd), this session explored the intersection of technology and security. Panelists Dr. Chintan Vaishnav (NITI Aayog), Brig Gen Eran Ortal (SIGAL Group, Israel), and Mr. Dmitry Stefanovich (IMEMO, Russia) discussed emerging technologies—such as artificial intelligence, quantum computing, IoT, and blockchain—and their role in enhancing security through better threat detection, operational efficiency, and data integrity, while also addressing the new vulnerabilities and ethical challenges they bring. The panel provided evidence-based policy recommendations to strengthen cyber resilience, protect critical infrastructure, and tackle emerging technological threats.

They also examined how to balance technological innovation with strong security measures, and proposed ethical guidelines for AI in security applications, ensuring alignment with societal values and privacy concerns.

Session 3: Groundbreakers: Shaping Land Warfare, Reflections for the Indian Army.

The final session, Chaired by Vice Admiral A B Singh (Retd), examined the Indian Army's integration of advanced technologies to enhance battlefield readiness. Panelists Dr. Konstantin Bogdanov (IMEMO, Russia), Prof. Amit Gupta (University of Illinois, US), and Dr. Patrick Bratton (US Army War College) discussed how emerging technologies - such as artificial intelligence, unmanned systems, cyber warfare tools, and autonomous weapons - can strengthen the Indian Army's capabilities by improving surveillance, precision strikes, and multi-domain operations, while also addressing new vulnerabilities and ethical concerns. The discussion highlighted the dual challenges of rapid technological advancements and evolving security threats, emphasizing the need to balance innovation with strong defense strategies.

The panel explored ways to integrate these technologies into the Army's infrastructure, enhance the resilience of critical military assets, and ensure protection against sophisticated threats. The session also stressed the importance of fostering indigenous defense technologies in line with the Atmanirbhar Bharat initiative, reducing reliance on foreign technologies, and encouraging strategic partnerships between the military, technology experts, and industry leaders to drive innovation and develop responsible solutions for current and future challenges.

In his closing address, Lt Gen N S Raja Subramani, Vice Chief of the Army Staff (VCOAS), highlighted the Indian Army's dedication to a secure and prosperous Bharat, emphasising on critical themes spanning geopolitics, economics, environmental concerns, space, multilateral issues, technology and the shifting dynamics of land warfare.

He emphasised the intrinsic link between economic growth and national security, underscoring the military's central role in a "Whole of Nation" approach to defence. Strategic partnerships with other nations were noted as essential for deterring larger adversaries, with a balanced blend of hard and soft power deemed crucial - acknowledging that soft power alone cannot secure victory in conflicts. He highlighted the India's leadership as a voice for the Global South, calling for reliable and resilient supply chains as vital for stability.

He also stressed the importance of including local communities in border area development, which not only benefits the armed forces but also promotes regional economic and community growth. With the nature of warfare evolving, he concluded by underscoring the importance of training and technological proficiency as essential tools for addressing modern security challenges.

The CDD 2024 served as a landmark platform for strategic thinkers, policymakers, and security specialists to forge resilient frameworks for India's future. Through its diverse discussions, the dialogue fostered collaborative problem-solving and explored solutions that can influence India's strategic direction on National Security and endeavours towards Viksit Bharat @2047.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2068184>



**Press Information Bureau
Government of India**

Ministry of Defence

Fri, 25 Oct 2024

India and Germany Sign Joint Declaration to Boost R&D in Advanced Materials

In a significant step to advance Indo-German cooperation in science and technology, Union Minister Dr. Jitendra Singh and German Federal Minister Ms. Bettina Stark-Watzinger exchanged a Joint Declaration of Intent for cooperation in research and development on advanced materials with commitment to seek mutual dividends.

The exchange, held in the presence of Prime Minister Narendra Modi, underscores both nations' commitment to fostering cutting-edge research that will drive innovation and address global challenges.

The bilateral talks between Dr. Jitendra Singh and Ms. Stark-Watzinger, which took place prior to the Plenary between two Heads of State, were a pivotal part of the Golden Jubilee celebration of Indo-German science and technology collaboration.

During the meeting, Dr. Jitendra Singh expressed gratitude to Ms. Stark-Watzinger for her consistent support in strengthening the Indo-German partnership. He highlighted recent collaborative successes, such as the launch of 2+2 joint projects in areas like "Waste to Wealth" and sustainable packaging, as well as a new call for proposals in AI for Sustainability.

These initiatives, along with the Joint Declaration of Intent, will be presented as key outcomes at the upcoming Indo-German Inter-Governmental Consultations led by the Prime Minister of India and the German Chancellor, said the Minister.

Dr. Jitendra Singh also lauded the Indo-German Science and Technology Centre (IGSTC) for its instrumental role in promoting joint research, having supported over 50 projects and connected young researchers from both nations. Discussions included the recent establishment of the International Research Training Group (IRTG) between IISER Trivandrum and Würzburg University, focusing on photoluminescence in supramolecular matrices, a testament to the advanced, collaborative research being fostered between the two countries.

Additionally, Dr. Jitendra Singh reaffirmed India's commitment to long-term international projects such as the Facility for Antiproton and Ion Research (FAIR) in Darmstadt, where Indian scientists play a key role in advanced materials and particle physics research.

The bilateral discussions also highlighted national initiatives such as India's Anusandhan National Research Foundation (ANRF) and the National Quantum Mission, both aimed at scaling up R&D across priority areas including electric mobility, sustainable agriculture, and advanced materials.

The two Ministers also discussed potential collaboration in hydrogen energy, with Dr. Jitendra Singh noting that India's National Hydrogen Mission could offer promising joint opportunities in R&D, production, and sustainable energy storage.

As the meeting concluded, Dr. Jitendra Singh and Ms. Stark-Watzinger affirmed their commitment to aligning innovation and research efforts across areas such as biotechnology, environmental technology, and healthcare. Both leaders emphasized the importance of fostering academic exchange and talent development, ensuring that the Indo-German partnership continues to drive innovative solutions for a sustainable and resilient global future.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2068197>

THE ECONOMIC TIMES

Sun, 27 Oct 2024

PM Modi, Spanish PM to inaugurate C295 military transport aircraft setup today

Prime Minister Narendra Modi and his Spanish counterpart Pedro Sanchez will inaugurate a new facility in Vadodara on Monday that will produce C295 military transport aircraft. The first private sector facility to build military aircraft in India will get a boost as additional orders are being processed that will bring more work to the Indian defence ecosystem.

Sources said that the facility will produce a total of 52 aircraft - 40 for the Air Force and 12 for the Navy and Coast Guard. The additional order for 15 aircraft for the Navy and Coast Guard - 3 will be bought off the shelf and rest produced in India - has been okayed by the defence ministry and is being processed.

Air Force already has an order for 56 of the military aircraft that was signed in September 2021 for ₹2,1935 crore. Out of these, 40 are to be produced at the Vadodara facility.

Sources said work on production will start this year and first aircraft from the facility will be delivered by 2026. All Air Force aircraft will be delivered by August 2031, as per current plans. Indian manufacturing consortium is led by Tata Advanced Systems in partnership with Airbus Defence and Space SA Spain.

A total of 37 companies have been identified by Airbus as sub-suppliers. Sources said a substantial proportion of components are planned to be manufactured in India.

<https://economictimes.indiatimes.com/news/defence/pm-modi-spanish-pm-to-inaugurate-c295-military-transport-aircraft-setup-today/articleshow/114662804.cms>

Germany and Spain eye P75(I) submarine project

India's decision to host leaders of Germany and Spain on succeeding days is a part of New Delhi's broad strategy for the continent that is focused on niche defence industry collaboration, FDI, mobility of skilled Indians, technology transfer and boosting manufacturing sector in the country amid moves by Europe to diversify from China.

With the aim to create partnerships for stabilizing the Indo-Pacific region both Germany and Spain are lobbying to clinch India's P75(I) submarine project (six advanced submarines equipped with air-independent propulsion (AIP) systems). Chancellor Olaf Scholz and Spanish PM Pedro Sanchez visits were aimed at impressing New Delhi about the quality and lethality of respective submarines.

While Germany's ThyssenKrupp Marine Systems (TKMS) has partnered with Mazagon Docks Limited for the P75(I) submarine project, Spanish firm Navantia has partnered with L&T to compete for the same project. The Spanish PM visit will be marked by the inauguration of the Tata Advanced Systems Ltd's (TASL's) final assembly line facility for the Airbus C295 aircraft in Vadodara on Monday.

