

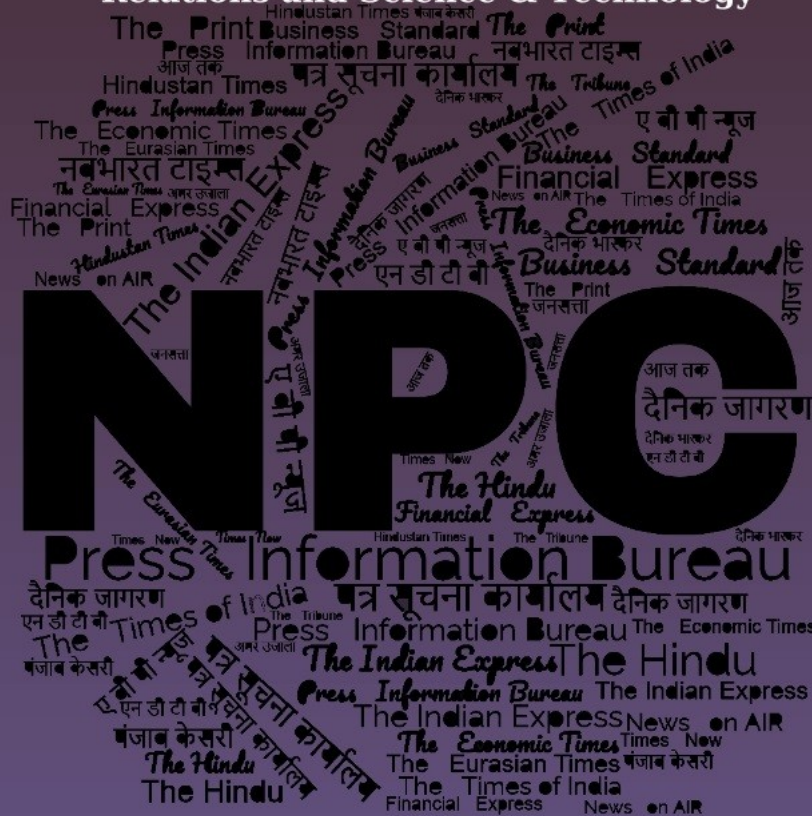
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DRDO-L&T's Zorawar a proud light tank project for Army. It must remain relevant for next 30 yrs

-BY LT GEN H S PANAG (RETD)

For the Defence Research and Development Organisation and its partner, Larsen and Toubro, 6 July 2024 was a red letter day when their indigenous light tank, Zorawar, was unveiled. Samir V Kamat, chairperson of DRDO, had good reason to be proud. "In a short period of two years to two and a half years, we have not only designed this tank but made a first prototype," he said during the unveiling at L&T's heavy engineering plant.

A 'request for information' was issued in April 2021, and the Ministry of Defence (MoD) approved the acceptance of necessity in December 2022. In principle, a go-ahead was given (by nomination) to the DRDO by the end of 2021 to manufacture 59 out of the requirement of 354 tanks. Contract for the remaining tanks would be given after an open bidding process for which some leading developers are in the fray.

Why do we require light tanks?

Light tanks weigh half that of a medium tank and have a much higher power to weight ratio. Mechanised forces exploit their mobility for reconnaissance in the plains/deserts and in other roles not suitable for medium tanks like air transported/airborne/amphibious operations, operations in riverine/coastal/mountainous/high-altitude terrain, and counter-insurgency/built-up areas.

Since Independence, Stuart, AMX 13, and PT 76 light tanks have been exploited for the above roles. Stuart tanks made history in the battle of the 11,553-foot-high Zozila Pass in 1948. This record was broken when AMX 13 tanks were air landed at 14,270 feet for the battle of Chushul in October-November 1962. PT 76 tanks played a stellar role in the riverine terrain of Bangladesh during the 1971 war. The author participated in four operations with PT 76 tanks in the Jessore-Khulna sector. Once AMX 13 and PT 76 tanks were phased out, our mechanised forces, perforce, had to rely upon medium tanks with inherent limitations for the roles highlighted above.

In Eastern Ladakh, a mechanised task force based on 20 BMP ICVs and 8 BRDM wheeled reconnaissance vehicles was inducted during Operation Trident in December 1986. The same force also participated in Exercise Chequerboard in 1987. In 1988-90, the author, inducted and

commanded the first combat group of a mechanised infantry battalion and two armoured squadrons and pioneered the evolution of the concept for employment of mechanised forces at high altitude. Similar deployment was also done in Sikkim.

Once the Chinese began intrusions in Eastern Ladakh in 2013, the deployment was increased to an armoured brigade of three armoured regiments and one mechanised infantry battalion in 2016. One more mechanised battalion was deployed separately. The mechanised forces deployment in Sikkim were also increased to an armoured brigade. During the crisis in Eastern Ladakh in May 2020, the deployment was increased by one additional armoured regiment and four mechanised infantry battalions. Mechanised forces played a major role in stalemating the People's Liberation Army (PLA) and are now operating in all sectors from Daulat Beg Oldi (DBO) and Galwan in the north, Chang Chemo-Pangong Tso-Chushul in the middle, and Indus/Hanle Valleys to the south.

Based on extensive exploitation in Ladakh/Sikkim, it is our experience that medium tanks with a relatively lower power to weight ratio (18.8 and 21 hp/ton for T72 and T90 respectively) and restricted manoeuvrability and main gun elevation/depression, can be exploited in the broader valleys/plateaus. However, in narrow valleys and on ridge lines/passes, they suffer from serious limitations. In these areas, light tanks with power to weight ratio of 1:30 and better manoeuvrability and gun elevation/depression perform much better.

A case in point is our deployment in the vicinity of and on the Kailash Range, Pangong Tso, Galwan and Chang Chenmo sectors. Medium tanks can be used in DBO, Chushul bowl and Indus/Hanle Valleys, and in the valleys across the Line of Actual Control (LAC). Light tanks and infantry combat vehicles (ICVs) can also undertake amphibious operations across the Pangong Tso. However, the viability of such an operation is debatable. Due to lower weight, light tanks are easily transportable by aircraft and heavy lift helicopters. With rubberised tracks, they can traverse long distances by road.

Restructuring/reorganisation of mechanised forces

The above analysis indicates that we need to employ a judicious mix of medium tanks, preferably with upgraded engines and light tanks tailor-made for high altitude. Even the existing fleet of tanks and ICV BMP 2 requires an upgraded engine and other modifications for high-altitude operations. The Future Infantry Combat Vehicle (FICV) project also must include a high-altitude variant. Before the light tanks are introduced, it would be prudent to restructure/reorganise the mechanised forces in high altitude areas.

It has been six years since the concept of integrated battle groups (IBGs) was first mooted. However, none have been formally fielded so far. Due to the intimate cooperation required between infantry and mechanised forces in Eastern Ladakh, combined arms IBGs are a compulsion and not a choice.

Mechanised forces with approximately 10-12 armoured regiments and mechanised infantry battalions also need to be restructured into composite units, which can be armour-heavy/mechanised infantry heavy/balanced with a judicious mix of medium and light tanks. Since traditional tank battles are unlikely to take place in high-altitude areas, it will be prudent to reduce the number of tanks in a squadron to 10 from 14 to make it more agile and create more composite units.

Since April-May 2020, the PLA deployed approximately six combined arms brigades, each having four or more composite combined arms battalions (mix of armour and mechanised infantry sub-units at unit level) supported by combat support/services units. The tank subunits are a mix of medium and light tanks. We have deployed a similar force level but based on inefficient traditional organisations.

Light tank project

The Army's General Staff Qualitative Requirement is for an amphibious 25 (+/-10 percent) ton tank with a power-to-weight ratio of 1:30, capable of operating in desert/riverine/high-altitude terrain. Its armament must include a 105 mm gun with 20-degree elevation and 10-degree depression, capable of firing all types of tank ammunition; an auto loader and automated fire control system; an ATGM (preferably gun launched) and a remote controlled weapon system (RCWS) with an automatic grenade launcher and 12.7 mm machine gun; and a drone launcher. The protection system should be state of the art with composite armour, add-on explosive reactive armour, and active electronic and kinetic anti-drone and ATGM counter measures. In a nutshell, the Army seeks a light tank that must remain relevant on the battlefield for next 30 years.

As a first impression, Zorawar is a hybrid tank with the prototype made with a Cummins 730 hp engine from United States, a Cockrill 105 mm gun and turret from Belgium, and a hull adapted from the Korean K-9 platform already being manufactured by L&T. It is assumed that all the imported systems would be manufactured in India with absolute transfer of technology. Details of the ATGM, RCWS, and anti-drone/ATGM protection systems are not yet available. Some of these systems may undergo change if better offers come forward and meet the terms and conditions. One more prototype will have to be made before field trials can commence. As per my assessment, if all goes well, it will take minimum five years before production can commence.

