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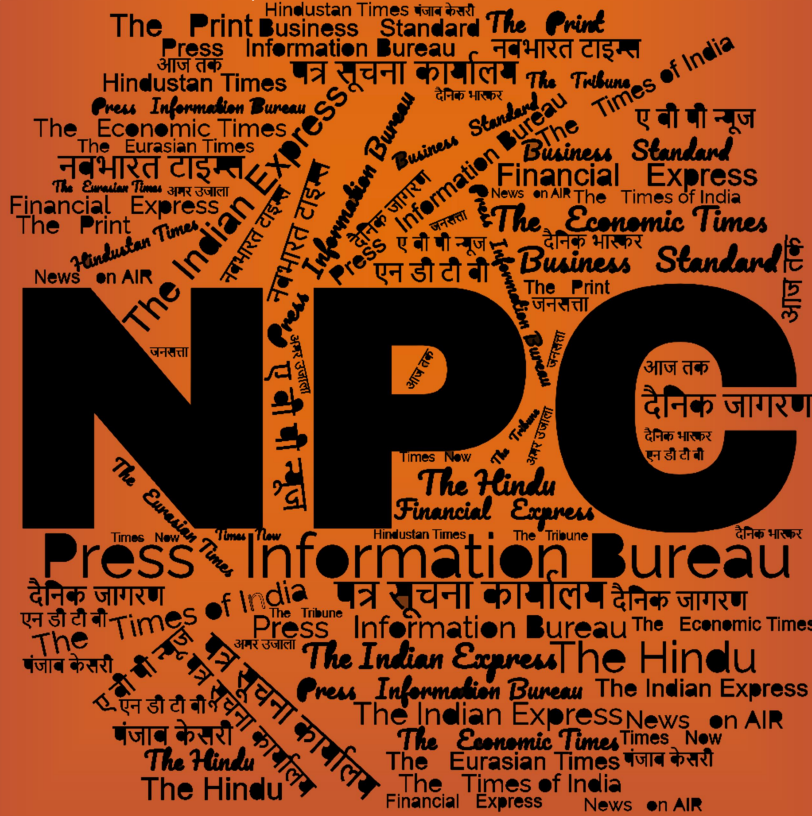
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Defence News

Defence Strategic : National/International



Press Information Bureau
Government of India

Ministry of Defence

Wed, 01 Mar 2023

Exercise Shinyuu Maitri: Indian Air Force Transport Aircraft Exercise with the Japanese Air Self Defence Force

The Indian Air Force (IAF) is participating in Exercise Shinyuu Maitri with the Japan Air Self Defence Force (JASDF). The exercise is being organised on the side-lines of the Indo-Japan Joint Army Exercise, Dharma Guardian, which is being conducted from 13 February 2023 to 02 March 2023 at Komatsu, Japan. The IAF contingent is participating in Exercise Shinyuu Maitri 23 with one C-17 Globemaster III aircraft. The Exercise is being conducted on 01 and 02 March 2023. The first phase of the exercise consists of discussions on transport operations and tactical manoeuvring, followed by the second phase of flying drills by IAF's C-17 and JASDF C-2 transport aircraft. The exercise gives an opportunity for the respective subject matter experts to interact and study each other's operational philosophies and best practices. The exercise shall also enhance mutual understanding and interoperability between the IAF and the JASDF.

Exercise Shinyuu Maitri 23 will be yet another step in the expanding defence cooperation between the two countries; as well as for the IAF to operate in diverse environments across the globe. The exercise is being conducted at a time when the IAF's heavy lift transport aircraft fleet is also taking part in Exercise Desert Flag VIII in UAE and Exercise Cobra Warrior in the UK.

<https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1903417>

mint

Wed, 01 Mar 2023

Cabinet Okays Procurement of 70 Basic Trainer Aircraft for Rs 6,828 crore

The Cabinet Committee on Security (CCS) chaired by Prime Minister Narendra Modi on Wednesday approved the procurement of 70 HTT-40 Basic Trainer Aircraft from Hindustan Aeronautics Limited (HAL) for the Indian Air Force at a cost of ₹6,828.36 crore.

The aircraft will be supplied over a period of six years, the Ministry of Defence said in a statement.

“The Cabinet Committee on Security (CCS) chaired by Prime Minister Shri @narendramodi has approved procurement of 70 HTT-40 Basic Trainer Aircraft at the cost of 6,828.36 crores,” Defence Minister Rajnath Singh said on Twitter.

The defence ministry said the HTT-40, produced by state-run aerospace major Hindustan Aeronautics Ltd, is a turboprop aircraft designed to have good low-speed handling qualities and provide better training effectiveness.

“This fully aerobatic tandem seat turbo trainer has air-conditioned cockpit, modern avionics, hot re-fueling, running change over and zero-zero ejection seats. The aircraft will meet the shortage of basic trainer aircraft of IAF for training of newly inducted pilots. The procurement will include associated equipment and training aids including simulators,” the ministry said.

“Being an indigenous solution, the Aircraft is configurable for upgrades to incorporate the futuristic requirements of the Indian Armed Forces,” it added.

The defence minister said the procurement decision will open new opportunities for hundreds of MSMEs (Ministry of Micro, Small and Medium Enterprises) and create thousands of jobs.

“It is a significant step towards strengthening India’s self-reliance in defence,” he said.

The HTT-40 contains approx. 56% indigenous content which will progressively increase to over 60% through indigenisation of major components and subsystems.

“The HAL would engage Indian private industry, including MSMEs, in its supply chain. The procurement has the potential to provide direct employment to approx. 1,500 personnel and indirect employment for up to 3,000 people spread over more than 100 MSMEs,” it said in a statement.

The acquisition of the HTT-40 provides fillip to the Indian Aerospace Defence ecosystem and boosts efforts towards ‘Aatmanirbhar Bharat’, it added.