India is looking to boost its submarine fleet to create deterrence amid China's long-term strategic outreach for the Indo-Pacific region. From Europe France, Germany and Spain are keen to be India's preferred partners in this endeavour. While the Indian Navy operates four Shishumar-class submarines, which are based on the Type 209 submarines designed by Howaldtswerke-Deutsche Werft (HDW) of Germany, India purchased six Scorpene-class submarines from France. In 2023 the Indian government approved the purchase of three more Scorpene-class submarines.

Key European economies are increasingly looking towards India as the world's biggest democracy presents a huge opportunity as they seek to diversify from China, an expert on Indo-European affairs explained. Even as the Indo-German defence industry partnership takes shape, New Delhi-Berlin ties built around an industrial and manufacturing collaboration got a big boost last week.

It is in this context Prime Minister Modi addressing the Asia-Pacific Conference of German Businesses here on Friday stated, "This is the right time to join India's growth story. When India's dynamism meets Germany's precision, when Germany's engineering meets India's innovation, when Germany's technology combines with India's talent, a brighter future is envisioned for the Indo-Pacific region and the world."

German Chancellor Olaf Scholz also addressed the conference and asserted that China should now give up the special treatment it has received as a developing country. Germany is increasingly becoming an attractive destination for Indians seeking higher education in the fields of technology as well as jobs in the skilled workforce category.

There has been a significant rise in the number of qualified and highly skilled Indian professionals in the fields of IT, banking and finance sectors in Germany. The agreements and declarations announced during the German chancellor's visit are aimed at increasing the skilled Indian workforce in Germany, increasing German investments in India to boost manufacturing, expanding skill training projects, and sharing technology for joint production under the Make in India.

Germany, Europe's economic power house, is among top 10 investors in India. Few would have noticed that Spain has a healthy growth rate and is the 16th largest investor in India with cumulative FDI stock of US\$ 3.94 billion (April 2000 - December 2023). Among other issues on the Indo-Spanish agenda is railway sector cooperation.

Spanish Railway firm Talgo which is involved in High-Speed Rail is keen to establish itself in the Indian market. Talgo is running successful projects in Saudi Arabia, Morocco and Uzbekistan. Spain is poised to be among India's key partners for the Mediterranean region where India is increasing its outreach. Indian investments in Spain are around US\$ 900 million. There are about 80 Indian companies in Spain mainly in software & IT services, pharmaceuticals, chemicals and logistics. India is among the top 30 investors in Spain globally and among the top 5 from Asia.

<https://economictimes.indiatimes.com/news/defence/germany-and-spain-eye-p75i-submarine-project/articleshow/114662403.cms>



Sat, 26 Oct 2024

China says disengagement of troops going on 'smoothly' in Depsang and Demchok

China has said that the disengagement of troops in eastern Ladakh by the Chinese and Indian armies is going on "smoothly" following a recent agreement between the two nations.

On October 23, 2024, Prime Minister Narendra Modi and Chinese President Xi Jinping endorsed the agreement on patrolling and disengagement along the LAC in eastern Ladakh during their bilateral meeting on the sidelines of the BRICS Summit in Kazan, Russia.

"In accordance with the resolutions that China and India reached recently on issues concerning the border area, the Chinese and Indian frontier troops are engaged in relevant work, which is going smoothly at the moment," Chinese Foreign Ministry spokesperson Lin Jian told a media briefing in Beijing on Friday (October 25, 2024).

India announced the agreement to pull back troops from the friction points on October 21 and China confirmed a day later saying the two sides have reached "resolutions on relevant matters" and Beijing will work with New Delhi to implement these resolutions. "Following the agreement, the two countries have begun troop disengagement at the two friction points at Demchok and Depsang Plains in eastern Ladakh and this process is likely to be completed by October 28-29," Indian Army sources said on Friday (October 25, 2024).

“The agreement was arrived at only for these two friction points, and “talks are still underway” for other areas,” they said.

The sources said that patrolling will begin at these points once the disengagement that began two days back is completed and both sides will move their respective troops and dismantle temporary structures. Eventually, they added, the areas and patrolling status are expected to be moved back to the pre-April 2020 level.

Over the borderline: On the India-China deal

The ties between the two Asian giants nosedived following a fierce clash in the Galwan Valley in June 2020 that marked the most serious military conflict between the two sides in decades. Foreign Secretary Vikram Misri said on Monday (October 21, 2024) in New Delhi that the agreement was finalised following negotiations over the past several weeks and that it would lead to a resolution of the issues that arose in 2020.

<https://www.thehindu.com/news/international/china-says-disengagement-of-troops-going-on-smoothly-in-ladakhs-depsang-demchok/article68798979.ece>

THE ECONOMIC TIMES

Sat, 26 Oct 2024

India and Germany good partners, both regionally rooted but globally committed: Rear Admiral Helge Risch

India and Germany are both democratic countries, good partners and are regionally rooted but globally committed, Rear Admiral Helge Risch of the key European nation's Navy said on Saturday. Risch, the commander of the Task Force Group, was talking to reporters on board frigate FGS BadenWurtemberg in Vasco in Goa. The German frigate is currently at Mormugao Port in south Goa as a part of its Indo-Pacific deployment which began on May 7.

"We are both democratic countries. We share a lot of values, we share a lot of interests. Both countries are regionally rooted but globally committed. This is the trigger for closer cooperation between India and Germany," the rear admiral said. Speaking about the joint naval exercise, he said the aim was to establish friendship and partnership between the two nations and its navies.

"We will see future exercises but I cannot speak about any concrete plans at the moment. Maybe this was something our governments discussed (in New Delhi)," he said in a reference to the meeting between Prime Minister Narendra Modi and German Chancellor Olaf Scholz in the national capital. Modi met Scholz on Friday and discussed a wide range of issues focused on bolstering bilateral strategic ties.

The German chancellor arrived in India on Thursday on a three-day visit. Rear Admiral Risch said as part of the IndoPacific deployment, the German Navy had partnering exercises with several countries in the Americas and Asia. The German Navy is here because India is one of the biggest

democracies in the world and a good partner in the region, he added. Both have a common aim of making the world a safer place, the German rear admiral said.

The two nations will become even more important partners in the region because "we are committed to the same values", he emphasised.

"We had some good exercises, first at the Eastern Naval command and then over the last few days at the western coast. The exercises were executed in a very professional manner. I am very impressed with the spirit of the Indian sailors and their professional knowledge," Risch said.

<https://economictimes.indiatimes.com/news/defence/india-and-germany-good-partners-both-regionally-rooted-but-globally-committed-rear-admiral-helge-risch/articleshow/114617878.cms>

THE ECONOMIC TIMES

Fri, 25 Oct 2024

Germany looks to strengthen defence, military ties with India

German Chancellor Olaf Scholz said on Friday he wanted to deepen defence ties with New Delhi and bring the two countries' militaries closer, in comments following a meeting with Indian Prime Minister Narendra Modi. Germany, which has not traditionally had close defence ties with India, is now pitching to join the latter's effort to wean its arms base from decades of dependence on Russia, at a time when the West seeks to counter China's growing influence.

"Our overall message is clear, we need more co-operation, not less," Scholz said.

"At our inter-governmental consultations with India, we also want to deepen co-operation in defence and agree to bring our militaries together." Scholz, accompanied by most of his cabinet, is leading a high-level delegation to New Delhi, betting that greater access to the vast Indian market can reduce Germany's reliance on China.

German Thyssenkrupp is one of two bidders that have partnered with Indian firms to build six conventional submarines in India, in a deal estimated to be worth \$5 billion. The Indian Navy is expected to pick between the German company or Spain's Navantia soon. Scholz reiterated his economy minister's comments on pushing for swift progress on talks for a free-trade pact between India and the European Union.

Earlier, Trade Minister Piyush Goyal warned that India would be unable to strike such a deal if the bloc insisted on getting access to the Asian giant's dairy industry. The two sides initially aimed to wrap up talks on the pact by the end of 2023, but progress has been slow, with India blaming the EU for what it called "irrational" standards as one reason.

A trade deal could be concluded swiftly if sensitivities were respected on both sides, Goyal told the Asia-Pacific conference of German business in the Indian capital, attended by German Economy Minister Robert Habeck.

On Thursday, Habeck had said agriculture was the "most problematic" area in the deal talks, suggesting it would be better if the two sides focused first on the industrial sector.

<https://economictimes.indiatimes.com/news/defence/germany-looks-to-strengthen-defence-military-ties-with-india/articleshow/114577424.cms>



Sun, 27 Oct 2024

Indian Navy's 262 indigenous projects under advance stage

The Indian Navy's institutional approach towards the indigenisation and innovation is bearing fruits with more than 250 projects covering the design and development areas. This holds significance in keeping the supply chain issues plaguing the country's several military projects.

Sources told TNIE, "262 projects in the field of design and development are at various stages of staff evaluation, of which 171 projects have been contracted under iDEX (Innovation for Defence Excellence) scheme."