On paper, Zorawar seems be at par with the PLA's light tank, ZTQ 15, except that the latter has a relative higher degree of protection and a more powerful 1000 hp engine. However, it weighs 33-36 tons, making it a "light medium tank" and it does not have amphibious capability. It is pertinent to mention that top attack ATGMs and drones have made the tanks extremely vulnerable. Any tank that is developed now and even the existing fleet has to have the capability to neutralise this threat.

DRDO and L&T have orders for only 59 tanks. Zorawar will have to compete with tanks of other players in the field for the remaining 295 tanks. So far, a commercial request for proposal has not been formally issued for the 295 tanks. It is likely that knowing our bureaucratic delays, most major players may have commenced development in anticipation. Nonetheless, if Zorawar project progresses on schedule, it will have a head start to win the contract.

So far, the development of the Zorawar is a success story. Being hybrid, it may face teething problems, but it will mature by the time it is fielded in five years. This project will give impetus to the design and development of indigenous futuristic infantry combat vehicle and future ready combat vehicles.

<https://theprint.in/opinion/drdo-lts-zorawar-a-proud-light-tank-project-for-army-it-must-remain-relevant-for-next-30-yrs/2179470/>

Armenia Seeks Indian Pralay Missiles To Counter Israeli-Origin LORA; Here Is What Makes DRDO Missile ‘Lethal’

Armenia’s reported interest in acquiring India’s Pralay missile is a great opportunity for India. A Pralay export contract following the export of the Brahmos missile will likely bolster DRDO’s image as a missile exporter. Indeed, the DRDO has acquired the capability to develop all types of missiles through decades of sustained effort, and it’s time to capitalize on this painstakingly acquired capability. Considering that the percentage of indigenous content in the Pralay missile would be much higher than the percentage of indigenous content in the Brahmos variant exported to the Philippines, India’s earnings per missile would be much higher.

Armenia Seeks To Counter Azerbaijan’s LORA Missile

Armenia reportedly wants to acquire the Pralay to counter the capability acquired by Azerbaijan through the purchase of LORA (Long Range Artillery) ballistic missiles developed by Israel Aerospace Industries. LORA is a theatre quasi-ballistic missile with a range of 400 kilometers and a CEP (Circular Error Probability) of 10 meters when using a combination of GPS and TV for terminal guidance.

The Pralay is a mobile canister-based surface-to-surface SRBM (Short-Range Ballistic Missile) with a range of 150-500 km. It was developed from the Prithvi AD missile of DRDO’s BMD system. The missile navigates to its target using inertial guidance. It can be controlled throughout its flight. The Pralay features a radio frequency (DSMAC—Digital Scene-Matching Area Correlation) seeker for terminal guidance. The missile is fitted with an indigenously developed Fused Silica Radar Dome (RADOME).

Iskander Analog

In many ways, Pralay is an analog of Russia’s Iskander-M missile, which has proven very effective in Ukraine. Besides similar range and (quasi ballistic) trajectory characteristics, the Pralay and Iskander have similar accuracy of around 10 m CEP. The Iskander-M uses optical or radio frequency DSMAC guidance.

Terminal Manoeuvring

The Pralay missile features a jet vane system for thrust vector control, suggesting that the missile can perform evasive maneuvers in the terminal phase of flight. It is possible that the Pralay, like the Iskander-M, can also release decoys to frustrate adversary air defense systems.

Quasi-Ballistic Trajectory

Quasi-ballistic missiles are much more difficult to intercept than ballistic missiles, such as the Prithvi tactical missile currently equipped with missile units of the Indian Air Force and the Indian Army. The flight path of a ballistic missile is predictable, based on its trajectory at the time of

rocket motor burnout. A quasi-ballistic missile switches from a ballistic to a flat trajectory following launch.

The switch facilitates maneuver and lowers the radar horizon for adversary radars, thereby delaying detection and making the flight path unpredictable. At long range, if you cannot predict the flight path of a missile, you cannot engage it with an air defence missile. The combination of high speed, quasi-ballistic trajectory, and terminal maneuvering makes the missile nearly impossible to intercept, as is the case with the Iskander-M.

The Pralay, powered by a solid propellant rocket motor, never leaves the atmosphere and follows a flat trajectory. It weighs 5t, with the propellant weight being nearly 3t. The missile can feature different types of warheads, including PF (Pre-fragmented), Monolithic PCB (Penetration cum blast), and Submunition PCB. The Pralay missile features two sets of small fins to reduce its radar signature.

Acquisition Plans

The Russian Iskander-M missile's spectacular performance in Ukraine has likely prompted the MoD and DRDO to accelerate its development and acquisition. ANI reported on December 25, 2022, that the MoD has cleared the procurement of around 120 Pralay ballistic missiles for the Indian armed forces.

“A high-level meeting of the Defence Ministry cleared the acquisition of around 120 missiles for the armed forces and their deployment along the borders,” senior defense sources told ANI in New Delhi. The missile would be first inducted into the Indian Air Force. It's likely that the Indian Army will also acquire the missile.

Both Indian adversaries, across the LoC and LAC, have capable air defense systems. It will be difficult for India to strike targets deep behind the battlefield using either manned aircraft or cruise missiles.

Conclusion

Dramatic improvements in the efficacy of modern air defense (AD) systems have made strikes by manned aircraft in contested airspace much more perilous than before. One of the important lessons of the ongoing war in Ukraine is that tactical ballistic missiles are more effective for battlefield interdiction, counterair, and strategic strikes than air-launched cruise missiles. In Ukraine, even low-flying Russian stealth cruise missiles have faced high attrition rates when transiting through contested airspace. For relatively small countries such as Armenia, tactical ballistic missiles are a better and cheaper option to deter adversaries than deploying fighters with cruise missiles.

Armenia may be the first country to express interest in an Indian tactical ballistic missile, but it likely won't be the last. It's not yet known if India has shown interest in exporting the missile. India has yet to acquire the Pralay for use by its own forces. ANI reported on December 25, 2022, that MoD has cleared the procurement of around 120 Pralay ballistic missiles for the Indian armed forces. So far, there have been no reports of contract signing. Interestingly, according to reports, during Aero India in June 2023, India's Bharat Electronics signed a Memorandum of Understanding with Israel's IAI to produce the LORA in India under license.

<https://www.eurasiantimes.com/armenia-seeks-indian-pralay-missiles/>



Press Information Bureau
Government of India

Ministry of Defence

Tue, 16 July 2024

Aatmanirbharta in defence: MoD notifies fifth Positive Indigenisation List of 346 items for DPSUs

In a major boost to Aatmanirbharta in defence & minimise imports by Defence Public Sector Undertakings (DPSUs), Department of Defence Production (DDP), Ministry of Defence has notified the fifth Positive Indigenisation List (PIL) consisting of 346 items. These include strategically-important Line Replacement Units/Systems/ Sub-systems/Assemblies/Sub-assemblies/Spares & Components and raw materials, with import substitution value worth Rs 1,048 crore. The items will only be procured from the Indian Industry after the timelines of indigenisation as indicated in the list available on the Srijan portal (<https://srijandefence.gov.in>). The items are available in the attached list.

[\(5TH POSITIVE INDIGENISATION LIST FOR DPSUs - DDP\)](#)

The Ministry of Defence had launched the SRIJAN PORTAL in 2020. On this portal, DPSUs and Service Headquarters (SHQs) offer defence items to the industries, including MSMEs and start-ups, for indigenisation. Prime Minister Shri Narendra Modi's major push for 'Aatmanirbhar Bharat' has yielded remarkable results in the indigenisation of defence items, with Raksha Mantri Shri Rajnath Singh driving the efforts to realise the vision of self-reliance in defence production.

The DPSUs will undertake indigenisation of the items mentioned in the fifth PIL through various routes including 'Make' procedure or in-house development involving the industry, including MSMEs. This will provide impetus to the growth in economy, enhanced investment in defence and lead to reduced import dependence. In addition, this will augment the design capabilities of domestic defence Industry due to the involvement of academia and research institutions.

Hindustan Aeronautics Limited (HAL), Bharat Electronics Limited (BEL), Bharat Dynamics Limited (BDL), BEML Limited, India Optel Limited (IOL), Mazagon Dock Shipbuilders Limited (MDL), Goa Shipyard Limited (GSL), Garden Reach Shipbuilders & Engineers Ltd (GRSE) and Hindustan Shipyard Limited (HSL) are the DPSUs involved in defence items of

the fifth PIL. These have initiated process for issuing Expressions of Interest/Requests for Proposal on their respective websites with a link on the 'Srijan Portal Dashboard (srijandefence.gov.in/DashboardForPublic) specifically designed for this purpose, and Industry/MSMEs/start-ups may come forward to participate in large numbers.