<https://www.livemint.com/news/india/cabinet-okays-procurement-of-70-basic-trainer-aircraft-for-rs6-828-crore-11677681200670.html>



Thu, 02 Mar 2023

CCS Clears Rs 10k cr Training Platforms

The Cabinet Committee on Security (CCS) chaired by Prime Minister Narendra Modi on Wednesday approved the acquisition of critical training platforms for the Navy and the Indian Air Force (IAF) — including three cadet training ships from the Larsen & Toubro Limited (L&T), and 70 Hindustan Aeronautics Limited (HAL)-made HTT-40 Basic Trainer Aircraft.

As per the defence ministry, the CCS accorded approval to sign a contract with L&T for the acquisition of three cadet training ships worth Rs 3,108.09 crore.

The ships will be procured under the Buy Indian-IDD (indigenously designed, developed and manufactured) category of the defence acquisition procedure—the manual governing all defence capital procurements.

The delivery of ships is scheduled to start from 2026 and will be used in the training of officer cadets, including women, at sea after their basic training to meet the future requirements of the Indian Navy, the defence ministry said in a statement.

“The ships would also provide training to cadets from friendly countries with the aim to strengthen diplomatic relations,” the ministry said, adding that the ships can also be deployed for evacuation of people and humanitarian assistance and disaster relief (HADR) operations.

The ships will be constructed at L&T shipyard in Kattupalli, Chennai, and the project is estimated to generate an employment of 22.5 lakh man-days over a period of four-and-half years.

A senior officer of the Navy explained that training on Cadet Training Ships form the very foundation of a sea-going officer.

The CCS also approved the procurement of 70 HTT-40 Basic Trainer Aircraft from HAL for the IAF at a cost of Rs 6,828.36 crore. It will be supplied over six years.

The HTT-40—a tandem seat trainer has an air-conditioned cockpit, modern avionics, hot refuelling, running change over and zero-zero ejection seats.

“The procurement will include associated equipment and training aids including simulators. Being an indigenous solution, the Aircraft is configurable for upgrades to incorporate the futuristic requirements of Indian Armed Forces,” the defence ministry said.

As per the defence ministry, the HTT-40 has about 56% indigenous content which will progressively increase to over 60% through indigenisation of major components and subsystems in the future.

<https://indianexpress.com/article/india/ccs-approves-procurement-of-70-basic-trainer-aircraft-for-rs-6828-cr-8473997/>

THE ECONOMIC TIMES

Thu, 02 Mar 2023

Army Seeks to Buy 310 Indigenous Advanced Towed Artillery Gun System

The Indian Army has moved a proposal to acquire indigenous Advanced Towed Artillery Gun System (ATAGS) that can be deployed at high altitude areas and fill critical capability gaps.

A proposal to acquire 310 such towed guns is expected to be cleared by the defence ministry, following which orders can be placed, people aware of the development said.

Designed by DRDO to replace the Bofors towed guns that are the current mainstay 155 mm artillery system in service, ATAGS has been extensively tested by the army in different terrain, from desert areas to high altitude ranges in Sikkim, and have been declared fit for induction.

These howitzers are to be produced by Bharat Forge and Tata Defence and Aerospace.

If the normal course of procurement is followed, the two companies - which are developmental partners of DRDO - will be invited to submit commercial bids. The lowest bidder would likely get 60% of the order and the other company would get the balance, provided it agrees to match the lowest price bid.

High altitude performance of the guns is an important factor given the Ladakh border crisis with China. Among the tests conducted by the army were sustained firing drills using just the backup battery at heights of over 13,000 feet and checking performance at extremely low temperature.

NATO standard guns have a chamber size of 23 litres, while the ATAGS is designed for 25 litres, giving it a slightly extended range of 48 km. Given its non-standard chamber, these guns may require bespoke ammunition as the extended size exerts extra strain on current ammunition.

Among the tests conducted were direct fire in day and night on tank-sized targets, sustained firing of 60 rounds per hour, tests for five round bursts and a rapid-fire rate of firing.

While commercial offers are yet to come in, it is estimated that the guns would cost at least Rs 18 crore per piece.

<https://economictimes.indiatimes.com/news/defence/indian-army-to-buy-307-atags-howitzers-for-deployment-along-china-pak-border/articleshow/98340697.cms?from=mdr>



Thu, 02 Mar 2023

Top Navy Meet to be held on Board INS Vikrant

Defence minister Rajnath Singh will on March 6 address the inaugural session of a top navy meeting on board India's first indigenous aircraft carrier INS Vikrant, with the move bringing into sharper focus the country's steps towards achieving self-reliance in the defence manufacturing sector, officials familiar with the matter said on Wednesday.

Singh, Indian Navy chief Admiral R Hari Kumar, Western Naval Command chief Vice Admiral Dinesh Tripathi, and other top officials will board the aircraft carrier at Goa to attend the biannual naval commanders' conference, said one of the officials cited above, asking not to be named. Only the opening day of the five-day conference will be held at sea, he said.

The discussions at the conference will cover issues related to operations, combat readiness, logistics, training, human resource development, jointness and indigenisation, said a second official, who also asked not to be named. The developments in the Indian Ocean region, where China seeks to increase its presence, are also likely to be discussed, the officials said.

Rarely are such top conferences held on board warships. In December 2015, Prime Minister Narendra Modi chaired the combined commanders' conference on board INS Vikramaditya, India's other aircraft carrier, off the Kochi coast. That was the first time the combined commanders' conference, involving the top brass of the three services, was held on board an aircraft carrier. Modi has been in favour of big events being held outside the national capital.

The naval commanders' conference is being held on board INS Vikrant six months after the aircraft carrier was commissioned into the navy.

“The development brings into focus the manifestation of the navy’s long-term maritime strategy by showcasing the India-designed and built INS Vikrant,” said former navy chief Admiral Arun Prakash (retd).

Flight trials are currently being conducted on INS Vikrant. In February, a prototype of the naval version of the locally made light combat aircraft (LCA) and the Russian-origin MiG-29K landed and took off from the aircraft carrier for the first time.

The French Rafale M fighter has edged out the American F/A-18 Super Hornet in a direct competition to equip the navy with 26 new deck-based fighters for INS Vikrant, as reported by HT last December. The Rafale is manufactured by Dassault Aviation while the Super Hornet is a Boeing product.