Also, the recently concluded DefConnect 4.0 saw a financial commitment of 132.5 crore to the Indian Navy's innovation efforts in a single launch of problem statements. Major equipment under indigenisation through 97 projects of TDF, Make and Revenue routes are accounting for about 850 crore, added source.

iDEX platform, under the aegis of the Department of Defence Production (DDP), Ministry of Defence, was launched in 2018. It aims to foster innovation & technology development in defence and aerospace by engaging innovators & entrepreneurs to deliver technologically advanced solutions for modernising the Indian Military.

The Technology Development Fund (TDF) scheme is a flagship programme of the Ministry of Defence executed by DRDO under 'Make in India' initiative. The DefConnect is an event organised by iDEX bringing together the start-ups and the multifarious stakeholders: armed forces, innovators, start-ups, and industry leaders. The event aims to showcase cutting-edge technologies and foster collaboration among the stakeholders.

Indian Navy has been at the forefront since 1965 in focusing towards indigenisation of the design, and development as the leadership, said the sources believes in a robust indigenous industry which is crucial for sustaining an omnipresent blue-water force that the Indian Navy has evolved into.

"Disruption of global supply chains due to isolated conflicts and amorphous shift of geo-political alliances has served as a stark reminder, time and again of the need to be self-reliant from system-level down to the most singular component-level."

With changing dimensions of war, the cost of technology denial can be crippling. "Importing technology is not a sustainable option for a rising global force such as the Indian Navy, which is already a preferred security partner in the Indian Ocean Region.",

In order to remain a modern and combat-ready force, the Indian Navy has committed to be 100% self-reliant by pursuing indigenisation activities from component level upwards; and leapfrogging technology through various avenues. The approach of the Indian Navy encompasses the potential of the Indian Industry.

The Indian shipbuilding industry has come of age "with 63 out of 65 IN Ships under construction presently being built at Indian shipyards turning the Indian Navy into a Builder's Navy.

Talking about the overall growth in this regard, about 90, 60 and 50 % of indigenous content has been achieved in the aspects of Float, Move and Fight categories, respectively, sources added.

The float part includes Hull and its related fittings and components, Move includes the engine and whatever makes it move, Complete propulsions systems, associated machinery and auxiliaries. Fight, includes, sensors and weapons. The Indian Navy is now focussing its indigenisation efforts in the domains of propulsion, power generation, weapons and sensors.

The Indigenisation Units (IUs) at Visakhapatnam for ENC & ANC; and at Mumbai for WNC under the umbrella of Centre for Indigenisation & Self Reliance (CISR) at Coimbatore lead the 'bottom-up' approach of Indigenisation, catering to the indigenisation needs of field units. CISR has also reached out to and engaged with more than 30 industries to map their capability for specific indigenisation needs.

A dedicated indigenisation Roll-on Plan for 2023-26 is in force for progressing indigenisation of assembly, sub-assembly and components.

Under the Year On Year Roll-on Plans, about 5000 items have been indigenised so far. The indigenisation roadmaps for the foreign-origin IN Ships Vikramaditya, Talwar Class frigates, P-75 Scorpene submarines and Deepak - class tankers are already in place and progressing to replace the foreign-origin equipment on these platforms with Indian-made equipment over the next few years.

Combined with the sustained impetus on increasing the indigenous content in ships under construction; and the design and construction of ships within India, the shipbuilding industry is well poised to support the Indian Navy.

Over 9000 applications that the Armed Forces received for iDEX challenges, specifically from start-ups and MSME amply proves that there is growth in the defence eco-system.

With the IN expecting to ramp up the indigenous content across platforms, the items on the government's Positive Indigenisation Lists (PIL), items uploaded on the Srijan Portal, and those listed in the Indian Navy's Swavlamban document are markers for the industry to take up and contribute to defence production.

Also, in the process, the Indian Navy's Naval Innovation and Indigenisation Organisation (NIIO) Seminar, Swavlamban is scheduled on 28 and 29 October in New Delhi.

It is the 3rd edition, with the Indian Navy receiving more than 2000 proposals from the Indian industry that have been converted into 155 challenges to facilitate the development of prototypes. This initiative has enabled collaboration with more than 200 MSMEs/ Startups under the iDEX Scheme.

This year's edition has been expanded to include the achievements of sister services and CAPFs as well, fostering a wholesome defence innovation and indigenous collaborative ecosystem.

<https://www.newindianexpress.com/nation/2024/Oct/28/complicated-registration-process-on-nmr-portal-causing-headache-to-doctors>

THE TIMES OF INDIA

Mon, 28 Oct 2024

US, France & Armenia top three buyers of Indian defence exports

With India shedding its hesitations in exporting lethal arms to other countries, Armenia has emerged as its biggest client of 'finished' weapon systems like Akash air defence missile systems, Pinaka multi-launch rocket systems and 155mm artillery guns, among others.

The US, France and Armenia ranked as the top three destinations for defence exports by India, which chalked up military sales worth Rs 21,083 crore (\$2.6 billion) to other countries in 2023-24, official sources said on Sunday. Indian public and private sector companies are now exporting a wide range of arms, ammunition and fuses to around 100 countries, which also include some complete weapon systems and platforms like supersonic cruise missiles, Dornier-228 aircraft, artillery guns, radars, Akash missiles, Pinaka rockets, and armoured vehicles, the sources added.

The exports to the US, however, mainly consist of sub-systems and components, which include global defence majors like Boeing and Lockheed Martin sourcing fuselage, wings, and other parts of aircraft and helicopters from India as part of their global supply chain networks as well as offset commitments.

The Tata Boeing Aerospace venture in Hyderabad, for instance, is making the fuselage and secondary structures for Apache attack helicopters. "France, in turn, is importing a lot of software and electronic equipment," a source said.

The former Soviet Republic of Armenia, on its part, has inked a flurry of deals with India over the last four years for import of 'finished products' like missiles, artillery guns, rocket systems, weapon-locating radars, bullet-proof vests, and night-vision equipment as well as a wide variety of ammunition and artillery shells. Some of these deals were inked even during Armenia's clash with Azerbaijan — which has close ties with Turkey and Pakistan — over Nagorno-Karabakh, as reported by TOI earlier.

Armenia has become the first foreign customer for the indigenously-developed Akash air defence missiles, which have an interception range of 25 km, while other countries like Brazil are even keen on co-production and co-development of advanced versions of the system.

"Brazil wants an intergovernmental agreement on it...talks are underway," another source said. Similarly, after India clinched the \$375-million contract in Jan 2022 for the export of three

BrahMos anti-ship coastal missile batteries to the Philippines, other Asean countries as well as some Gulf nations are increasingly showing interest in acquiring the precision-strike missiles that India has co-developed with Russia. India, of course, continues to remain in the strategically-vulnerable position of being the world's largest arms importer, accounting for 9.8% of the total global imports in the 2019-2023 time-frame.

The country, however, is now progressively expanding its domestic defence-industrial base (DIB) and banning import of some weapon systems under the drive for 'Aatmanirbharta' (self-reliance) or 'Make in India', while aggressively pushing arms exports.

With India's annual defence production reaching a record high of Rs 1.2 lakh crore in 2023-24, the govt has set an ambitious target for it to touch Rs 3 lakh crore by 2028-29, along with arms exports of Rs 50,000 crore.

India's defence-industrial base, apart from the 16 defence PSUs, has now expanded to over 430 licenced companies and 16,000 MSMEs, with around three times increase in value of production since 2014-15. The private sector's contribution amounts to 21% in this, the official sources said.

<https://timesofindia.indiatimes.com/india/us-france-armenia-top-three-buyers-of-indian-defence-exports/articleshow/114666748.cms>

THE ECONOMIC TIMES

Fri, 25 Oct 2024

India-Bangladesh border talks postponed

The DG-level border talks between India and Bangladesh, scheduled to be held in Delhi next month, have been postponed following a change in plan by the neighbouring country, official sources said on Friday. The bi-annual talks led by the heads of the Border Security Force (BSF) and its Bangladeshi counterpart the Border Guard Bangladesh (BGB) were to be tentatively held between November 18 and 22 in the national capital, the first such meeting after the collapse of the Sheikh Hasina government on August 5.

Sources told PTI that the Bangladeshi side informed about the postponement and indicated that they were working on "an early date" for the meeting to be held. Overall, it will be the 55th edition of the Director General (DG)-level talks between the two forces that also includes officials from the home and external affairs ministries, and anti-narcotics, Customs and some other federal agencies from both the countries that have a stake in border management.

The last edition of these talks were held in Dhaka in March. The BSF guards a 4,096-kilometre-long international front with Bangladesh on India's eastern side.