Earlier, four PILs comprising 4,666 items were notified by the DDP for DPSUs, of which 2,972, having import substitution value worth Rs 3,400 crore, have already been indigenised. These five lists for DPSUs are in addition to the five positive indigenisation lists of 509 items notified by the Department of Military Affairs (DMA). These lists include highly-complex systems, sensors, weapons and ammunition.

Till June 2024, over 36,000 defence items were offered to the industry for indigenisation by the DPSUs and SHQs. Of them, more than 12,300 items have been indigenised in the last three years. As a result, the DPSUs have placed orders on domestic vendors to the tune of Rs 7,572 crore.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2033571>



Press Information Bureau
Government of India

Ministry of Defence

Tue, 16 July 2024

Government is committed to capacity building of PSUs: Raksha Rajya Mantri Shri Sanjay Seth

Raksha Rajya Mantri Shri Sanjay Seth has reiterated the Government's commitment to ensure capacity building of Public Sector Undertakings (PSUs) by providing all required support and handholding. Addressing the officials of Bharat Electronics Limited (BEL) during his visit to the Bengaluru Complex on July 16, 2024, he stated that it is incumbent upon the PSUs to improve their performance and remain competitive in the highly-competitive era.

Commending the achievements and performance of BEL, Shri Sanjay Seth said the PSU has been making substantial contributions to the Make in India initiative and Aatmanirbharta. It has developed many indigenous equipment and systems in partnership with the Defence Research & Development Organization (DRDO) and Airports Authority of India (AAI). It has bagged patents of 150 items this year reinforcing the Aatmanirbharta, he said.

The RRM visited the Precision Manufacturing Facility at Advanced Defence Systems Navy (ADSN) Strategic Business Unit (SBU), Military Radars SBU and the state-of-the-art EMI / EMC Lab. He was given a demo of the Coastal Surveillance System and the Perimeter Security System. He visited the Smart City Experience Centre, and the Product Development and Innovation Centre (PDIC), which fosters innovation, research and development of cutting-edge defence and security solutions. He interacted with engineers, scientists and researchers working on next generation projects.

The Raksha Rajya Mantri also planted a sapling at PDIC to commemorate his maiden visit to BEL. Earlier, he was received by Shri Manoj Jain, CMD, Shri Bhanu Prakash Srivastava, Director (Other Units), Shri Damodar Bhattad, Director (Finance), Shri K V Suresh Kumar, Director (Marketing), and other senior officers.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2033717>

THE ECONOMIC TIMES

Thu, 18 July 2024

Mazagon, Garden Reach Shipbuilders lead race for Defence Ministry's ₹70,000 crore warships order

The defence ministry is set to clear a mega ₹70,000 crore order for new warships for the Indian Navy. The stealth frigates will be the most advanced ships to be built in India and are a follow-on of the Nilgiri class that are currently under construction.

Sources said that state-run yards - Mazagon Dockyards Limited (MDL) and Garden Reach Shipbuilders and Engineers (GRSE) - are the frontrunners for the order that is classified as Project 17B. The two yards are currently constructing frigates under Project 17A (Nilgiri class). MDL is making four of the frigates while GRSE is executing an order for three.

While details will emerge after the defence ministry clears the project, there is a possibility that it could be split between the two yards, as was the case for Project 17A. A split order helps shorten delivery timelines for the Navy.

The advanced frigates will have high indigenous content, which will include locally developed fire control system, Brahmos cruise missiles, anti-submarine weapons and electronic warfare systems. The order will help boost dozens of sub-suppliers and vendors who will get a major share of the work.

One of India's most advanced shipyards, MDL has a larger order book that could get further strengthened with the order. The Mumbai-based yard is currently constructing the Kalvari class submarines, Project 17A class frigates and has just completed construction of Project 15B class destroyers.

The yard is also expected to sign a contract for three additional Kalvari class submarines in the current financial year, which is likely to be valued at around ₹35,000 crore. These new submarines will be larger and more advanced than the six Kalvari class that have been constructed by the yard.

GRSE is currently building next generation offshore patrol vessels and anti-submarine warfare corvettes. The Kolkata-based yard also has had recent success in securing export orders, with several more in the pipeline.

<https://economictimes.indiatimes.com/news/defence/defence-ministry-set-to-clear-70000-crore-frigates-order/articleshow/111817259.cms?from=mdr>

China says halted nuclear arms talks with US over Taiwan weapons sales

China said Wednesday it had suspended negotiations with the United States on nuclear non-proliferation and arms control in response to Washington's weapons sales to Taiwan -- a move the State Department called "unfortunate." The US and China in November held rare talks on nuclear arms control, part of a bid to ease mistrust ahead of a summit between presidents Joe Biden and Xi Jinping. Further dialogue had not been publicly announced since, with a White House official in January urging Beijing to respond "to some of our more substantive ideas on risk reduction."

But China's foreign ministry on Wednesday said recent US sales of arms to self-ruled Taiwan were "seriously undermining the political atmosphere for continued arms control consultations between the two sides".

"The US has... continued its arms sales to Taiwan, and taken a series of negative actions that seriously damage China's core interests and undermine political mutual trust," foreign ministry spokesman Lin Jian said.

"For this reason, China has decided to suspend negotiations with the United States on a new round of arms control and non-proliferation consultations," he added. The United States switched diplomatic recognition from Taipei to Beijing in 1979 but it has remained Taiwan's most important partner and biggest arms supplier, sparking repeated condemnations from China.

Washington in June approved two military sales to Taiwan worth approximately \$300 million in total, mostly of spare and repair parts for the island's F-16 fighter jets.

Nuclear arsenal increasing

In a congressionally mandated report last October, the US Defense Department said China was developing its nuclear arsenal more quickly than the United States had anticipated. China possessed more than 500 operational nuclear warheads as of May 2023 and is likely to have more than 1,000 by 2030, it said.

The United States currently possesses about 3,700 nuclear warheads, trailing Russia's roughly 4,500, according to the Stockholm International Peace Research Institute, which counts 410 warheads for China. Washington for its part criticised China for halting the negotiations.

"China has chosen to follow Russia's lead in asserting that engagement on arms control can't proceed when there are other challenges in the bilateral relationship," State Department spokesman Matthew Miller told reporters.

"That step they have taken is unfortunate," he said. "We think this approach undermines strategic stability. It increases the risk of arms race dynamics."

Lin had said that China is "willing to maintain communication with the United States on international arms control issues on the basis of mutual respect". "But the United States must respect China's core interests and create necessary conditions for dialogue," he warned.

<https://economictimes.indiatimes.com/news/defence/china-says-halted-nuclear-arms-talks-with-us-over-taiwan-weapons-sales/articleshow/111822531.cms>

THE ECONOMIC TIMES

Wed, 17 July 2024

America is worried Russia is sharing Ukraine lessons with China

What does China get in lieu of support to Russia? The US is worried Russia could be passing on to China the knowledge it has gathered about American and European weapons being used in the Ukraine war. A bipartisan US congressional committee wants the Joe Biden administration to assess this issue.

Chairman John Moolenaar and Ranking Member Raja Krishnamoorthi of the House Select Committee on the Strategic Competition Between the United States and the Chinese Communist Party (CCP) has sent a letter to National Security Advisor, Jake Sullivan, requesting an assessment of the information that Russia has shared with the PRC regarding US weapons capabilities and those of the partners and allies.

Russia found vulnerabilities in American weapons?

The letter says, "As you stated on July 9, we should not expect that foreign adversaries, such as the PRC, 'are supporting Russia for free.' Rather, we should anticipate and indeed operate under the assumption that Russia is passing information about vulnerabilities or counters to American and allied weapons systems to the PRC in support of its 'no limits' partnership." The committee thinks Russia has found vulnerabilities in American weapons and thus has been able to undermine their effectiveness.

"As the United States and our NATO allies continue to stand with Ukraine against Russia's war of aggression, recent reports have detailed alarming levels of Russian adaptation that have undermined the effectiveness of several U.S. weapons systems," the letter says.

"While some of the systems in question are older and less modern, in other cases, even newer weapons have reportedly failed thanks to Russian electronic warfare and associated countermeasures.

As Under Secretary of Defense for Acquisition and Sustainment William LaPlante put it, "The Russians have gotten really, really good" at disrupting precision munitions. These reports raise important questions about the U.S. military and industrial base's ability to "counter-innovate" to overcome or adapt to these Russian tactics and their potential proliferation to other adversaries in other theaters."

The committee has requested the following information from the Biden administration: An assessment of Russia's ability to mitigate or counter US weapons systems in Ukraine; the extent to which Russia has shared lessons learned from battlefield innovation in Ukraine with the PRC, especially as it pertains to US weapons systems; any efforts by the People's Liberation Army (PLA) to adopt lessons learned from the battlefield in Ukraine or mirror Russian military innovations; the administration's plans to ensure the future effectiveness of American weapons systems against both Russia and the PRC in light of these threats; and steps to hold the PRC accountable for its support for Russian aggression in Ukraine.