The 26 fighters that the navy plans to buy are only a stopgap until the country develops its own twin engine deck-based fighter (TEDBF). The first TEDBF prototype could make its maiden flight by 2026 and be ready for production by 2031, the officials said.

Vikrant, which has 76% indigenous content, will operate an air wing consisting of 30 aircraft including the new fighters, MiG-29Ks, Kamov-31 choppers, MH-60R multi-role helicopters and advanced light helicopters. INS Vikramaditya operates MiG-29K fighters.

The 45,000-tonne Vikrant was built at Cochin Shipyard at a cost of ₹20,000 crore. Only the US, the UK, Russia, France and China have the capability to build aircraft carriers this size. It has been named after aircraft carrier INS Vikrant, which was operated by the navy from 1961 to 1997. A second indigenous aircraft carrier to project India’s maritime power in the far seas is also on the navy’s radar.

INS Vikramaditya was bought second-hand from Russia for \$2.33 billion. The navy has been arguing it needs three such floating airfields given its vast area of interest.

Vikrant is the fourth aircraft carrier to be operated by the Indian Navy -- the first Vikrant (British origin) from 1961 to 1997, INS Viraat (British origin) from 1987 to 2016, and INS Vikramaditya 2013 onwards.

<https://www.hindustantimes.com/india-news/top-navy-meet-to-be-held-on-board-ins-vikrant-101677698748543.html>



Wed, 01 Mar 2023

Five S-400 Regiments Expected to be Delivered by Early-2024

Deliveries of five regiments of S-400 air defence systems under a \$5.43 billion deal with Russia are expected to be completed by year end or early 2024, according to official sources. However, issues of delayed payments as well as insurance and reinsurance remain major stumbling blocks

delaying deals in the pipeline, an issue that would be in focus during Russian Foreign Minister Sergey Lavrov's talks with his Indian counterpart S. Jaishankar on the sidelines of the G-20 Foreign Ministers meeting taking place just after the first anniversary of the ongoing war in Ukraine.

Delivery of the third S-400 regiment has been completed, as acknowledged by Russia's Ambassador to India Denis Alipov earlier this month, which leaves the deliveries of two more regiments. The second and third regiments saw delays of a few months. There have been delays in "milestone payments".

The three regiments are deployed along the Northern, Eastern and western borders, sources said.

In July 2019, the Union government said in a written reply in Parliament that S-400 deliveries were "likely to be made by April 2023". In August 2022, speaking at the Army Expo in Moscow, the CEO of Russia's Rosoboronexport Alexander Mikheyev had said that they would deliver all five S-400 regiments to India by late 2023.

Meanwhile, the Indian Navy's Kilo class submarine, INS Sindhuratna, which just secured an extension of life in Russia, could not be brought back due to transportation issues. The initial plan was to move it by a transport dock ship directly from Russia, which didn't materialise, following which the Navy tried to transport the submarine by sea to Norway and then via a transport dock to India, which also didn't materialise, sources said. It will now sail on its own, making port calls along the way, it has been learnt.

Officials had acknowledged that transportation and finding cargo carriers outside the purview of sanctions and their insurance has been a major issue. Insurance and reinsurance is under discussion, also to avoid cargo ships under sanctions, as reported by The Hindu earlier. On this, diplomatic sources stated that most of the shipments being used were increasingly Russian.

India has contracted five S-400 regiments under a \$5.43 billion or ₹40,291 crore deal as per a conversation rate of ₹74.2 against the dollar at the time, signed in October 2018. The deal has been delayed from the start over payment issues. With the looming threat of U.S. sanctions under CAATSA (Countering America's Adversaries Through Sanctions Act), the two sides had worked out payments through the rupee-rouble exchange. The delivery schedule was slightly delayed following delays in making the 15% advance of the \$5.43 billion when the deal was signed, as it was to be executed in the rupee-rouble method.

The payments troubles compounded after Russia was shut out of the global SWIFT system for money transfers. India and Russia have agreed to conduct payments through the rupee-rouble arrangement after trying payments in euros as well. With several big ticket deals under implementation, there are a large volume of payments to be made and discussions are continuing on both sides to resolve it.

Speaking at a seminar earlier this month, Mr. Alipov said that the vostro accounts had been opened and the mechanism of the rupee-rouble trade has been established, and it's now a matter for banks to use it, while terming many Indian banks as "overcautious" for fear of any secondary sanctions from the U.S.

<https://www.thehindu.com/news/national/five-s-400-regiments-expected-to-be-delivered-by-early-2024/article66568964.ece>

India Looks to Ink Defence Pact During Italian PM's Visit, Cautions Rome Against Selling Weapons to Pakistan

With India having lifted the ban on Leonard, the Italian arms giant, New Delhi and Rome are working towards a strategic defence agreement during the visit of Prime Minister Giorgia Meloni, beginning tomorrow.

Meloni, who is chief guest at the Raisina Dialogue, and also, the inaugural speaker, will be meeting Prime Minister Narendra Modi on Thursday. Highly placed sources confirmed that efforts to have a defence agreement with Italy are on and hopefully, it will be concluded while Meloni is in Delhi.

Defence cooperation between the two countries were at a low ebb after the Westland helicopter scam, and A.K. Antony then banned any dealings with Leonardo, of which Westland is a part.

The ban became a major difficulty for India, primarily because there are only a few countries that India can do business in the defence field with, and eliminating Leonardo reduced options. The ban was lifted recently by the Modi government, though the investigations are still continuing. Lifting the ban has also given India some leverage as Pakistan is keen to buy weapons from Leonardo, particularly torpedoes. Some time ago, Rear Admiral Abdul Samad, a Pakistani naval officer, had visited Leonardo's Torpedo Production Centre for demonstrations of the A244/S Mode light-weight torpedoes for the Pakistan Navy, which wanted to buy eight. Now, India has additional leverage. Leonardo officials were briefed by the Indian defence ministry officials and told that selling weapons to Pakistan wasn't a good idea.

The Indo-Italian partnership is getting to a new high. Not only is Meloni coming over, but also, the deputy prime minister and foreign minister of Italy, Antonio Tajani. Tajani is also here this month and will be meeting external affairs minister S. Jaishankar.