The sources had earlier said the next meeting, whenever it took place, was expected to be held on the traditional issues and subjects related to "comprehensive" border management, curbing cross-border crimes and mutual coordination in sharing real-time intelligence along the front.

The recent developments in Bangladesh "may guide the contours" of the discussions, they had said. An interim government led by 84-year-old Nobel laureate Muhammad Yunus is in charge of affairs in Bangladesh at present. "Overall, the situation is under control along the India-Bangladesh border.

There is good connect with our counterparts post the August 5 developments in Bangladesh. However, the field units are on alert mode since that day," a senior BSF officer posted along the frontline said.

A home ministry official said a comprehensive review of this border was recently undertaken at the ministry level and the situation was stated to be "satisfactory". Some friction points were noted during this review meeting that was chaired by Union Home Secretary Govind Mohan and the BSF, Customs and immigration authorities deployed along the front were asked to be "ruthless" against illegal infiltration and cross-border crimes, the official said.

At the same time, they have been directed to ensure all humanitarian assistance, like always, in genuine cases, the ministry official added. The DG-level border talks were held annually between 1975 and 1992 but made bi-annual in 1993 with either side alternatively travelling to the respective national capitals of New Delhi and Dhaka.

<https://economictimes.indiatimes.com/news/defence/india-bangladesh-border-talks-postponed/articleshow/114579047.cms>

THEWEEK

Sun, 27 Oct 2024

What are M61 Vulcan cannons, Israel's solution to destroy Hezbollah's Iranian drones in northern borders?

Israel has decided to equip its military with the Gatlin-style M61 Vulcan cannons on its northern borders to counter drone strikes from its foes. These rotary cannons have been the go-to weapon of the United States's fixed-wing aircraft for over half a century. Lebanon and Syria are located to the north of Israel and Iran-backed Hezbollah has been at war with the Israel Defense Force (IDF) for many months now.

M61 Vulcan cannons were used by the US Army in Vietnam, Iraq and in Afghanistan, amongst other wars. The IDF and Israeli Air Force used it during the first Lebanon War (1982). However, Washington first sent the giant cannons to Israel during the Yom Kippur War of 1973. In the first decade of the twenty-first century, Israel tasked its Air Force with the responsibility of storing the M61 Vulcans, the Jerusalem Post said in a report while confirming its deployment in the northern borders.

Gatling guns and the M61

According to the National Museum of the US Air Force website, the M61A1 Vulcan cannon is a Gatling six-barrel 20mm weapon that can shoot some 6,000 rounds per minute. As the name indicates, a Gatling gun is a machine gun that has many barrels that fire bullets by turning the barrels in circles. It was first used by the Union Army during the American Civil War.

Vulcan cannon can be loaded with target practice, armour piercing, or high explosive incendiary rounds. M61A1 cannons can be driven electrically, hydraulically or by a ram-air engine. Simply put, it fires by the power of electricity and is cooled by air.

Some history

In June 1946, the General Electric Company was awarded the contract for "Project Vulcan". Out of the thirty-three model C T45 guns delivered in 1952, the T171 20mm gun was selected for further development. In 1956 the T171 20mm gun was standardized by the U.S. Army and U.S. Air Force as the M61 20mm Vulcan aircraft gun. In service since the 1950s, the US used to equip its fighter aircraft including the F-104, F-15 and F-16 with these cannons, the NMUSAF website added. It is often referred to as the main gun for all fixed-wing aircraft of the US military since the late 1960s.

M61 and M61A1

The initially developed M61 versions used linked, belted ammunition. However, it was soon discovered that they were prone to "misfeed" and presenting a foreign-object damage hazard with discarded links. Thus, the M61s were replaced by the M61A1 variants. The Dutch Aviation Society said in a report that M61A1 uses a linkless ammunition feed system, unlike its predecessor. Each of the gun's six barrels fires only once during each revolution of the barrel cluster. The six rotating barrels contribute to long weapon life by minimizing barrel erosion and heat generation.

Toyota Prius with a 20mm M61 Vulcan cannon.

The M61 Vulcan fires 4,000 to 6,000 rounds per minute, costing up to \$180,000 per minute due to \$27 per round. The M61 Vulcans are mobile and can be mounted on vehicles as well, making it easier for the IDF to use it at multiple warfromnts.

<https://www.theweek.in/news/defence/2024/10/27/what-are-m61-vulcan-cannons-israel-s-solution-to-destroy-hezbollah-s-iranian-drones-in-northern-borders.html>

THEWEEK

Fri, 25 Oct 2024

Solar hydrogen-based microgrid to power Indian Army's off-grid locations in Ladakh

The Indian Army is setting up a solar hydrogen-based microgrid at Chushul of Ladakh in partnership with PSU NTPC to provide a stable power supply in off-grid Army locations.

Defence Minister Rajnath Singh laid the foundation stone for the project, which is set to support soldiers stationed in these strategically significant, but tough terrains in challenging climatic conditions.

The system will replace existing diesel generator sets at off-grid Army locations, providing a sustainable power supply despite harsh winter conditions, NTPC said in a release and added that it will offer a stable power supply under adverse conditions.

The microgrid, which is highly scalable and suitable for various applications, will ensure reduced carbon emissions and promote cleaner and sustainable energy ecosystem.

According to NTPC, the system combines the reliability of battery storage with the extended energy storage capability of hydrogen, thereby making sure that there is a consistent power supply in these adverse terrains.

"Given Ladakh's high solar irradiance and low temperatures, this project will facilitate the production and utilisation of green energy, eliminating reliance on fuel logistics and enhancing self-sufficiency in remote areas affected by road connectivity disruptions," NTPC said in a release.

Once operational, it would usher in a new era of decarbonisation of the defence sector far off the Himalayas, NTPC added.

<https://www.theweek.in/news/defence/2024/10/25/solar-hydrogen-based-microgrid-to-power-indian-armys-off-grid-locations-in-ladakh.html>



Fri, 25 Oct 2024

Robotic technology promises to speed shipbuilding and repair work

Technology that mates robotics, sensors, and artificial intelligence (AI) is being used to speed repairs and new construction work on aircraft carriers, submarines, and surface ships as the US Navy (USN) tries to reduce the backlog in ship-work programmes.

Gecko Robotics outfits different types of mobile robotic structures with especially developed and modified acoustic and optical sensors and cameras to provide a data-rich representation of ship structures to a degree and depth the navy has not had before and then uses AI to process and analyse that data and offer the navy recommendations on how to improve repair work or construction, according to the company.

"And what we're really trying to do is to be predicative," Jake Loosarian, Gecko Robotics cofounder and CEO, told Janes in a 19 September interview.

The USN has found the Gecko Robotics technology worthwhile. The company estimates its work for the service's surface fleet has increased about 400% since last calendar year.

Gecko Robotics also told Janes that it finished a robotic investigation and analysis of a carrier flight deck in mid-October.

The company recently secured a contract to do similar work for new submarine construction, and the company also has a pending USD75 million indefinite delivery/indefinite quantity (ID/IQ) contract for automated vessel inspection and maintenance, which is being delayed due to US government administrative hurdles.

The submarine work comes at a time when submarine builder HII has acknowledged the discovery of failures to follow proper welding procedures at its Newport News Shipbuilding yard. Gecko Robotics notes its technology can be used to check on welding quality assurance.

<https://www.janes.com/osint-insights/defence-news/sea/robotic-technology-promises-to-speed-shipbuilding-and-repair-work>



Fri, 25 Oct 2024

China expands DF-26 launcher inventory

Umbra synthetic aperture radar (SAR) imagery captured at 1045L on 9 September 2024 shows that 59 DF-26 intermediate-range ballistic missile (IRBM) transporter-erector-launchers (TELs) remain parked in a new staging area at the Beijing Xinghang Electromechanical Equipment Factory.

Commercial imagery throughout 2023–24 suggests the factory has assembled at least 72 DF-26 TELs since the last batch was delivered to the People's Liberation Army Rocket Force (PLARF) in 2020–21. The number of TELs identified in 2024 could constitute up to two full 36 TEL brigades. The US Department of Defense (DoD) 2023 China Military Power Report, which was published in October covering developments to the end of 2022, noted that China has continued to increase its DF-26 inventory, estimating that the PLARF had reached 250 IRBM launchers.

The Federation of American Scientists noted that the DoD figure likely includes TELs identified at the Beijing-based factory. However, monthly imagery observations in 2022 from multiple providers indicate there was likely insufficient visible DF-26 assembly activity that would have significantly impacted the Pentagon's estimate. Throughout most of the year, a singular DF-26 TEL was observed in a handling area, parked with a mobile crane and a possible dummy missile load.