Strengthening Russia-China defence ties

China and Russia have greatly reinforced ties since the start of the Russian offensive in Ukraine that began in February 2022. Their common goal is also to reduce the role of the United States and the West on the international stage.

China and Russia's naval forces on Sunday kicked off a joint exercise at a military port in southern China on Sunday, official news agency Xinhua reported, days after Nato allies called Beijing a "decisive enabler" of the war in Ukraine. The Chinese defense ministry said in a brief statement forces from both sides recently patrolled the western and northern Pacific Ocean and that the operation had nothing to do with international and regional situations and didn't target any third party.

The sternly worded final communique, approved by the 32 Nato members at their summit in Washington, made clear that China is becoming a focus of the military alliance, calling Beijing a "decisive enabler" of Russia's war against Ukraine.

The European and North American members and their partners in the Indo-Pacific increasingly see shared security concerns coming from Russia and its Asian supporters, especially China. It said Beijing's "so-called 'no limits' partnership" and "large-scale support for Russia's defence industrial base" were of "profound concern".

The Pacific is a hotbed of international tensions due to sovereignty disputes between Beijing and several of its US-backed neighbours, such as Japan, the Philippines and Taiwan. China and Russia hold joint military exercises regularly but their level of interoperability is greatly inferior to that of NATO, the European Union Institute for Security Studies said in a report in early July. In 2023, ships from the two countries took part in a naval exercise off the US state of Alaska.

China developing attack drones for Russia?

Beijing presents itself as a neutral party in the war and says it is not sending lethal assistance to either side, unlike the United States and other Western nations. It has however offered a critical lifeline to Russia's isolated economy, with trade booming since the conflict began.

But that economic partnership has come under close scrutiny from the West in recent months, with Washington vowing to go after financial institutions that facilitate Moscow's war effort. The United States and Europe have also accused Beijing of selling components and equipment necessary to keep Moscow's military production afloat.

Chinese and Russian companies are developing an attack drone similar to an Iranian model deployed in Ukraine, Bloomberg reported two weeks ago, citing European official sources, a sign

that Beijing may be edging closer to providing the sort of lethal aid that western officials have warned against.

The companies held talks in 2023 about collaborating to replicate Iran's Shahed drone, and started developing and testing a version this year in preparation for shipment to Russia, said the officials, who asked not to be identified to discuss private information. The Chinese drones have yet to be used in Ukraine, sources told Bloomberg.

Providing Russia a Shahed-like attack drone would mark a deepening of Beijing's support for Russia despite repeated warnings from the US and its allies. President Xi Jinping has sought to portray China as neutral in the conflict in Ukraine even as western officials say it's provided components and other support for President Vladimir Putin's forces.

US officials have said China is holding off directly providing weapons and artillery, something that would signal an unprecedented escalation and almost certainly trigger more forceful action — such as sanctions — against the world's second-biggest economy. Bloomberg reported in April that China was providing Russia with satellite imagery for military purposes, microelectronics and machine tools for tanks, as well as a swath of technologies used in weapons or needed to produce them.

<https://economictimes.indiatimes.com/news/international/world-news/america-is-worried-russia-is-sharing-ukraine-lessons-with-china/articleshow/111808559.cms>

ThePrint

Wed, 17 July 2024

Indian helmet-mounted sights seen on Armenian soldiers, India major defence supplier to the country

Armenian troops have been spotted wearing an India made helmet mounted thermal imaging monocular during an ongoing joint exercise with the US. The images doing the rounds on social media show the Armenian soldiers wearing the thermal imaging monocular manufactured by Bengaluru-based firm Tonbo Imaging.

These sights are among the several defence-related equipment that Armenia has bought from India to beef up its military after losing out in a war with Azerbaijan. Incidentally, the Indian Army had also bought these sights besides others from Tonbo Imaging as part of emergency procurement in 2021.

Products of the company are in use with several special forces, including that of Israel and France, besides India. During the 2016 surgical strikes, the special forces personnel had used the thermal sights procured from the firm. The company was discovered by the Indian armed forces thanks to a joint exercise with NATO a decade ago. The US Army was using weapons that had Tonbo systems on them.

It was then that the Army realised such systems were available in India.

Armenia's procurement from India rising

From buying artillery gun systems and the Pinaka multi-barrel rocket launchers to small arms and ammunition and fuses, Armenia has emerged as a big client for the Indian defence companies, both in public and private sector. The Indian defence establishment is silent when it comes to exports to Armenia, but sources maintained that they are facilitating whatever requests they get from foreign countries based on New Delhi's larger strategic role.

Incidentally, Indian defence exports from India have touched an all-time high of Rs 21,083 crore in the financial year 2023-2024, with consignments reaching 85-plus countries in the neighbourhood and beyond. As reported first by ThePrint in 2022, Armenia has been looking at India to beef up its defence forces which are undergoing a modernisation drive.

The ex-Soviet republic bought four indigenous Swathi weapons locating radars in 2020 from India which was delivered in the backdrop of its conflict with Azerbaijan. After this, Armenia bought the Pinaka rocket system and since then it has bought several other equipment besides focusing on training its forces in India.

Armenia's arch rival Azerbaijan is seen by many as part of an emerging axis with Turkey and Pakistan. It has used Turkish drones to fight the war against Armenia. Both India and Armenia are in the process of establishing a joint working group on the issues of bilateral defence cooperation.

Interestingly, it was in May this year that both countries held their first formal consultations between the defence ministries of both countries. During the consultations, the present state of cooperation between Armenia and India in the defence sector and prospects for future development — including military-technical, military education and combat training of personnel, exchange of experience and others — were discussed, the Armenian defence ministry had then said in a statement. Besides India, Armenia has also bought several systems from the US and France as part of its modernisation process.

<https://theprint.in/defence/indian-helmet-mounted-sights-seen-on-armenian-soldiers-india-major-defence-supplier-to-the-country/2178352/>

ThePrint

Wed, 17 July 2024

India to finally get its new stealth frigate 'Tushil', crew of about 200 carrying out acceptance trials

About 200 personnel from the Indian Navy are in Russia to carry out acceptance trials of the first of the two stealth frigates that is being built in Kaliningrad as part of a USD 2.5 billion deal. If all goes well, the first ship, christened Tushil (shield in Sanskrit) by the Indian Navy, should be in by mid-September. The next ship, Tamal, would be delivered to India by early next year, sources in the

defence establishment here said. They added that the two more frigates being built at the Goa Shipyard as part of the deal with Russia are progressing and the first ship will be launched soon.

The two ships being built at the Yantar shipyard in Russia were originally meant to be delivered at the end of 2022 but got delayed because of the Covid crisis, payment issues between the two countries and the ongoing conflict with Ukraine. Incidentally, the gas turbine engines fitted on the ship are from Ukraine's Zorya- Mashproekt, which India had to procure directly, after which it was sent to the Russian shipyard.

Following Crimea's reunification with Russia in 2014, its ties with Ukraine went for a toss and Moscow stopped importing the engines from the Ukrainian firm. India had to, therefore, procure and transfer the same to Russia, which also needed Ukrainian permission. India had, in 2016, inked an inter-governmental agreement with Russia for four frigates, a follow-on of the Talwar-class vessels, and its contract was signed at the end of 2018. According to the deal, two ships are to be built in Russia, while the other two are to be built at the Goa Shipyard in India with technical collaboration from Russia. The Yantar Shipyard has also manufactured three of the six Talwar-class frigates that are in service with the Indian Navy.

ThePrint had visited the Yantar shipyard in 2019. The hulls for the two ships had already been cut for the Russian Navy, but remained mothballed for several years. The new ships will have 22 new systems, including Indian specific navigation, communication and weapons. The Navy had earlier said these ships are based on its specific requirements to meet the entire spectrum of naval warfare in all three dimensions of air, surface and sub-surface.

The ships with a potent combination of state-of-art Indian and Russian weapons and sensors are equipped to operate in littoral and blue waters, both as a single unit and as consort in a naval task force. They feature "stealth technology" in terms of low radar and underwater noise signatures. These ships are being equipped with major Indian supplied equipment such as surface-to-surface missiles, sonar system, surface surveillance radar, communication suite and anti-submarine warfare along with Russian surface-to-air missiles and gun mounts.

<https://theprint.in/defence/india-to-finally-get-its-new-stealth-frigate-tushil-crew-of-about-200-carrying-out-acceptance-trials/2178539/>



Thu, 18 July 2024

Strengthening Ties Through Military Cooperation: India-Mongolia Joint Exercise Nomadic Elephant

The 16th edition of the India-Mongolia Joint Military Exercise, Nomadic Elephant, concluded today at Umroi, Meghalaya, marking the end of a rigorous training period and collaboration. The closing ceremony saw the presence of Lt Gen Zubin A Minwalla, GOC of 33 Corps, and Maj Gen Ganbyamba Sunrev, Chief of General Staff of the Mongolian Armed Forces.