<https://www.timesnownews.com/india/india-looks-to-ink-defence-pact-during-italian-pms-visit-cautions-rome-against-selling-weapons-to-pakistan-article-98340420>



India's Nuclear Submarine Secrecy: Boosting Naval Firepower

By Manish Kumar Jha

India's top secret nuclear submarine project achieved another milestone with the launch of a second ballistic missile submarine, the Arighat. India's quest for the indigenous nuclear

submarine started when the Indian government approved the construction of six nuclear-powered attack submarines in 2015. Nuclear submarines form the strategic part of India's 'no first use' policy for nuclear weapons. It works as a guarantee of an 'assured retaliation' or a second strike, preventing any surprise first strike by a nuclear-armed adversary.

So, what is the full spectrum of India's nuclear-submarine architecture? India's submarine fleet is based on the east coast of Visakhapatnam and on the west coast of Mumbai. Also, the submarines in the nuclear class have not been documented in photographs. So, it is largely based on the experts' analysis through the structural similarities and technical expertise. Primarily, India's nuclear-powered submarine program is managed by the Defence Research and Development Organisation (DRDO), the Department of Atomic Energy (DAE), and the Indian Navy at Visakhapatnam.

Nuclear submarine: SSN and SSBN

The SSN, commonly referred to as the fast attack submarine, is known as Submersible Ship Nuclear. The SSBN stands for Submersible Ship Ballistic Missile Nuclear.

The common factor between these two types of the submarine is nuclear reactors which power the entire submarine. While the major difference lies in the design and the types of weapons.

In terms of firepower, the SSBN is designed to carry long-distance missiles while the SSN is designed for short-range assailant attacks. The SSN is also designed for carrying out surveillance and intelligence missions.

Arihant-class submarines

The Arihant-class is named after the country's first nuclear-powered submarine — INS Arihant. The Arihant-class is defined as a nuclear-powered ballistic missile submarine for the Indian Navy.

The first of these SSBNs, the INS Arihant (S2), was launched in July 2009. The INS Arihant was commissioned into the Indian Navy in August 2016. The second in the series, S3 (INS Arighat), is in the final stage of sea trials. The last in the series is the S-4 submarine. The S-4 remains highly classified. The construction of these two remaining two Arihant-class submarines is undergoing at the shipbuilding center in Vadodara in Gujarat.

The Arihant-class submarines are being developed and built indigenously under the Advanced Technology Vessel (ATV). India took steps to operationalize its nuclear triad by commissioning its first ATV submarine, the INS Arihant, in 2016 at a cost of \$12 billion. The four SSBNs carry shorter-range K-15 and larger K-4 ballistic missiles. The K-15 has a range below 1000 km.

The naval arm of the nuclear triad is significant for India given its no-first-use (NFU) nuclear posture.

The SSN-Chakra

India operated one SSN — the INS Chakra-2. Basically, the INS Chakra was an Akula-class attack boat, which was on a 10-year lease from Russia.

India leased two SSN-class nuclear-powered submarines from Russia. In March 2019, India signed for a second nuclear-powered attack submarine, named — Chakra-3—which is under modification in Russia. The Chakra-III is expected to be delivered to the Indian Navy by 2025.

The biggest advantage of the nuclear-powered submarine is the ability to remain submerged indefinitely. For example, an 80MW pressurized water reactor (PWR) submarine can stay submerged for many months without the risk of detection. While conventional diesel-electric submarines can only stay for a limited period. Such conventional submarines need to come up to the surface to release carbon dioxide produced by the generator.

In the prevailing scenarios in the Indian Ocean and beyond, India is perusing the prospect of leasing another SSN from Russia. The submarine deployment in the Indian Ocean has been proven as an effective deterrence against Chinese warships. However, the Indian navy is phasing out its conventional submarines. And, India currently has only one Akula class SSN on lease while one more is expected to come on the lease, not before 2025.

<https://www.financialexpress.com/defence/indias-nuclear-submarine-secrecy-boosting-naval-firepower/2996559/>



Wed, 01 Mar 2023

By Embracing the Private Sector, India's Military-industrial Complex is now on the Right Track

By Raj Shukla

Aero India 2023 held earlier this month in Bengaluru was reported to have firmed up 266 partnerships, 201 MOUs, 53 major announcements, nine product launches and a dozen transfer of technologies. There has also been some scepticism with regard to focus and outcomes. The mega-event is a good occasion for sombre reflection on Project Aatmanirbharta in Defence (Project AID).

Self-Reliance: Then And Now

Self-reliance was always a part of the Indian state's lexicon in defence. But the manner in which it panned out in practice, was not quite aatmanirbhar. The principal stakeholders - the armed forces were at best onlookers, the private sector was categorically excluded, and the startup experiment had not even been seeded.

DRDO and defence PSUs monopolised the main effort. It was a mixed bag really – dotted with a few successes, but in the main, one of sub-optimality and inefficiencies. It led to a predicament whereby India became one of the largest importer of arms (accounting for 11 percent of global arms sales) while exposing the vulnerability of our supply chains.

The aatmanirbharta initiative of the Modi government, having absorbed the lessons of the earlier experiment, is a well thought through concept, fleshed out in minute detail and roadmapped with practical schemes. Additionally, apex level political commitment is there for the world to see.

Goodbye To Sarkari Monopolies

The armed forces are integral participants, the DRDO and DPSUs are being restructured to address the new realities, the private sector and the startup ecosystem in defence is enthused. Defence which was once viewed as an unproductive endeavour is now being seen as a tool for acquiring strategic heft and revenue generation. Challenges remain and saboteurs could still surface.

Startups have waded into emerging domains and in a short span of time, are now the beneficiaries of orders in a suite of technologies: Drone swarms, robotics, low-light imaging and electro-optical/infra-red systems. India's first startup to design semiconductors in defence could soon become a reality.