This suggests that the DoD's reported DF-26 number likely reflects launchers estimated to be assigned to active units. Janes assesses that there are at least seven brigades that operate the DF-26, according to satellite imagery and handheld photography analysis.

<https://www.janes.com/osint-insights/defence-news/defence/china-expands-df-26-launcher-inventory>

Nemesis Of US Navy, Chinese Hypersonic Missiles Pose Massive Threat To Its Warships; USN Devices Plan To Counter Them

The United States is mulling the deployment of Patriot interceptors to thwart a potential Chinese hypersonic missile attack. Two unnamed senior defense officials revealed that the US Navy could equip some of its ships with Patriot interceptor missiles due to concerns that China could use hypersonic weapons to sink American ships in the Pacific, according to Reuters.

The Lockheed Martin-manufactured Patriot Advanced Capability-3 Missile Segment Enhancement (PAC-3 MSE) interceptors are mainly used by the Army in the United States. An unnamed industry official cited by the publication stated that their deployment aboard Navy ships is being contemplated due to the threat posed by China's rapid strides in developing highly maneuverable hypersonic weapons. The integration of the Lockheed Martin-made air defenses comes amid simmering tension in the Indo-Pacific region, specifically in the Taiwan Strait and the contested South China Sea. An escalation at either of these two hotspots could lead to a direct military confrontation between China and the United States.

Aware of these possible contingencies, the US has strengthened its defenses across the expansive Indo-Pacific region. The recent initiative, if confirmed, could be a part of that larger effort. However, the Pentagon has not taken cognizance of these reports. Further, the potential deployment of PAC-3 MSE comes in the wake of the combat efficacy demonstrated by the Patriot missile defense system in Ukraine against the Russian hypersonic 'Kinzhal' missile, which Russian President Vladimir Putin previously projected as 'invincible.'

The Patriots have reportedly downed multiple Kinzhal missiles since the missile defense batteries were handed over to Kyiv. Hypersonic missiles are harder to intercept as they travel at least five times the speed of sound and follow an unpredictable trajectory. China, for one, has emerged as a world leader in hypersonic capabilities—resulting in a significant shift in the balance of power.

Beijing has fielded an array of hypersonic weapons—including the YJ-21—an anti-ship hypersonic missile in service with the People's Liberation Army Navy (PLAN). The YJ-21 can be launched from Chinese destroyers like the Type 055 and the PLA Air Force's (PLAAF) H-6 bombers. According to experts, anti-ship missiles are key to China's A2/AD (anti-access/area-denial) capabilities. In the event of a regional confrontation, these missiles can provide the PLA with a "home advantage" and keep adversary navies out of contested waters off the coast of China.

Top US commanders believe that China's anti-ship hypersonic missiles are more deadly since they can hit moving targets. During the terminal phase of flight, they can hit large warships because of their dynamic maneuvering ability during re-entry. China has indirectly boasted its hypersonic capabilities, sending a clear message to the United States. For instance, Chinese researchers

asserted that a US carrier group could be “certainly” destroyed by Chinese hypersonic missiles in a paper published in a Chinese journal in May 2023.

Additionally, several pieces of literature and special media propaganda posts have been published stating that Chinese hypersonic weapons can penetrate the most advanced air defense systems in the world. Besides the road-mobile DF-17 and the YJ-21 anti-ship missiles, China has now developed a very long-range missile called ‘DF-27’ that can fly as far as Hawaii and strike US aircraft carriers.

Patriots Against Hypersonic Missiles

While the US does not currently have any credible defense against hypersonic missiles, it is working on the development of the Glide Phase Interceptor (GPI) missile in collaboration with Japan. The GPI has been envisioned as a cutting-edge interceptor that would take down the hypersonic missile in its glide phase.

Currently, it is not known whether the deployment of Patriot interceptors aboard ships is an interim measure until the US fields potent hypersonic missile interceptors. The Patriot Advanced Capability 3 (PAC-3) Missile Segment Enhancement (MSE) is a high-velocity hit-to-kill, surface-to-air missile that can intercept unmanned aerial systems, cruise missiles, air-breathing threats, and tactical ballistic missiles.

The US Navy believes integrating Patriot interceptors might add another high-probability layer that has yet to be tested against hypersonic weapons. The US Navy told Reuters that “more testing is required in the development roadmap that will include launching PAC-3 MSE from a ship and validating communication with the SPY-1 radar,” the main sensor in the Aegis missile system.

The Aegis missile system is an integrated naval weapons system that tracks and directs weapons to attack enemy targets using radars and computers. It is used aboard Arleigh-Burke class destroyers, Ticonderoga-class Cruisers, and Constellation-class frigates. The Reuters report further stated that the PAC-3 has a shorter range than other anti-ship cruise missiles like the SM-6. However, a missile defense program director with direct knowledge of the Aegis system told the publication, “Steering rockets near the nose make it more agile, and destruction of the threat is more likely because of its “hit to kill” concept, in which the interceptor strikes the target rather than explode near it, said a missile defense program director with direct knowledge of the Aegis system.”

When confronted with cutting-edge Chinese weapons, such as hypersonic glide vehicle warheads, those capabilities “supplement the existing missiles on a US ship very well” by making it easier to shoot and destroy fast-moving, high-speed ballistic missiles, according to the program director. Moreover, a Patriot missile system’s PAC-3 interceptor, which the US Army and its allies mostly use for air defense on land, was tested on a “virtual Aegis ship” in May 2024, utilizing a Mk. 70 vertical launcher. However, it has not yet been installed on a navy vessel. At the time, Tom Copeman, Lockheed Martin’s strategy and naval programs vice president and a former surface warfare officer, said in a statement: “These systems could deliver a proven, Integrated Air and Missile Defense (IAMD) capability with growing capacity to the US to help defend against advanced, maneuverable threats.”

Moreover, Lockheed Martin also said that it “validated” the PAC-3 MSE’s communication capabilities with an AN/SPY-1-series radar via Aegis in June 2023. This essentially indicates that the PAC-3 MSE would greatly bolster the defense of US Navy vessels when it is finally integrated. While it is unclear how many of these interceptors the US Navy would need, the demand for the missile has been skyrocketing recently. The United States has tapped Japan, a crucial ally, as a site for joint production of the missiles, and the Pentagon is reportedly working with all stakeholders to increase production.

<https://www.eurasiantimes.com/us-ships-will-be-armed-with-patriot/>

Science & Technology News



Press Information Bureau
Government of India

Ministry of Science & Technology

Fri, 25 Oct 2024

Innovative and affordable self-powered smart windows developed by Bengaluru Researchers

Groundbreaking studies have led to novel smart window technologies which do not require external electrical energy for their operational needs, hence enhancing their energy efficiency and functionality.

Existing electrochromic smart windows technology requires external power for its operational needs. It is limited to changing colour from transparent to blue and vice versa (switching optical transparency functionality) upon application of an electrical stimulus and blocks both visible and near-infrared radiation, leading to a decrease in the room temperature. Moreover, the cost of electrochromic smart windows is unaffordable to many due to the expensive process and materials involved in it.

Researchers led by Dr. Ashutosh K. Singh at the Centre for Nano and Soft Matter Sciences (CeNS), an autonomous institute under the Department of Science & Technology (DST), Government of India, have addressed this through two studies.

In one of them they have removed the dependency of electrochromic devices on external electrical power for their operational needs. In the second one, they have made the fabrication process more affordable.

The resulting self-powered electrochromic smart window operates through the power stored in its switching operation from transparent to coloured states. This enhances the operational energy efficiency, affordability and energy storage functionality of the new smart windows technology.

The DST is supporting this technology under the "Advanced Materials Technology (AMT)" program for developing Affordable Electrochromic Windows technology in India.

In the first work, the CeNS team has developed a device that can store electrical energy by changing colour upon the application of a small electrical stimulus generated through electrochemical reactions taking place within the device itself resulting from the device configuration. Technically this device is called Redox Potential-Based Self-Powered Electrochromic (RP-SPEC) device and is popularly known as the self-powered smart windows.

In its coloured state, the device blocks both visible and near-infrared (NIR) parts of the electromagnetic spectrum, that significantly leads to a decrease in the room temperature and reducing power consumption.

The device utilizes tungsten oxide (WO₃) EC film, vanadium-doped nickel oxide (V-NiO) as the ion storage film, and aluminium as the anode, all coated on a single tin-doped indium oxide (ITO) sheet. This design eliminates the need for an ITO-based counter electrode, making the device cost-effective.