Enhancing Joint Capabilities

Scheduled from July 3 to 16, 2024, the exercise included 45 Indian soldiers from the SIKKIM SCOUTS Battalion and other units, joined by the 150 Quick Reaction Force Battalion of the Mongolian Army. This annual event, alternating between the two countries, facilitates synergy in conducting joint semi-conventional operations in semi-urban and mountainous terrains, thereby strengthening the interoperability between the two-armed forces. The previous exercise was held in Mongolia in July 2023.

Strategic Objectives and Training

The opening ceremony was attended by the Ambassador of Mongolia to India, Dambajavyn Ganbold, and Major General Prasanna Joshi, General Officer Commanding 51 Sub Area of the Indian Army. The primary aim of the exercise was to bolster joint military capabilities for counter-insurgency operations in semi-urban and mountainous terrains, aligning with Chapter VII of the United Nations Mandate.

Key tactical drills during the exercise included responding to terrorist actions, establishing joint command posts, intelligence and surveillance centers, securing helipads, small team insertions and extractions, special heliborne operations, and counter-drone measures. These drills promote the exchange of best practices in tactics, techniques, and procedures for joint operations, enhancing interoperability, camaraderie, and defence cooperation.

Bilateral Defence Relations

In addition to the exercise, the 12th India-Mongolia Joint Working Group meeting took place in Ulaanbaatar from May 16-17, 2024. The meeting, co-chaired by Amitabh Prasad of India, Joint Secretary, Indian Ministry of Defence, and Brigadier General Gankhuyag Davagdorj of Mongolia, focused on ongoing defence cooperation, reviewing progress, and identifying areas for further enhancement. Both sides expressed satisfaction with the existing defence cooperation and exchanged views on the current geopolitical situation.

During the discussions, the Indian Joint Secretary highlighted the potential of India's defence industry, stressing a fruitful partnership with Mongolia's Armed Forces. The Mongolian side acknowledged the growing ties between the two countries and expressed confidence in India's industry capabilities.

Historical Context and Future Prospects

India's historical ties with Mongolia, dating back to 1955, have strengthened over the years. In 1994, both nations signed the Treaty of Friendly Relations and Cooperation, further solidifying their relationship. During Prime Minister Narendra Modi's visit to Mongolia in 2015, the ties were upgraded to a strategic partnership, with defence being an essential element of bilateral engagement.

As part of their growing cooperation, the India-funded greenfield oil refinery project in South Gobi aims to reduce Mongolia's reliance on Russian oil imports. The refinery, with a capacity of 1.5 million tonnes annually, is expected to be operational by 2026, meeting Mongolia's demand for various fuels.

Looking ahead, Mongolia anticipates a visit by the Indian Prime Minister in 2025, coinciding with the 70th anniversary of diplomatic relations. The President of Mongolia is also expected to visit India later this year.

<https://www.financialexpress.com/business/defence-strengthening-ties-through-military-cooperation-india-mongolia-joint-exercise-nomadic-elephant-3555602/>



Tue, 16 July 2024

Guanajuato Mexico and India collaborate for innovation and entrepreneurship exchange

The state government of Guanajuato, Mexico, through the Institute of Innovation, Science, and Entrepreneurship for Competitiveness (IDEA GTO), has initiated important exchanges with various organizations, institutions, and agencies in India. This collaboration aims to strengthen the innovation and entrepreneurship ecosystem known as “Mindfactory Valley.”

Promoting Innovation through Mindfactory Valley

Governor Diego Sinhue Rodríguez Vallejo has been instrumental in promoting the Mindfactory public policy. This initiative was shared with both public and private sector organizations in India that focus on innovation, fostering a dialogue between the two ecosystems to create opportunities for innovative projects in both countries.

Achievements of Guanajuato’s Innovation Ecosystem

Guanajuato has been expanding its alliances to consolidate its innovation and entrepreneurship ecosystem. The state boasts the highest number of patent applications per 100,000 economically active inhabitants in Mexico. It is recognized as the fastest-growing ecosystem in Central America by Startup Blink and was ranked second in the world in the Fab City Awards 2023.

Strategic Partnerships with Indian Organizations

During the exchanges, Guanajuato signed a Memorandum of Understanding with Incubation Masters, a leading institution in strengthening startups and promoting Smart Cities, and with the Think Tank Movastcon Foundation.

Engaging with Leading Indian Technology Companies

Guanajuato representatives met with leading Indian technology companies such as Infosys, ByJu’s, HCL Tech, Dtown Robotics Primate Limited, and TATA Consultancy Services. These meetings were productive, resulting in a collaboration letter to generate opportunities for reskilling, upskilling, and talent fostering through hackathons. Plans were made to host webinars, share mentors, and participate in summits.

Exploring Fintech Innovations

In the fintech sector, Guanajuato representatives visited the National Payments Corporation of India and the Reserve Bank Innovation Hub, learning about the significant impact of PayTM in facilitating mobile payments. Participation in the Second International India Fintech Festival Forum provided further insights and opportunities.

Interactions with the Indian Public Sector

Besides having a meeting with the Mayor of Delhi, Guanajuato's delegation visited the Ministry of Electronics and Information Technology, and the Parliament House.

Building Bridges with Indian Institutions

The exchanges established connections between Guanajuato and leading Indian institutions such as Nasscom, the Startup India project, and Amity University of Technology and Engineering. These interactions focused on using technology to improve the quality of life and emphasized the role of organized society and government in participating in the digital economy.

Strengthening Bilateral Relations

These conferences have consolidated the relations between Guanajuato and India. Indian organizations have already promoted digitalization, STEM training, and the detection of technological opportunities in Guanajuato.

<https://www.financialexpress.com/business/defence-guanajuato-mexico-and-india-collaborate-for-innovation-and-entrepreneurship-exchange-3555580/>

The Tribune

Thu, 18 July 2024

India needs a strategic approach to hybrid warfare

-By RK Arora (Ex-commandant, BSF)

IN the evolving landscape of modern warfare, India must adapt to the concept of hybrid warfare to strengthen its defence and deterrence strategies. Hybrid warfare, characterised by a blend of conventional weapons, irregular tactics, cyberattacks and other unconventional methods, requires a nuanced and resilient approach to effectively counter the multifaceted threats from its adversaries.

According to NATO, hybrid threats combine military and non-military as well as covert and overt means, including disinformation, economic pressure, deployment of irregular armed groups and the use of regular forces. "Hybrid methods are used to blur the lines between war and peace, and attempt to sow doubt in the minds of target populations. They aim to destabilise and undermine societies... the speed, scale and intensity of hybrid threats have increased in recent years," observes the US-led alliance.

The cornerstone of India's strategy should be resilience. Leveraging its inherent strengths, India can put adversaries at a disadvantage and fortify its strategic stance against hybrid threats. Eschewing the traditionally rigid distinctions between conventional and irregular warfare, India's

approach should recognise the continuum of conflict, integrating various methods and modes of warfare.

India's western border with Pakistan is a significant area of concern. Pakistan has been accused of engaging in hybrid warfare tactics, including sabotage, terrorism and cyberattacks, particularly in regions like Jammu and Kashmir and Punjab. Recent incidents underscore the gravity of the threat. In a deadly encounter in Doda, four Army soldiers, including a Captain, were killed earlier this week, bringing the total number of personnel killed in the region to 48 over the past 32 months.

The joint operation by the Army and the Jammu and Kashmir Police highlights the persistent danger of cross-border terrorism. The Army has claimed that a number of measures have been instituted to enhance synergy between various agencies, such as joint training with the J&K Police and Central Armed Police Forces and "a robust intelligence-sharing mechanism between the Army, the police and other intelligence agencies".

The rise of narco-terrorism and the use of drones for cross-border insurgency reflects the evolving nature of this hybrid conflict. Pakistan's support for proxy forces, terrorist organisations and drug cartels poses a severe threat to India's security. The blending of advanced military capabilities with irregular tactics has been a persistent issue, necessitating preparedness to deflect these 'wars in the shadows' while enhancing collective defence capabilities.

On the northern front, India's relations with China present a different set of challenges. China's strategy includes psychological, political and legal tactics — collectively known as the 'three warfares' — to achieve its geopolitical goals. The Chinese investment in the United Front Work Department to influence the Chinese diaspora and foreign communities, along with the use of front organisations, exemplifies its hybrid warfare strategy. Beijing's increasing use of commercial security operations to protect its interests abroad, coupled with its blurred tactics and quasi-military forces in the maritime domain, underscores its innovative approach to hybrid conflicts. The likelihood of indirect and proxy Chinese intervention is a growing concern, particularly as China expands its influence across Asia and beyond.