Zeus Numerix, riding on a Technology Development Fund (TDF) grant of Rs 5 crore, has built composite material water pumps for two frontline destroyers of the Indian Navy – INS Kolkata and INS Delhi. An Indian version of the Bayraktar TB-2, built by an Indian startup could find its way into military inventories in a couple of years.

The most significant attribute of Project AID is the respect accorded to “wealth creators”. For years, the private sector was willfully excluded: It could not be trusted with defence secrets and high-end strategic knowhow; so went the established wisdom. Industry-led design and development could soon, hopefully, deliver us an indigenous, light weight tank, the multi-role helicopter, low-orbit satellites and hypersonic glide vehicles.

Messaging To Foreign OEMs

The large presence of foreign original equipment manufacturers (OEMs) in Bengaluru, was proof enough of a growing belief that India is now a serious player in defence. These OEMs have also developed a healthy respect for Indian companies and startups.

To improve business confidence, bureaucratic delivery on political commitment and foreign confidence needs to improve. Languishing projects and unfulfilled promises - slow movement in the Defence Trade and Technology Initiative for example – key projects in MDA, Space Situational Awareness and Sectoral ISR, continuing to stall in the absence of clarity on budgetary leads and other systemic warps. The great potential of iCET (Initiative on Critical and Emerging Technologies), must not get lost in bureaucratise.

Foreign OEMs are also no longer in doubt that their business ambitions in India will have to be realised through Indian partners. The commitment of the Defence Minister to earmark three fourths of the defence capital outlay for 2023-24 (more than Rs 1 lakh crore) for domestic defence manufacturers is the surest indicator of the government walking the talk.

When it comes to the associated innovation system, too, it must be made clear that companies that land up with the big orders, must set aside a fixed percentage for local innovators. This will help the smaller, Indian players to integrate with the larger platforms and global supply chains. The way forward may be to do a capability gap survey and chart out a precise plan for vendor building.

Pathways For The Future

The central lesson coming out of Ukraine is that precisionary and data are the new engines of war. Data, algorithms and the miniaturisation of combat power (chips) seem to be powering the transition to digital combat. Project AID may like to draw up and focus on ten projects (micro

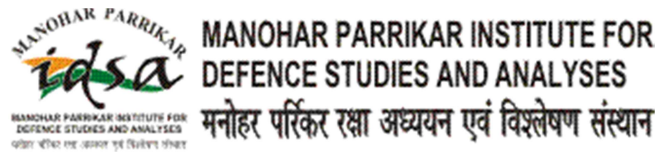
electronic cores, gimbals, connectors, lenses, variety of chips, AI stacks) that will enable the Indian military to make such a transition.

Under the overarching umbrella of IDEX–TDF (Innovations for Defence Excellence, Technology Development Fund), cross-functional teams must be constituted to drive such projects from concept to inventorisation.

Thought leadership to sketch futuristic pathways for Indian leveraging of the growing global defence markets, technology incubation, supply chain statecraft and life cycle costs, is the need of the hour. The larger purpose of Project AID, of course, is to develop a sophisticated strategic–military complex ; one that is tailored to the Indian genius, indigenous in content, global in connect, strategic in purpose and with business at the core.

From the foundational edifice now established, Project Aatmanirbharta can embrace only three trajectories in the future : a slow climb, a graduated rise or an upward zoom. The strategic guidance from the political apex is clear : let us try and reach for the moon. If the competing bureaucracies and stakeholders get the nitty gritty going, at the very least, we shall land amongst the stars.

<https://www.moneycontrol.com/news/opinion/by-embracing-the-private-sector-indias-military-industrial-complex-is-now-on-the-right-track-10181731.html>



Wed, 01 Mar 2023

Absorption of Emerging Technologies in Armed Forces

By Lt Col Akshat Upadhyay

Summary

Critical and Emerging Technologies (CETs) can be classified in terms of their use in war, i.e., as battlefield and over-the-horizon (OTH). Battlefield CET refers to those technologies that can be used for warfighting and used explicitly on the battlefield. OTH CET comprises technology which can be used in the non-kinetic domain and includes cyber-physical attacks, influence operations, big data analytics (BDA), among others. There is a need to rethink organisational structures in the Indian armed forces to optimally integrate CETs. Given that data is at the heart of CET, robust cyber security standards need to be put in place for data privacy and protection.

Introduction

The prototypes showcased at the recently concluded Aero India 2023 at Bengaluru are symptomatic of two major shifts underway within the Indian Armed Forces. The first is the move towards ‘Atmanirbharta’ or self-reliance, while the second is an added emphasis on critical and emerging technologies (CET). While self-reliance or indigenisation in defence has unlocked the entrepreneurial spirit of the Indian private sector and is essential for retaining the country’s strategic autonomy, a move towards mainstreaming CETs is equally important given the changed

nature of the battlefield facing India today. This Brief examines the importance of CETs in the military domain, the efforts undertaken by the Indian government and the Armed Forces in promoting the use of CETs and the optimum organisational structure for absorption of these technologies and finally recommends some steps that need to be undertaken so that these technologies can be utilised to their full potential.

Changed Nature and Character of War

It has become quite a cliché to talk about the changed character of war or HOW war is fought. The presumptive component is the unchanged nature of war or WHAT war entails. War, at its most basic and primal level, is understood as the calibrated use of violence to attain political objectives. It is taken for granted that at the foundational level this notion holds true, i.e., war is about violence and only the tools, organisation and application of violence for gaining political ends are bound to change. However, of late there has been a change in the way war is conceptualised. Warfare has become both non-contact and non-kinetic in its character and the nature of war has become diffused, i.e., violence is no longer the scaffolding on which war is visualised. This is due to a number of technological and historical factors. Due to the limited scope of this Brief, only the technological factors will be examined.

Three significant technological shifts have taken place since the end of World War II. Advances in semiconductor technology, creation of data through the process of digitisation and finally, systems integration have had a profound impact on the way war is imagined and fought. These three processes have combined to create a host of new technologies, collectively called critical and emerging technologies (CETs). The CETs include artificial intelligence (AI), quantum processing, advanced unmanned systems, internet of things (IoT) and cloud computing, among others. The common thread is electronics and data. Electronics and therefore, semiconductors, have become ubiquitous in the modern age.