The RP-SPEC smart windows demonstrate a very opaque state and high transmittance modulation of 88% at a 550 nm wavelength. The device retains its switching ability over two thousand cycles and operates by connecting the EC film with an aluminium electrode. During coloring and bleaching, the device generates voltages of 1.1 and 1.2 V, respectively, and 1.7 V between the Al and V-NiO films. The use of Al³⁺-based electrolytes instead of Li⁺ further reduces costs. This work, carried out by Dr. Ashutosh K. Singh and his co-workers, was recently published in the journal 'Small'.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2068162>



Press Information Bureau
Government of India

Ministry of Science & Technology

Sat, 26 Oct 2024

India will have its own Space Station by 2035, which will be known as "Bharatiya Antriksh Station"

India will have its own Space Station by 2035, which will be known as "Bharatiya Antriksh Station".

This was disclosed here today by Union Minister of State (Independent Charge) for Science and Technology, Minister of State (Independent Charge) for Earth Sciences, MoS PMO, Department of

Atomic Energy, Department of Space, Personnel, Public Grievances and Pensions, Dr Jitendra Singh while responding to a query from a media person after he announced the signing of a landmark Memorandum of Understanding (MoU) between the Indian Space Research Organisation (ISRO) and the Department of Biotechnology (DBT).

In a significant development, the MoU marks a unique collaboration aimed to integrate biotechnology with space technology, heralding a new era of scientific innovation in India.

Dr. Jitendra Singh highlighted the transformative journey of biotechnology, which has traditionally been confined to laboratories, now reaching the vast expanse of space. He emphasised that this MoU represents a pivotal step towards practical applications of biotechnology, moving beyond theoretical research.

The Minister praised ISRO Chairman S. Somnath and Secretary of the Department of Biotechnology Dr. Rajesh Gokhale for their efforts in making this collaboration possible. He noted the historical journey of both departments and the visionary leadership that has driven their success.

Dr. Jitendra Singh emphasised on public-private participation, which has been instrumental in the rapid growth of India's space sector. He credited Prime Minister Narendra Modi for opening up the space sector to private players, leading to a surge in innovation and entrepreneurship. The minister pointed out that the number of space startups has grown significantly, with nearly 300 startups now contributing to the space economy.

Dr. Jitendra Singh also spoke about the rising prominence of biotechnology, particularly in the wake of the COVID-19 pandemic. He acknowledged the Department of Biotechnology's role in developing the first-ever DNA vaccine, which brought global recognition to India's scientific capabilities.

The MoU outlines several key initiatives, including the establishment of a Bharatiya Antariksh Station and the unveiling of the BioE3 (Biotechnology for Economy, Environment, and Employment) Policy. This policy aims to foster high-performance biomanufacturing in the country, with a goal of reaching a \$300 billion bioeconomy by 2030. The collaboration will focus on areas such as microgravity research, space biotechnology, space biomanufacturing, bioastronautics, and space biology.

This partnership is expected to benefit the national human space programme and spur innovations in human health research, novel pharmaceuticals, regenerative medicine, and bio-based technologies for efficient waste management and recycling. It will also open opportunities for startups in the space and biotechnology sectors to develop commercially attractive technological solutions.

Concluding his address, Dr. Jitendra Singh expressed optimism about the future, envisioning a new era of bio-astronautics and space biology. He highlighted the potential for groundbreaking research and innovation that this collaboration could unlock, benefiting not just India but the world at large.

This historic partnership between ISRO and the Department of Biotechnology is set to pave the way for unprecedented advancements in science and technology, reinforcing India's position as a global leader in innovation.

The event saw the participation of ISRO Chairman S. Somnath, Secretary of the Department of Biotechnology Dr. Rajesh Gokhale, Dr. Ramesh V. Sonti, Director of ICGEB, Dr. Alka Sharma, Chief Scientist in the Department of Biotechnology, and other senior officers, underscoring the high-level commitment and collaborative spirit driving this landmark partnership.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2068495>

THE ECONOMIC TIMES

Sat, 26 Oct 2024

ISRO to launch electric propelled satellite this December: Here's why it's a big deal for India

India is gearing up to test its homegrown electric propulsion system, an innovation that promises to reduce satellite weight and enhance functionality, by the end of the year. Indian Space Research Organisation (ISRO) chairman S Somanath announced during the Sardar Patel Lecture at Akashvani that the first Technology Demonstrator Satellite, TDS-01, featuring indigenously developed electric thrusters, will be launched this December. This will be India's first test of electric propulsion in a fully indigenous setup, showcasing advancements that could set the stage for more efficient satellite launches.

The TDS-01 will also trial Indian-made travelling wave tube amplifiers (TWTAs), key components for communications and remote sensing satellites. These amplifiers are expected to enhance satellite functionality, providing a platform for improved communications and data relay systems.

Efficiency Gains with Electric Propulsion

Traditional satellite thrusters require a significant amount of liquid fuel, primarily to shift from a launch orbit to a geostationary orbit and to maintain position against gravitational shifts. For instance, a typical four-ton communication satellite currently requires over two tonnes of liquid fuel for this purpose. Electric propulsion, however, drastically reduces this requirement, allowing for a lighter satellite structure.

“A four-tonne satellite carries 2-2.5 tonnes of fuel. In case of electric propulsion, the fuel requirement reduces to just 200 kg,” explained Somanath. Electric propulsion systems use ionised propellant gases, such as Argon, which are powered by solar energy rather than traditional chemical fuels. “When the fuel tank size is reduced, the size of every peripheral also comes down. It is a cumulative effect. So, this satellite will not weigh more than two tonnes but will have the power of a four-tonne satellite,” he added.

Low Thrust Drawbacks

While electric propulsion reduces the fuel burden, it generates significantly lower thrust compared to chemical-based systems. Somanath acknowledged this limitation, noting that reaching the intended orbit could take months instead of weeks. “The only issue with electric propulsion is it is

very low thrust. It will take almost three months to reach the geo orbit from the launching orbit, as against one week in chemical thrusters," he said.

The electric propulsion system (EPS) was first introduced by ISRO for the GSAT-9, also known as the South Asia Satellite, launched in May 2017. However, that system was imported from Russia, making TDS-01 a milestone for Indian-made satellite technology.

NISAR Satellite Progress

In addition to TDS-01, ISRO is also preparing for the upcoming NASA-ISRO Synthetic Aperture Radar (NISAR) satellite. This collaborative mission aims to monitor various environmental phenomena, including ecosystem disturbances, deforestation, and ice-sheet collapse. Somanath reported that work on the satellite's radar antenna reflector had recently concluded, with the component now en route to ISRO's spacecraft integration and testing facility in Bengaluru.

"Integration of the radar antenna reflector with the satellite will take about two months," Somanath stated, adding that the mission's launch is slated for February.

<https://economictimes.indiatimes.com/news/science/isro-to-launch-electric-propelled-satellite-this-december-heres-why-its-a-big-deal-for-india/articleshow/114626752.cms>

ThePrint

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Muscle regeneration in microgravity to microalgae growth at ISS, India pushes to advance space biotech

The Indian Space Research Organisation (ISRO) and government's Department of Biotechnology (DBT) have partnered to conduct a series of experiments in space, including testing the impact of metabolic supplements on muscle regeneration under microgravity and assessing how microgravity radiation reacts on microalgae at the International Space Station (ISS).

Some of these biotechnology experiments are also likely to make it on-board the Gaganyaan mission scheduled for next year. On Friday, ISRO and DBT signed a memorandum of understanding (MoU) to further space biotechnology research, primarily focusing on microgravity research, space biotechnology, space biomanufacturing, bioastronautics and space biology.

ISRO chairperson S. Somanath confirmed that some of these experiments will be carried out onboard the upcoming Axiom-4 mission—a National Aeronautics and Space Administration (NASA)-supported mission to the ISS which will also fly the Indian astronaut Shubhanshu Shukla—and India's first human spaceflight Gaganyaan.

"Some of these experiments will be taken on Axiom-4. We will also be conducting some experiments on the uncrewed and crewed missions of Gaganyaan. The details of these experiments will be decided later," he said at the MoU signing event in Delhi.

India's biotechnology push

In August this year, the Union Cabinet approved the new BioE3 (Biotechnology for Economy, Environment and Employment) policy, intending to foster high-performance biomanufacturing in the country to enable India to lead the global bio-revolution. The policy for the next few years will create an ecosystem for promoting biomanufacturing, a process that uses biological systems of living organisms to produce commercially viable products.

The DBT has already started working on various policy aspects, and the MoU with ISRO is a step in that direction. Senior officials from the DBT said that the experiments will primarily revolve around subjects including microgravity, space biotechnology, space biomanufacturing, bioastronautics and space biology.

“A key challenge in space missions is the continuous availability of nutrients, preservation of food, microgravity radiation and the possibility of health problems such as cancer, cataracts, bone and muscle loss,” Vamsi Krishna, a senior scientist at DBT, said while speaking at the signing event. These issues can be addressed with viable research around biotechnology.