The insurgency landscape within India also demands attention. The spate of terror attacks in the Jammu region and the continued unrest in Manipur highlight the internal challenges. Additionally, the Naxal insurgency in central India remains a significant threat, with numerous attacks on security forces and civilians. In response to the rising terror incidents, Prime Minister Narendra Modi has reviewed the security situation, discussing counter-terrorism efforts with top officials. The situation in Punjab is also concerning, with increased activities of narco-terrorism and drone infiltrations from Pakistan necessitating a robust response.

To effectively counter these hybrid threats, India must integrate hybrid warfare into its defence strategies. This involves overcoming natural disadvantages and leveraging India's strengths, interests and values. India's strategic approach should emphasise resilience, with border guarding forces and Army personnel equipped to handle advanced technologies and hybrid threats. The ongoing conflicts in Jammu and Kashmir, Manipur and other regions underscore the need for a robust and adaptive defence strategy. India must be prepared to counter both direct and indirect threats from Pakistan and China, utilising a comprehensive approach that includes conventional military capabilities, irregular tactics and cyber defence.

As India navigates the complex landscape of hybrid warfare, it is crucial to adopt a flexible strategy. By integrating hybrid warfare into its defence framework, leveraging its strengths, and preparing for the diverse threats from Pakistan, China and internal insurgencies, India can enhance its security and maintain stability in the region. This strategic shift, while challenging, is essential for safeguarding India's national interests and ensuring its sovereignty in an increasingly hybrid conflict environment.

<https://www.tribuneindia.com/news/comment/india-needs-a-strategic-approach-to-hybrid-warfare-640755>

Science & Technology News



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Bimetallic NiFe systems are better than doped ones for water splitting claims a study conducted by Institute of Advanced Study in Science and Technology (IASST) under the Department of Science and Technology (DST)

A bimetallic Nickel Iron layered double hydroxide system is sufficient for efficient O₂ production through water splitting, according to a new study that obviates the necessity of current trends of research to find trimetallic solutions for increasing productivity in this system.

In an era where renewable energy sources are gaining paramount importance, water splitting emerges as a beacon of hope in the quest for sustainable energy solutions. Water splitting can be reckoned as a sustainable and eco-friendly way to generate green and pure H₂ and O₂ on a larger scale without harming the flora and fauna.

To explore ways of increasing the efficiency of water splitting, scientists from the Institute of Advanced Study in Science and Technology (IASST) under the Department of Science and Technology (DST), Government of India, in Guwahati, have assessed one of the two important reactions that come into play -- hydrogen evolution reaction (HER) and the oxygen evolution reaction (OER).

The work led by Dr. Biswajit Choudhury and the main author Mr. Suvankar Deka focused on the understanding of the oxygen evolution ability of Nickel-Iron Layered double hydroxides. This is because improving the efficiency of the OER contributes to the overall efficiency of water-splitting processes.

In addition to NiFe Layered Double Hydroxide (LDH), they synthesized two other trimetallic systems ZnNiFe layered double hydroxide and CoNiFe LDH, and investigated its electrocatalytic activity in 1M KOH. Strikingly, the OER activity of the trimetallic systems was found to be slower than the bimetallic system. The research provided mechanistic Insights into electrocatalytically reduced OER performance in marigold-like trimetallic NiFe-based LDH.

Their investigation accepted for publication in the Journal of Materials Chemistry A, revealed that the reduced activity in the trimetallic system can be attributed to breakage in the charge transfer chain of Ni-O-Fe-O-Zn and Ni-O-Fe-O-Co moieties (part of a molecule) as well as confinement of phonons (quantum of vibrational energy). This leads to the trapping of charge carriers affecting the reaction pathway and kinetics resulting in reduced water oxidation activity.

The study suggests that doping of the bimetallic NiFe system does not improve its water splitting efficiency and can help in focussed research on finding ways of improving the bimetallic system for oxygen generation through overall splitting.

Publication link: <https://doi.org/10.1039/D3TA07489G>

<https://pib.gov.in/PressReleasePage.aspx?PRID=2033659>



Wed, 17 July 2024

National Quantum Mission: Why India has a lot of catching up to do

India launched the National Quantum Mission last year and became one of the few countries in the world to have a dedicated programme to harness the power of quantum technologies. These technologies, which use special properties of the tiniest particles of matter, can yield radical solutions to some of the most intractable problems of our age, such as clean energy and affordable healthcare.

But despite having a fairly strong research base in quantum science, India has a lot of catching up to do. A new report, surveying the existing capabilities of the country in this area, has found that countries like China and the United States have a huge head start over India. These countries have not just invested much more money in funding research, they also have more people working in this sector.

They have been publishing far greater numbers of scientific papers, and register many more patents as well.

But the good thing, as Indian science leaders have been emphasising, is that quantum technologies are still under development, and India is not exactly starting from zero. In fact, in some areas, Indian scientists are very much at the forefront of global research.

The quantum mission

After several years of discussions, India in 2023 announced the setting up of the National Quantum Mission to build capabilities in quantum-related science and technology. The mission focuses on four key domains: computing, communications, sensors, and materials.

Quantum technologies try to make use of the fact that matter behaves in a very unexpected and counter-intuitive manner at its smallest scale. Sub-atomic particles such as electrons seemingly exist at multiple locations at the same time, and can influence the behaviour of a like-particle, with which they have had a prior interaction, over infinitely large distances.

These strange properties have been experimentally verified hundreds of times. However, it is only in recent years that scientists have acquired capabilities to put them to some beneficial uses. Some of these properties, like the ability to exist in multiple states at the same time — a phenomenon called superposition — can be used to perform real-life tasks that conventional technologies are unable to achieve.

Quantum computers are already a reality, though their capabilities are quite limited at this point. More mature quantum computers would be able to do calculations that would be either impossible for normal computers, or would take far too long to perform. By overcoming the limits of current technologies, a quantum-enabled transformation can build the foundations of a new economy in a decade or two.

This is why India wants to try and rapidly build its capabilities in these areas. Partnering in technology development would ensure early fruits of success, which can trigger rapid economic growth. It would also make leading technologies accessible to India.

A lot of ground to cover

The National Quantum Mission, however, is just the first step and there is a lot of ground to cover, according to the Landscape of Indian R&D in Quantum Technologies report. The report has been prepared by itihaasa Research and Digital, a not-for-profit company that seeks to study the evolution of technology and business in India.

The Rs 6,000 crore (around \$0.75 billion) earmarked for the mission is impressive by Indian standards but it pales in comparison to what other countries are spending on quantum-related research, the report said. China is estimated to be investing \$15 billion in this effort, while the US is pumping in about \$3.75 billion.

The United Kingdom has put in about \$4.3 billion and countries like Germany, South Korea, and France have all committed to spend more than \$2 billion (see box alongside).

Researchers in China and the US have been producing the largest number of research papers. Between 2000 and 2018, Indian researchers published 1,711 papers on quantum-related science, according to one publicly available database, while Chinese and American researchers published 12,110 and 13,489 papers respectively. Seven other countries have published more papers than India during this period. Among the 10% most cited papers, the US and China again lead the way, and India ranks 20th, the report said.

China and the US are also garnering a lion's share of the patents being registered. Between 2015 and 2020, Chinese and American researchers acquired 23,335 and 8,935 quantum-related patents

respectively. However, Indian researchers had only 339 such patents in the same period, according to a patent database. India was ranked ninth by the number of patents obtained.

The country was lagging on a few other parameters as well but had a foundation that could be built upon.

Tough race but in competition

The new report pointed out that between 110 and 145 senior scientists were currently leading research groups on quantum-related technologies in India. These groups supported 75-100 post-doctoral fellows, and about 400 PhD students. In addition, about 200 senior scientists were working in the related fields of material sciences, electronics, computer science, and physics.

The report also found that outside the European Union, India had the largest number of graduate students in disciplines aligned to quantum technologies. These include biochemistry, electronics, chemical engineering, statistics, and information and communication technologies. There were more than 82,000 such students enrolled, which is more than in China or the US.

The report said the National Quantum Mission needed to identify and promote young talent. The mission could also raise a separate cadre of quantum scientists like the atomic energy or space science establishments had done, the report added. Indian scientists are already at the forefront of research into quantum communications and quantum sensing, according to Abhay Karandikar, Secretary in the Department of Science and Technology. Even in areas such as computing and materials, the gap is not such that it cannot be bridged, he said.

<https://indianexpress.com/article/explained/explained-sci-tech/national-quantum-mission-why-india-has-a-lot-of-catching-up-to-do-9458086/>



Tue, 16 July 2024

Two Indian space scientists honoured at international space scientists meet

Two Indian space scientists, Prahlad Chandra Agrawal and Anil Bhardwaj, were honoured on Monday evening with prestigious awards by the Committee on Space Research (COSPAR), the world's first scientific body dedicated to space science research.