Non-kinetic warfare, i.e., the use of non-violent methods of warfighting, has diffused with far-reaching effects. Disinformation and propaganda has become amenable to being individualised. Similarly, the dependence of countries on access to the latest electronics components for growth has created leverages for certain countries controlling chokepoints of the semiconductor supply chains. Export controls and outright bans can be used, again, as part of non-kinetic means of waging war. On the non-contact front, the precision revolution that started in the 1970s in the later stages of the Vietnam War and which reached its high point during the First Gulf war, has combined with the ongoing data revolution to create precise and deadly weapon systems supplemented by sensor-fusion, advanced intelligence, surveillance, target acquisition and reconnaissance (ISTAR) and the ability of joint fires without the need for massing forces. Both non-contact and non-kinetic means of warfighting are dependent on CETs.

Why are CETs Important?

CETs have become essential components in the warfighting domain due to the three shifts alluded to earlier. Advances in semiconductor technology has led primarily to generation of massive amounts of data. This has become possible due to the 'PC revolution' which led to computers being mainstreamed in citizens' homes, followed by the advent of smartphones, pioneered by Apple and finally the current phase, which is dominated by 'wearables' such as smart watches, and IoT devices like smart bulbs, speakers, cameras, etc. At every stage, the cost per unit of these devices has decreased exponentially. Then Intel Chief Executive Officer (CEO) Paul Otellini's 2013 prediction that the cost of personal computing devices will come down to as

low as US\$ 100 as sales rise exponentially, has indeed come true. Mainframe computers, for instance, initially costed tens of thousands of dollars since limited numbers were sold. He also predicted that the next generation of PCs would cost less than US\$ 1000 per unit with more than 300 million units being sold and the future generation of computing devices would further be priced at close to US\$ 100 per unit and sales estimated at 3 billion units.

While the global shipment of smartphones in 2022 was 1.2 billion units, the sale of tablets in the same period was 163.2 million units, making it a total of 1.36 billion units. These are the figures of only one year. There is a significant percentage of the global population which already has slightly dated mobile phones. As per the World Bank estimates, the global internet penetration, calculated as the percentage of individuals with an active internet connection, is close to 60 per cent. Also, the number of 'unique' mobile phone users in the world is now close to 5.5 billion.

These figures highlight two important points: the world is increasingly becoming more connected through platforms and that a staggering amount of data is being produced, stored and processed around the world in real-time. As per an estimate, data produced in 2022 was 2.5 quintillion bytes per day. This is ten followed by 30 zeros. All aspects of human activity including biometrics, social interactions, finances, entertainment, politics and ideologies are being moderated through these devices and platforms. The implications are wide. The possibility of affecting individuals across countries through influence, coordination and radicalisation are immense, creating vulnerabilities from a national security point of view. There are examples of election fraud and genocide by exploiting this connectivity. Similarly, civilian domains have been weaponised using non-kinetic tools of warfighting. Ban on Russian access to semiconductors, export controls against China in the fields of semiconductor manufacturing equipment (SMEs) and chips for AI, cyber-attacks against power grids and disinformation campaigns are some of the ways non-kinetic war is being waged by countries.

Four other advances due to the semiconductor revolution relate to the field of AI, quantum cryptography, precision munitions and sensor fusion/systems integration. The clustering together of increasing numbers of transistors within a single piece of chip has led to powerful processors such as graphics processing units (GPUs) and tensor processing units (TPUs) which have the capability of being 'trained' on vast amounts of data being generated, thereby creating stronger AI programmes. Similarly, the semiconductor revolution has also given rise to quantum cryptography which both holds the potential of ensuring impossible-to-hack communications as well as breaking erstwhile secure communications. Precision munitions have the potential to target specific platforms and personalities and avoid collateral damage on the battlefield. The lethality of precision munitions is enhanced by increasing fusion of sensors, where data from a number of analog and digital sensors is fused through standards and plug-and-play platforms, edge computing and use of AI for creating strike options for the commanders.

The fourth technological shift, systems integration, has been in the making for a while. Systems integration can be classified into two parts: within body and outside-body. Outside-body integration comprises innovations such as the combined-arms manoeuvres during World War II where different platforms such as tanks, infantry and steep-dive bombers like the Stukas were integrated into a single fighting force through organisation and introduction of radio communication. These were responsible for the blitzkrieg. Similarly, the navy and air forces have created formations where complementary capabilities fielded by different platforms are combined for battlefield effect, e.g., carrier battle groups (CBGs) and strike packages. These are held together by advances in communication and data integration where a command centre

(static or mobile) with an array of encryption, communication and decision-making tools coordinates the operations of various platforms.

Within-body systems integration is a relatively new phenomenon. It is based on the recognition that the capabilities of conventional platforms can be enhanced by replacing or adding enabler modules. For example, the same unmanned aerial system (UAS) could use different payloads for executing vastly different missions. Cameras, missiles, infrared sensors and even compatible communication modules can lead to the UAS acting as an ISTAR or kinetic platform or wingman to a manned fighter. This modularity has been made possible due to the semiconductor revolution. Similarly, several modernisation programmes around the world have taken the infantry soldier as a system, adding upgrades that may heighten his cognitive capabilities, enhance his firepower range and allow him to communicate to nearby in-situ assets .

Categories of CETs

There have been attempts to classify CETs into categories to increase understanding about these technologies and highlight their utility. One such attempt is by the United States National Defense University (NDU), which classifies CETs under four heads namely, perception, processing, cognition; performance and materials; communication, navigation and targeting; and manufacturing, logistics and supply chain. This Brief suggests another way of classification in terms of their use in war, i.e., as battlefield and over-the-horizon (OTH) CET. Battlefield CET refers to those technologies that can be used for warfighting and used explicitly on the battlefield. These include sensor fusion where data from analog and digital sensors is standardised and fed into a system generating a common operating picture (COP).