“Currently, there is ongoing research on muscle regeneration under microgravity and the impact of microgravity on microalgae at the ISS,” he said. Apart from exploring the possibility of advancing biotechnology in space, different labs under DBT are experimenting with foods with specific nutritional value, biodegradable plastic, reusable textiles, and agricultural byproducts which can be scaled commercially in the coming years.

With a probable increase in population size and the extreme impacts of climate change, countries will likely face an acute resource shortage in the coming years. In such a scenario, bio-manufactured, industry-made products will act as alternatives to bridge the gap between natural availability of resources and public demand.

<https://theprint.in/science/muscle-regeneration-in-microgravity-to-microalgae-growth-at-iss-india-pushes-to-advance-space-biotech/2329526/>



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Astronomers just found complex carbon molecules in space – step closer to deciphering origins of life

A team led by researchers at MIT in the United States has discovered large molecules containing carbon in a distant interstellar cloud of gas and dust. This is exciting for those of us who keep lists of known interstellar molecules in the hope that we might work out how life arose in the universe.

But it's more than just another molecule for the collection. The result, reported today in the journal *Science*, shows that complex organic molecules (with carbon and hydrogen) likely existed in the cold, dark gas cloud that gave rise to our Solar System.

Furthermore, the molecules held together until after the formation of Earth. This is important for our understanding of the early origins of life on our planet.

Difficult to destroy, hard to detect

The molecule in question is called pyrene, a polycyclic aromatic hydrocarbon or PAH for short. The complicated-sounding name tells us these molecules are made of rings of carbon atoms. Carbon chemistry is the backbone of life on Earth.

PAHs have long been known to be abundant in the interstellar medium, so they feature prominently in theories of how carbon-based life on Earth came to be. We know there are many large PAHs in space because astrophysicists have detected signs of them in visible and infrared light. But we didn't know which PAHs they might be in particular.

Pyrene is now the largest PAH detected in space, although it's what is known as a "small" or simple PAH, with 26 atoms. It was long thought such molecules could not survive the harsh environment of star formation when everything is bathed in radiation from the newborn suns, destroying complex molecules. In fact, it was once thought molecules of more than two atoms could not exist in space for this reason, until they were actually found.

Also, chemical models show pyrene is very difficult to destroy once formed. Last year, scientists reported they found large amounts of pyrene in samples from the asteroid Ryugu in our own Solar System. They argued at least some of it must have come from the cold interstellar cloud that predated our Solar System.

So why not look at another cold interstellar cloud to find some? The problem for astrophysicists is that we don't have the tools to detect pyrene directly – it's invisible to radio telescopes.

Using a tracer

The molecule the team has detected is called 1-cyanopyrene, what we call a "tracer" for pyrene. It is formed from pyrene interacting with cyanide, which is common in interstellar space. The researchers used the Green Bank Telescope in West Virginia to look at the Taurus molecular cloud or TMC-1, in the Taurus constellation.

Unlike pyrene itself, 1-cyanopyrene can be detected by radio telescopes. This is because 1-cyanopyrene molecules act as small radio-wave emitters – tiny versions of earthly radio stations. As scientists know the proportions of 1-cyanopyrene compared to pyrene, they can then estimate the amount of pyrene in the interstellar cloud.

The amount of pyrene they found was significant. Importantly, this discovery in the Taurus molecular cloud suggests a lot of pyrene exists in the cold, dark molecular clouds that go on to form stars and solar systems.

The complex birth of life

We are gradually building a picture of how life on Earth evolved. This picture tells us that life came from space – well, at least the complex organic, pre-biological molecules needed to form life did. That pyrene survives the harsh conditions associated with the birth of stars, as shown by the findings from Ryugu, is an important part of this story.

Simple life – consisting of a single cell – appeared in Earth’s fossil record almost immediately (in geological and astronomical terms) after the planet’s surface had cooled enough to not vaporise complex molecules. This happened more than 3.7 billion years ago in Earth’s approximately 4.5 billion history.

For simple organisms to then appear so quickly in the fossil record, there’s just not enough time for chemistry to start with mere simple molecules of two or three atoms. The new discovery of 1-cyanopyrene in the Taurus molecular cloud shows complex molecules could indeed survive the harsh conditions of our Solar System’s formation.

As a result, pyrene was available to form the backbone of carbon-based life when it emerged on the early Earth some 3.7 billion years ago. This discovery also links to another important finding of the last decade – the first chiral molecule in the interstellar medium, propylene oxide. We need chiral molecules to make the evolution of simple lifeforms work on the surface of the early Earth. So far, our theories that molecules for early life on Earth came from space are looking good.

<https://www.deccanherald.com/science/space/astronomers-just-found-complex-carbon-molecules-in-space-step-closer-to-deciphering-origins-of-life-3250094>

THE ECONOMIC TIMES

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Mission Possible: Ingredients are here for India to manufacture AI, lead AI revolution, says Nvidia's Jensen Huang

Artificial Intelligence is making computers an instrument for everyone and not just for the privileged few, believes Jensen Huang, the iconic founder and chief executive of chip maker Nvidia. He allayed the fears that AI could consume jobs or replace humans and said that the technology will make everything more efficient and productive, saving key resources and elevating human capabilities. In a free-wheeling conversation with Sruthijith KK at the ET Conversations event in Mumbai on Friday, Huang, 61, who steered the company out of turbulent early years and turned it into a \$3.43 trillion behemoth that it is today, said that he still wakes up fearing that Nvidia could even now go out of business. No one in technology should get too comfortable or complacent, said the top boss helming the world’s second most valued company. His message to India’s IT services industry was unequivocal: Move from the back office to the front office and lead the AI revolution. Edited excerpts:

I want to start with a core technical question. How is your leather jacket holding up in the Mumbai heat?

(Laughs) It's fine. Thank you! I enjoy the heat.

How prepared should India be for disruption in the IT sector, in terms of low-level coding being very rapidly getting disrupted by AI?

Well, the future of programming is going to be very different. We will do less programming of the computer and do more programming of the AI. And the idea of programming explicitly, telling the computer exactly what we want, is going to be less. And then letting the computer know what we intend and what we'd like to achieve will be more popular. And so we'll do less coding and do more prompting.

This is an extraordinary time for India for several reasons. India has one of the world's largest digital ecosystems and an enormous population of computer-literate engineers. This is just an extraordinary opportunity for India to reinvent itself from a back-office, IT cost-reduction industry to a front-office, AI-driven innovation ecosystem. And I was so inspired by all the companies that I met while I was here. The energy around artificial intelligence and the literacy and the capability that has been developed here in the last year (is great). In just the last year alone, Infosys, Wipro, TCS and many more that I met, the work that they're doing in agentic AI, at the leading edge of artificial intelligence is really quite extraordinary.

There is a fear that AI will replace jobs...

You know, AI is not going to replace humans anytime soon. There's not one piece of artificial intelligence that can replace 100% of someone. But, it is the case that everyone can take advantage of artificial intelligence to elevate our capabilities. And so think of it as a tool that elevates our abilities to make us all superhuman. And I think that that understanding pervades in India today. Everybody that I see, the number of startups here, the understanding of the opportunity of artificial intelligence, the energy that's here is really quite extraordinary. And so I'm excited about the opportunity for India. A third of Nvidia is here in India. Somebody mentioned that most of the letters of our company spell India. And in a lot of ways, Nvidia's senior leadership is Indian. A third of our engineers are here. We've been in Bangalore for almost 25 years. India designs Nvidia's chips, writes Nvidia software, designs Nvidia systems, and develops a lot of Nvidia's algorithms.

The aspiration, the vision, the ambition to elevate yourself from an IT cost reduction industry, from a labour outsourcing industry, to become an artificial intelligence production industry, I think you've got to pursue that with all of your might. You don't want to be a cost-reduction industry, you want to be a revenue-growth industry. You want to be an industry where, when you're sleeping, you're still making money. And it's hard to do that when your business model is by an hour. And I'm excited by the fact that the leadership here recognises this extraordinary opportunity.

There's no reason that the fundamental intelligence of this country is not encoded in intelligence that can be manufactured at scale. Every aspect of artificial intelligence, the natural resources are here. The digital economy is here, so you have lots and lots of data. You have a deep understanding of computer science, you have a deep understanding of computing. You have massive resources.

And in order to be in the artificial intelligence industry, to manufacture intelligence, you need energy, you need data, and you need computer science expertise.

All three exist right here. And I remember fondly the first time I spoke to Modiji about artificial intelligence. And he had a great deal of curiosity about what it is that I did for a living. And I spoke to him about AI. And at the end of it, he said something that was profoundly wise. He said that India should not export flour and import bread. The flour is the natural resource of your country, which is data. The data of India belongs to India. It's your natural resource.