Agrawal, one of the seniormost space scientists in India and a retired professor in the Department of Astronomy and Astrophysics at the Tata Institute of Fundamental Research, received the Harrie Massey Award at the 45th COSPAR scientific assembly, which opened in Busan, South Korea, on Monday. The award citation said the Harrie Massey Award recognises outstanding contributions to space research in which a leadership role is of particular importance.

Anil Bhardwaj, director of the Ahmedabad-based Physical Research Laboratory, was awarded the Vikram Sarabhai Medal, which honours outstanding space science research in developing

countries. This medal was instituted jointly by COSPAR and the Indian Space Research Organisation (ISRO).

Along with a medal and citation, the award for Agrawal also involves naming of a minor planet after the scientist. Agrawal, best known for his work in X-ray astronomy, led the AstroSat programme, India's first multiwavelength astronomy satellite, which was launched in 2015 and is still under operation. Astrosat observations have been cited in over 300 research papers, a statement said. He was also involved in the Chandrayaan-1 mission.

Bhardwaj, director of PRL since 2017, specialises in planetary space sciences and solar system exploration. He has been a key player in all of ISRO's recent scientific missions, including Chandrayaan, Mangalyaan, and the Aditya-L1 missions.

The Committee on Space Research, one of the largest forums for space scientists, was established in 1958, immediately after the launch of the first-ever satellite by the then Soviet Union in 1957. It holds its scientific assembly every two years, attracting between 2,000 and 3,000 scientists worldwide.

<https://indianexpress.com/article/technology/science/indian-space-scientists-international-meet-award-prahlad-agarwal-anil-bhardwaj-9456148/>



Thu, 18 July 2024

What is dual-tower solar thermal plant, that could boost efficiency by 24%

China has unveiled the world's first dual-tower solar thermal power plant, which utilises an innovative design to significantly improve energy efficiency, according to a report by state-run China Global Television Network.

Located in Gansu Province, the plant features two 200-meter tall towers, each surrounded by nearly 30,000 mirrors that form overlapping circles to focus sunlight onto the towers.

This dual-tower configuration is a key innovation that sets this plant apart from traditional solar thermal facilities.

"The mirrors in the overlapping area can be utilized by either tower," explains plant project manager Wen Jianghong. "This configuration is expected to enhance efficiency by 24 percent under the same boundary conditions".

The concentrated sunlight heats water inside the towers, generating steam that drives turbines to produce electricity.

Unlike conventional thermal power plants, this design incorporates molten salt storage, which acts as a thermal battery. The molten salt retains extra heat collected during the day and releases it at night, allowing the plant to generate power continuously.

The mirrors used in the plant are made of specialized materials that can achieve a remarkable 94% reflection efficiency.

Additionally, the mirrors are programmed to automatically track the sun's movement, concentrating the rays on the eastern tower in the morning and adjusting westward in the afternoon .

This innovative dual-tower design has the potential to be scaled up even further. “The system also has the potential to involve multiple towers for even greater efficiency gains,” the project manager noted.

The Gansu plant is part of a larger clean energy complex that will integrate solar, thermal, and wind power to generate over 1.8 billion kilowatt-hours of electricity annually while avoiding 1.53 million tons of carbon emissions, CGTN reported .

China's pioneering work in solar thermal technology represents a significant advancement in the global pursuit of sustainable energy solutions.

<https://indianexpress.com/article/technology/science/what-is-dual-tower-solar-thermal-plant-china-worlds-first-9459999/>



Wed, 17 July 2024

Searching for LUCA, the first life-form from which all other life descended

The origin of life on the earth is one of the world's most enduring mysteries. There are a number of competing theories but all of them lack conclusive proof. Nonetheless, scientists widely believe a combination of geological, climatic, and chemical processes gave rise to the building blocks of life.

In the 1920s, Alexander Oparin and J.B.S. Haldane independently proposed their origin theories — the first of their kind. In 1924 and 1929, Oparin and Haldane respectively suggested the first molecules making up the earliest life forms gradually self-organised from a “primordial soup” in a young earth's tempestuous, prebiotic environment. This idea is today called the Oparin-Haldane hypothesis.

Researchers have also conducted biochemistry experiments and found evidence to support this hypothesis. A particularly famous one was the Miller-Urey experiment in 1952, in which University of Chicago researchers Stanley Miller and Harold Urey showed that in the right conditions, inorganic compounds could give rise to complex organic compounds. Miller and Urey mixed methane, ammonia, and water, and when they applied a strong electric current — like a lightning strike might have — the mixture contained amino acids, the building blocks of proteins.

They reported their discovery the very next year in the journal *Science*. While we have evidence today that the earth's environment then may not have been much like what the experiment presumed to mimic, the very fact that amino acids could be created in a broth of inorganic

molecules was groundbreaking. Other researchers have proposed other theories about the origin of life.

A particularly prominent one is that meteorites from space could have brought the building blocks of life, sustained by discoveries on the earth as well as out there. In August 2019, French and Italian scientists reported discovering extra-terrestrial organic material 3.3 billion years old whereas Japan's Hayabusa 2 mission to the asteroid Ryugu indicated the presence of more than 20 amino acids there.

LUCA and the molecular clock

As mysteries go, a close second to the origin of life is how life-forms evolved to produce the rich diversity we see around us today. Researchers believe all the three branches of life — bacteria, archaea, and eukarya — originated from a single cell, called the last universal common ancestor (LUCA).

There is no fossil evidence to support the existence of LUCA, but the fact that modern genomes share so many features provides some insights. An important concept that allows scientists to reconstruct the 'tree of life' is the theory of the molecular clock. Molecular biologist Emile Zuckerkandl and biochemist Linus Pauling proposed it in the 1960s and biologist Motoo Kimura subsequently improved it.

According to a simplified version of the theory, the rate at which mutations are added or removed from a population's genome is proportional to the rate of acquiring new mutations, which is constant. Later studies also found that the mutation rate varies between species. Using these two facts, researchers developed a way to estimate how much time could have passed between two evolutionary events.

To calibrate the molecular clock to a particular rate of mutations, researchers establish links between a genome with known events, such as the 'date' on which the first mammal evolved or with the age of certain fossils. These links act like temporal benchmarks. Thanks to the large number of genome sequences and fossils of various organisms as well as the computing power available today, researchers routinely use the molecular clock to understand the evolution of various life-forms on the earth through time.

Which is older: LUCA or fossils?

In a recent paper in the journal *Nature Ecology and Evolution*, researchers at the University of Bristol and Exeter in the U.K. constructed a phylogenetic tree of 350 bacterial and 350 archaeal genomes. Then, using a molecular clock, the team estimated when LUCA could have originated: around 4.2 billion years ago, just 300 million years after the earth itself formed.

The team also reported LUCA may have had a small genome, of some 2.5 million bases and encoding around 2,600 proteins, all just enough to help it survive in a unique environmental niche. The team also suggested the metabolites produced by LUCA — compounds produced as a result of its metabolism — could have created a 'secondary' ecosystem in which other microbes could have emerged.

Importantly, the origin of LUCA by 4.2 billion years significantly pre-dates previous suggestions about the origin of life on the earth. For context, researchers have found fossil records of the

earliest life-forms in the Pilbara Craton in western Australia, one of the few places on the planet where archaean rocks are exposed aboveground and accessible. Studies of these fossils have suggested the life that lived on the rocks emerged around 3.4 billion years ago. The current study on the other hand pushes this date back by almost a billion years, almost on the heels of the birth of our planet itself. The researchers also found some reasons to believe LUCA may have had genes responsible for immunity, suggesting it had to fight off viruses.

Taken together, the findings are tremendously significant not just for understanding how life emerged and evolved on the earth: they also speak to our ability to look for similar forms of life across the universe. The insights into evolution they provide will also give a significant fillip to human ambitions to engineer synthetic organisms for various industrial, chemical, and biological processes on the earth as well as to create or moderate ecosystems on other planets in future.

<https://www.thehindu.com/sci-tech/science/searching-for-luca-the-first-life-form-from-which-all-other-life-descended/article68409763.ece>



Thu, 18 July 2024

ISRO's Chandrayaan 3 team wins prestigious IAF World Space Award 2024

New Delhi: On 23 August 2023, India made history by becoming the fourth country in the world to successfully execute a soft, controlled landing on the surface of the Moon, after USA, Russia and China. The remarkable achievement by ISRO demonstrated India's capabilities of delivering a payload to the lunar surface at a time and place of its choosing. The International Astronautical Federation (IAF) has recognised the Chandrayaan 3 team for its exceptional impact to the progress of world space activities, with the prestigious World Space Award 2024.