This data can be further used by creating multiple strike options using AI, similar to the ones being used by the Ukrainians in the ongoing conflict. Battlefield CETs also comprise advanced unmanned systems with multiple payloads such as infrared (IR) and/or light detection and ranging (LIDAR) sensors, combat cloud, edge computing, internet of military things (IoMT), space based ISR, electronic warfare (EW) and cyber warfare against military systems.

OTH CET comprises technology which can be used in the non-kinetic domain and includes cyber-physical attacks, social engineering, disinformation, influence operations, gene editing, big data analytics (BDA) and energy capture and storage. There are certain technologies which are common in both the sets, based on their usage since most are based on data and are dual-use in nature.

Acquisition of technologies for the Armed Forces is the first step towards operationalising them. The second and third steps, i.e., absorbing and scaling them, are more critical. Absorbing a particular technology within the Forces refers to the process of aligning the organisational structure with the technology for optimum results on the battlefield, in whatever manner it may be defined. Scaling refers to the mass production of the technology platforms so that it reaches the user in due time.

Matching Technology with Structure

The current organisational structure of the Indian Armed Forces has been created, conceptualised and honed to fight a particular form of warfare and in which the Forces have gained a professional edge. This form of warfare has certain attributes: focus on combined-arms operations, use of mechanised platforms in manoeuvre battles, emphasis on territory and/or attrition and hierarchical directives and orders. This is an ideal structure for fighting large-scale

conventional wars. The two most recent conflicts, i.e., Armenia–Azerbaijan and the ongoing Russia–Ukraine one, have thrown up radically different interpretations of the use of conventional force in achieving political objectives. While military force was used in the former to force a political outcome in Azerbaijan’s favour, the latter has highlighted the tenuous link between the use of violence and achieving political aims. As a result, one cannot discard the conventional warfighting paradigm.

However, there is a need to rethink organisational structures in terms of optimally integrating CETs. Certain steps have indeed been taken in this direction. For example, the Indian Army is in the process of inducting swarm drones into its mechanised forces, at the same time reported to be procuring close to 2,000 drones through a variety of manufacturers—400 for logistical support and around 1,500 for ISTAR purposes. Swarm drones, powered by AI and edge computing, have the capability to overwhelm enemy air defence systems, and saturate airfields and artillery gun concentrations, extending the range and target set of the force operating them.

However, the procurement of drones from multiple suppliers need to be coordinated in terms of software and firmware compatibility, standardised data formats, communication systems and cybersecurity. Swarm drones function on the presumption of autonomy, in selecting and neutralising targets. How much autonomy has been provided to the drones, whether it is limited only to collision avoidance and collaborative action in terms of recouping losses or is also extendable to the selection and neutralisation of targets, is a matter of conjecture.

For autonomous systems, a ‘man-on-the-loop’ as a failsafe measure always needs to be present. However, in a communication-contested environment, this may not always be the case. Serious discussion is, therefore, required on responsible AI and AI ethics. On the organisational front, there is a need to boost human autonomy by delegating actions to junior commanders and the structure of the forces needs to reflect this. Modular forces capable of point air defence (AD) and supplemented by micro UAVs for local ISR and plug-and-play wearable modules for a broader operational picture may be one of the ways that the future force may be conceived of.

Similarly, for absorbing AI, there is a requirement of a data standards policy that fulfils two criteria: convert analog data within the Services to digital and; collection, collation and storage of the data, preferably in consonance with the National Data Governance Framework Policy. In case of OTH CETs, the requirement is of collaborating with sister agencies for shaping common and reinforcing narratives, preventing information fratricide and knowledge sharing. Operations of this magnitude require certain capabilities of the Forces to be available in a supplementary manner. These are just some of the examples of major requirements for absorbing and then scaling technologies into the Armed Forces.

Recommendations

Root of Trust

Roots of trust are “highly reliable hardware, software and firmware components that perform specific, critical security functions. Since these are inherently trusted, they must be secure by design”. When translated into requirements for the military, this implies that all of the latest technologies and platforms being inducted into the Armed Forces must have roots of trust which are inviolable and rigorously vetted by designated agencies. All electronics components must be checked for hardware trojans and only certified components must be allowed to be used in the military.

There have been instances in the US military where spurious chips in fighter jets have led to the death of US Air Force officers. Similarly, the Russian military designates all electronics components through a centralised agency and stamps all components which can be checked through visual inspection. In the case of software, common cybersecurity standards need to be laid down and implemented stringently. This assumes added importance since the defence sector has seen an influx of private players increasing the importance of coordinating cyber security measures.

Commonalities

Exploiting commonalities of requirements between separate ministries will ensure that private companies reach economies of scale and are able to deliver in a more expedited time frame. For example, drone airframes and propulsion systems are required not only by the Armed Forces but also by the state police forces, central armed police forces (CAPFs), and by other departments and organisations like the Archaeological Survey of India (ASI), National and State Disaster Relief Forces (N/SDRF), the Ministry of Agriculture among others. Combining the common requirements of these ministries will create a much bigger customer base for companies rather than catering to piecemeal requirements. Also, defence companies can explore the consortium method where they can combine their strengths to ‘collaborate and compete’ rather than merely competing. The consortium method has been extremely successful in certain cases, e.g., MBDA (Matra, BAe Dynamics and Alenia)—a multinational consortium of missile production companies with participants from France, Italy and the United Kingdom (UK).

Project Managers

While the Project Managers (PMs) employed with the US Defense Advanced Research Projects Agency (DARPA) have a very wide charter, which includes scouting for talent in the science, technology, engineering and mathematics (STEM) fields internationally, there is a requirement of the forces appointing similar project managers, not limited to their in-house personnel, to scout for talent in universities across the country. The list of these universities does not need to be limited to the Indian Institutes of Technology (IITs) or the National Institutes of Technology (NITs) but can be widened to look at colleges in the Tier 2 and 3 cities. Apart from this, bright talent can also be on-boarded from a young age through leveraging the Atal Tinkering Labs and similar young science incubators.