The data of India encodes the knowledge of your people. Of course, it's the language and the history, but it also encodes your knowledge and your culture. It belongs to you. There's no reason to let anyone else harvest that, process that, and turn it into something of value called intelligence, digital intelligence. You can do it yourself. He also said that India should own its own AI cloud — meaning that the AI infrastructure, the processing infrastructure, the factories — we call them AI factories. The AI factories are part of your national infrastructure. Just like energy, just as roads, and communications, all of those networks should be built here. And it should be part of the national infrastructure. And his understanding of it was quite inspiring to me, quite impressive to me. And when I come to India, I have had the opportunity to update him several times on the progress of artificial intelligence. And you can tell that he is honed in on this idea that AI can lift the nation. And the example that he spoke about was agriculture. The vast majority of the country is in the industry of agriculture. And if we could put AI in the hands of farmers, so that the use of AI enhances crop yields and make better predictions of the weather and the yield of crops, that could lift the productivity of the people. So I think in a lot of ways, whether it's the national will, the inherent capability of this industry, the IT industry, and also the digital economy that we've already created over so many years, the ingredients are right, the ingredients are here for you to take advantage of this AI revolution. (India should) manufacture AI and lead the AI revolution.

You are bullish on applications such as robotics and autonomous driving. Now that you have experienced India's traffic, do you think Nvidia can make chips powerful enough to handle autonomous driving in India?

Well if somebody can conquer autonomous driving in India, you can be assured that autonomous driving will be solved everywhere else in the world. Of course, we also know that autonomous vehicles use the wrong sensors for India (jokingly). Cameras are obviously insufficient. You can't use computer vision, you need sonar. Because, you know, here in India, you have to honk. You drive by sound, not by sight. You can close your eyes and drive in India (laughs).

You started investing in the CUDA (Compute Unified Device Architecture) platform back in 2007, and for years afterwards, Wall Street analysts kept asking you where's the ROI in this. What gave you the conviction to continue investing in the platform?

At the core of the company, we believed that a general-purpose processor can't be good at everything. And we were in the beginning of a new technology revolution like the microprocessor. The rate of progress was so great that the general-purpose CPU wasn't good enough. We felt that there are many problems in computing where the general-purpose sequential processing capability of the CPU wasn't the right fit. And there are many algorithms that could be offloaded from the CPU, the sequential processor, to be accelerated using a parallel processor. Now, we believed that

in the very beginning, and we believe that today. And if you believe in something, unless some fundamental new insight were to change your belief, there's no reason to change your belief. And so we've pursued it for about 33 years now. And finally, our day has come.

We invented accelerated computing. It sits next to the CPU. It doesn't replace the CPU. The things that are sequential continue to run on the CPU, but the things that could be accelerated in parallel acceleration, parallel processing, could be offloaded. It has taken us three decades because you can't just put a GPU in a system and all of a sudden everything gets faster. You have to actually change the software applications on top. It is the reason why so many of our endeavours require a brand-new software stack. Nvidia is in a lot of ways, really a computer algorithm company.

We've reduced the marginal cost of computing in the course of the last 10 years by 100,000 times, to the point where researchers said to themselves, why don't we take all of the data in the world, take all of human knowledge, take all of the entire corpus of human knowledge, and give it to the computer, and let the computer figure out where the knowledge is, what is the knowledge that's represented inside, by learning the patterns and relationship of every single piece of information that it was able to learn, basically, machine learning, or what we now call large-language models.

It's easy to forget now because of Nvidia's stupendous success at this point that how hopeless a startup it was. You used to start your meetings by saying that our company is 30 days from going out of business. From that to today where concerns are being raised that Nvidia employees have become so wealthy that they are being criticised for being a bit complacent by some... Having seen this journey, what is the greatest motivator—fear or ESOPs?

I woke up this morning thinking the company would be 30 days from going out of business. And that hasn't changed. No one in technology should ever feel too comfortable. Technology changes incredibly quickly as you know. And artificial intelligence is the single largest industry that the world has ever known. And the reason for that is because intelligence is the largest industry the world has ever known. And so it's natural that we have a lot of competitors. And so we have to make sure that we don't take our position for granted. And of course, we grew everything from nothing. And so I know what it feels like to have nothing and to be nowhere. And those feelings don't leave you. I grew up poor and our company grew up poor. And I'm sure that there are many people in the audience who started from rather modest beginnings. When you start with modest beginnings, those feelings never leave you. I don't know about you, but I still enjoy leftovers. And so I think you want to stay modest as a person. You want to stay modest as a company.

The second part is that you might be surprised that many of the employees have been rich for a very long time. I'm looking at a few employees right in front of me right now. They've been wealthy for a very long time. And yet they've worked incredibly hard that entire time. I'm not working for the money. I'll be honest. I've been wealthy for a very long time. And yet I work harder than ever.

Let's talk about energy. AI needs a lot of it. What are the sustainability practices that Nvidia is adopting and where are we headed?

First, we need to improve the energy efficiency of our computing as fast as possible. The second thing is to realise that AI doesn't care where it goes to school. AI doesn't really need to be close to us. And so we can put the AI data centres near where we have excess energy.

You know that the world has more energy than we use. Obviously, a lot more energy comes from the sun than is actually used. But we don't have excess power because people like to live in certain areas. And so we can move the data centres, build the data centres farther away.

And then the third concept is to remember the goal of AI is not to train the models, which consumes a lot of energy. The goal of AI is to apply the models to be more efficient. Remember, I'll give you one example. We can predict weather 1,000 times, 10,000 times more energy efficiently than using computers and simulators.

Net-net, however, I will tell you that the world will be a lot more productive in the future. We will be much, much smarter about using energy. However, my hope is that the amount of energy that we use for artificial intelligence increases as a percentage of total energy over time. And the reason for that is very simple. I hope that the production of intelligence is a very large industry. Because we all hope that we produce intelligence. The goal is not to produce cement. The goal is not to produce steel. The goal is to produce cement more smartly, and present a new type of material that could replace steel. Our goal is to be much more smart about agriculture so that we can do everything a lot more efficiently. And so my hope is that if we end up using more energy for intelligence, less for cement, steel, less energy for sitting in traffic, less energy for all those things that consume energy that we're using.

What happens after we achieve AGI(Artificial GeneralIntelligence)? And are you concerned about effective regulation around the development of AGI?

We should regulate AI. We should regulate AI in the context of every application. When you use artificial intelligence as an accountant, that accountant should be regulated. Similarly, for lawyers, doctors, etc. AI should be regulated in the context of its use.

Your first question has to do with artificial general intelligence. My hope is that we will all be surrounded by super-AIs, super-intelligent people. And what happens when you're surrounded by super-intelligent AIs? Well, that's exactly my thing. Remember, I'm surrounded by people who are far better at what they do than I am. I'm surrounded by super-intelligent people, and yet I have no trouble working with all of them. And in fact, aren't you supposed to surround yourself with smart people? Smarter people than yourself? And why wouldn't you want to have assistants that are super-intelligent at the skills that they do?

Can AI help societies like India to solve fundamental challenges of poverty and development? Should countries be starting to think about universal basic income?

As you know, the vast majority of Indians do not know how to program a computer. The ability to program a computer is one of the greatest economic capabilities today. Most of us in the computer industry have access to a capability that most people don't have. And so, on the one hand, very few people can program a computer, but everyone can program an AI.

What I'm saying is, for the very first time in history, the computer is an instrument for everybody. Not just for people who are privileged or somehow were better educated or learned how to do that. And so I think the technology divide is likely to be reduced, likely to be eliminated. But it's more likely that AI will elevate the capabilities of everyone than the top 1%. Most people thought

initially that AI was going to threaten blue-collar jobs. But it turns out it is likely to be much more challenging for the white collar. And the reason for that is because everyone is now elevated.

What have been your biggest takeaways from this trip to India?

Back office to front office. An industry of cost reduction to an industry of innovation. An industry of labour to an industry of invention and deep tech. An industry that can only make money when you spend hours, to an industry that can make money when you're sleeping. That's the industry that I'm certain India will become.

I came not expecting anything, but I leave with incredible enthusiasm and optimism that across the entire IT industry here, all of the technology companies here, the CEOs that I met here, the determination to reinvent the IT industry, to take advantage of this generational opportunity, the once-in-a-lifetime opportunity to reinvent, to take advantage of that, and translate it to take advantage of the natural resource of this country, of this nation, and propel it forward. I am super-energised by it.

<https://economictimes.indiatimes.com/news/company/corporate-trends/mission-possible-ingredients-are-here-for-india-to-manufacture-ai-lead-ai-revolution-says-nvidias-jensen-huang/articleshow/114671624.cms?from=mdr>