The Chandrayaan 3 team will be celebrated at the upcoming International Astronautical Congress 2024, which is scheduled to be held in Milan in mid October, 2024. In a statement, the IAF has noted, "Chandrayaan 3 mission by Indian Space Research Organisation exemplifies the synergy of scientific curiosity and cost-effective engineering, symbolizing India's commitment to excellence and the vast potential that space exploration offers humanity. Rapidly unveiling previously undiscovered facets of the Moon's composition and geology, the mission stands as a global testament to innovation. Achieving a historic milestone, Chandrayaan 3 becomes the first to touch down near the lunar South Pole, showcasing both aspiration and technological prowess on an international scale."

The awards won by Chandrayaan 3

The extraordinary achievement of Chandrayaan 3 has bagged the mission a number of awards, including top prize of the Astro Awards 2024, awarded by science communicator Tim Dodd for the most innovative, important and inspirational space mission of 2023, the Lief Erikson Lunar Prize

by the Exploration museum in Husavik, Iceland for a significant achievement in lunar exploration and the 2024 John L Swigert Jr award that celebrates excellence in space endeavours by the US-based Space Foundation. The Indian National Space Promotion and Authorization Center (IN-SPACe) and Indian Space Association (ISPA) have together recognised the contribution of IIT Bombay to the mission with the Chandrayaan 3 award.

<https://www.news9live.com/science/isros-chandrayaan-3-team-wins-prestigious-iaf-world-space-award-2024-2621774>



Thu, 18 July 2024

ISRO's Chandrayaan 2 orbiter dodges South Korea's Danuri spacecraft in Moon orbit

The Indian Space Research Organisation (ISRO) has coordinated closely with the Korea Aerospace Research Institute (KARI) to ensure the safety of their respective assets in lunar orbit. ISRO's Chandrayaan 2 entered into lunar orbit on 20 August, 2019, and continues to study the Moon and its environment, apart from supporting the Chandrayaan 3 mission. KARI's Korea Pathfinder Lunar Orbiter (KPLRO), also known as Danuri, entered lunar orbit on 27 December, 2022, and continues to study the Moon.

Both the orbital spacecraft have captured images of the various landers that have reached the Moon. On 24 May, 2024, ISRO and KARI coordinated to prevent a close conjunction between the Chandrayaan 2 orbiter and Danuri. ISRO executed two orbit maintenance manoeuvres on the Chandrayaan 2 orbiter, to ensure that there was no possibility of a collision between the two spacecraft.

The skies of the Moon are getting increasingly populated by spacecraft from Earth, and ISRO coordinates closely with other space agencies to avoid any traffic jams in lunar orbit.

NASA's LRO, KARI's Danuri, and ISRO's Chandrayaan 2 orbiter frequently encounter each other, and ISRO has previously conducted collision avoidance manoeuvres (CAMs) to avoid conjunctions or close approaches with these spacecraft. The LRO has also captured Danuri streaking across the surface of the Moon below, during a close encounter earlier in the year.

ISRO is committed to safe and sustainable space operations

The high-speed encounters between orbital assets can introduce a tremendous amount of debris into orbit, that can be difficult to track or scrub, posing a hazard to future missions. Such manoeuvres ensure the safety of orbital regimes for future missions. ISRO conducts Space Object Proximity Analysis every day, ensuring that its satellites in Low Earth Orbit and Geostationary Orbit are safe.

ISRO has submitted documents on the decision criteria for CAMs in lunar orbit, as well as space debris mitigation for low-lunar orbit to the InterAgency Space Debris Coordination Committee (IADC).

<https://www.news9live.com/science/isros-chandrayaan-2-orbiter-dodges-south-koreas-danuri-spacecraft-in-moon-orbit-2621811>



Wed, 17 July 2024

Elena Geo Receives Pandit Deendayal Upadhaya Telecom Excellence Award for Advancing NavIC Chips

Elena Geo Pvt. Ltd., incubated at IIT Kharagpur in 2012, has been honoured with the prestigious Pandit Deendayal Upadhaya Telecom Excellence Award by the Government of India. The award, instituted by the Department of Telecommunications, recognizes outstanding contributions to the telecom ecosystem, specifically in telecom skilling, services, and manufacturing applications. Elena Geo was selected for this award for their exceptional work in developing NavIC-based devices and applications.

The core of Elena's achievement lies in the indigenous development of NavIC chips through sustained research and development efforts. Despite India currently lacking a semiconductor fabrication facility, the government has initiated several measures to establish a semiconductor industry, expected to materialize in the next 2-3 years.

The initial facility is projected to offer 28nm technology, but its quality certification and commercial success may take an additional year. In contrast, Elena has already developed a 12nm chip, significantly ahead of the anticipated timeline.

What is the company's contribution?

Elena Geo's contribution is a milestone in the development of NavIC chips, reducing the overall development time by three to four years. Their continuous R&D efforts are focused on advancing to 7nm chips in the coming years. This progress will enhance the capabilities of NavIC-based applications and expedite the effective utilization of the NavIC constellation by 3-4 years.

Importance of NavIC Chips

The importance of NavIC chips cannot be overstated. NavIC (Navigation with Indian Constellation) is an autonomous satellite navigation system developed by India, providing accurate positioning, navigation, and timing (PNT) information. NavIC chips are crucial for India's strategic independence in satellite navigation, reducing reliance on foreign systems like GPS. These chips enable a wide range of applications, from transportation and logistics to defence and disaster management.

Elena Geo's 12nm NavIC chip, launched on April 13, 2023, at an Indian Space Association event, is capable of processing all three facets of GNSS: Positioning, Navigation, and Timing. The launch was graced by General Anil Chauhan, Chief of Defence Staff, Dr SV Kamat, Chairman DRDO, Chief of Air Staff VR Chaudhary, and MD Bharat Shakti, Nitin Gokhale.

With an eye on future advancements, Elena Geo is poised to further enhance India's capabilities in satellite navigation, contributing significantly to the country's technological and strategic prowess.

<https://www.financialexpress.com/business/defence-elena-geo-receives-pandit-deendayal-upadhaya-telecom-excellence-award-for-advancing-navic-chips-3556376/>



Tue, 16 July 2024

GRSE Signs Rs 840 Cr Deal with NCPOR for Ocean Research Vessel

In a significant stride towards self-reliance in maritime technology, Garden Reach Shipbuilders and Engineers (GRSE) Ltd has secured a contract worth Rs 840 crore with the National Centre for Polar & Ocean Research (NCPOR).

This contract, signed on July 16, 2024, marks a major milestone for India's Aatmanirbhar Bharat initiative. The deal, inked in Goa by Cdr Shantanu Bose, IN (Retd), Director (Shipbuilding) at GRSE, and MM Subramaniam, Scientist I/C, Vessel Operation and Management at NCPOR, underscores the nation's growing capabilities in oceanographic research.

GRSE's expertise in constructing survey vessels, honed over nearly four decades, positions it well for this project. Notably, the shipyard has previously built the Marine Acoustic Research Vessel INS Sagardhwani and recently delivered the INS Sandhayak, the largest survey vessel built in India, to the Navy. This extensive experience will be leveraged in the design and construction of the new Ocean Research Vessel (ORV) for NCPOR.

About the ORV

The ORV will be an 89.50-meter-long, 18.80-meter-wide ship with a depth of 12.50 meters and a gross tonnage of 5,900 tons. It will achieve speeds of up to 14 knots and operate at depths of 6,000 meters. The vessel is designed for a variety of research tasks, including Underway Swath Multibeam and Geophysical Seismic surveys, CTD profiling, biological sampling, seabed sampling, and more. It will also support mooring and buoy operations, atmospheric observations, and the deployment of submersibles such as AUVs and ROVs. Scientists on board will have facilities for analytical work and data processing, making the ORV a comprehensive research platform.

Does China have a similar vessel?

Comparatively, China has made substantial investments in oceanographic research and vessel construction. China's fleet includes advanced research vessels like the Dongfanghong series, which are equipped with state-of-the-art technology for marine research. The Dongfanghong 3, for instance, is a large research vessel used for deep-sea exploration and has capabilities similar to those planned for India's new ORV.

These vessels play a crucial role in China's ambitious oceanographic research programs, which are part of the country's broader strategy to assert its influence in global maritime affairs.

About the Contract

The ORV contract is part of GRSE's broader efforts to become a global player in specialized vessels. The shipyard recently signed an agreement with the Government of Bangladesh for an advanced tug and is also constructing a dredger and multi-purpose cargo vessels for international clients. These projects, alongside the 18 warships being built for the Indian Navy, highlight GRSE's expanding portfolio and its contribution to India's maritime self-sufficiency.

<https://www.financialexpress.com/business/defence-grse-signs-rs-840-cr-deal-with-ncpor-for-ocean-research-vessel-3555585/>

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