The prime focus of the PMs must be talent search and then matching the talent with a given project within a laid-down timeline. Once prototyping has been done, the technology needs to be copyrighted by the Forces, then given to a private company for scaling and production. Efforts have been made in this direction by the Defence Research and Development Organisation (DRDO) through their Technology Development Fund (TDF) and the Department of Defence Production (DDP) through the innovations for defence excellence (iDEX) challenges, as well as the respective services’ innovation organisations such as the Army Design Bureau (ADB) and the Naval Indigenisation and Innovation Organisation (NIIO). There needs to be further coordination amongst these organisations with representatives from the private sector being on-boarded in advisory roles, something on the lines of the Defense Innovation Board (DIB) in the US.

Data Policies

Most CETs described in this Brief have data as their base. As mentioned earlier, there is an increasing trend towards digitisation, i.e., the process of creating data out of daily analog activities which allows organisations to process data and delve further into the functioning of the modern world. As a result, data privacy and protection have become critical, especially in the face of major cyber-attacks. Within the forces, there is a need for a data governance policy, preferably aligned with the national data governance policy framework, but also firewalled from public interfacing to prevent inadvertent leak of sensitive data. As a result, data standards need to be laid down, cloud centres need to be designated and physically protected, and finally effective cyber security measures need to be ensured. All these need to be created at the tri-services level so that common data standards can be used in future warfare for joint operations.

Conclusion

Technology absorption is a function of both the organisational structure and the technology itself. Neither can be effective without the other. Technologies and their enablers are themselves products of the zeitgeist or the social milieu in which they are conceptualised and formed. Therefore, attempting to induct or absorb technologies without a corresponding change in structures may not yield the desired outcomes. Therefore, it is imperative that serious debates be undertaken within the forces regarding the future force structures necessary for winning in the competition continuum.

<https://idsa.in/issuebrief/technologies-in-armed-forces-aupadhyay-010322>



Thu, 02 Mar 2023

Taiwan Military to get \$619 Million U.S. Arms Boost as China Keeps up Pressure

The United States has approved the potential sale of \$619 million in new weapons to Taiwan, including missiles for its F-16 fleet, as the island reported a second day of large-scale Chinese air force incursions nearby.

The arms sales are likely to further sour already tense ties between Washington and Beijing, which has repeatedly demanded such deals stop, viewing them as unwarranted support for democratically governed Taiwan, an island China claims as its own territory.

The Pentagon said on Wednesday the U.S. State Department has approved the potential sale to Taiwan of arms and equipment that includes 200 anti-aircraft Advanced Medium Range Air-to-Air Missiles (AMRAAM) and 100 AGM-88B HARM missiles that can take out land-based radar stations.

"The proposed sale will contribute to the recipient's capability to provide for the defence of its airspace, regional security, and interoperability with the United States," it said in a statement. Taiwan's defence ministry said the missiles would help "effectively defend the airspace to deal with threats and provocations from the Communist military" and would bolster defence stockpiles.

Raytheon Technologies (RTX.N) and Lockheed Martin (LMT.N) are the principal contractors, it added. China has sanctioned both companies for selling Taiwan weapons.

Taiwan has complained for the past three years or so of stepped-up Chinese military activities near the island as Beijing seeks to assert its sovereignty claims.

Taiwan reported on Thursday a second day of large-scale Chinese air force incursions into its air defence identification zone, with its defence ministry saying that during the last 24 hours it had spotted 21 aircraft.

China has said its activities in the area are justified as it seeks to defend its territorial integrity and to warn the United States against "colluding" with Taiwan, despite the anger this causes in Taipei.

Taiwan's defence ministry said the aircraft, 17 J-10 fighters and four J-16 fighters, had flown into the southwestern corner of Taiwan's air defence identification zone, according to a map the ministry released.

The J-10s, an older model that entered service two decades ago, flew closer to the Chinese coast than Taiwan's, while the J-16s, a much newer and more advanced fighter, flew northeast of the Taiwan-controlled Pratas Islands, the map showed.

The lightly defended Pratas are strategically located at the top of the South China Sea, and many of China's fly-bys happen nearby.

Taiwan's forces monitored the situation, including sending up its own planes, the ministry added, using the normal phrasing for its response to such Chinese incursions.

The ministry on Wednesday reported 19 Chinese aircraft flying in Taiwan's air defence zone.

None of the aircraft crossed the sensitive median line of the Taiwan Strait, which has served as an unofficial barrier between the two sides, but which China's air force has been flying over almost daily since staging war games near Taiwan last August.

Taiwan last reported a large median line crossing of Chinese aircraft on Friday, when 10 planes were involved.

China has not commented on recent activities near Taiwan. In January, China said it staged combat drills around the island to "resolutely counter the provocative actions of external forces and Taiwan independence separatist forces".

No shots have been fired and the Chinese aircraft have been flying in Taiwan's ADIZ, not in its territorial airspace.

The ADIZ is a broader area Taiwan monitors and patrols that gives it more time to respond to any threats.

Taiwan's government has repeatedly offered talks with China, but says the island will defend itself if attacked and that only the Taiwanese people can decide their own future.

<https://www.reuters.com/world/asia-pacific/taiwan-reports-21-chinese-air-force-planes-entered-its-air-defence-zone-2023-03-02/>

Taiwan Reports 21 Chinese Air Force Planes Entered its Air Defence Zone

Taiwan reported on Thursday a second day of a large-scale Chinese air force incursion into its air defence zone, with its defence ministry saying that in the past 24 hours, it had spotted 21 aircraft, as part of Beijing's ongoing military pressure campaign.

Taiwan, which China views as its own territory, has complained for the past three years or so of stepped-up Chinese military activities near the island as Beijing seeks to assert its sovereignty claims. China has said its activities in the area are justified as it seeks to defend its territorial integrity and to warn the United States against "colluding" with Taiwan, despite the anger this causes in Taipei. Taiwan's defence ministry said the aircraft, 17 J-10 fighters and four J-16 fighters, had flown into the southwestern corner of Taiwan's air defence identification zone, according to a map the ministry released.

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<https://indianexpress.com/article/world/taiwan-reports-second-day-of-large-chinese-incursion-into-its-air-defence-zone-8474468/>

ThePrint

More Work Needed on AUKUS Technology Sharing – British, Australian Officials

More work is needed to break down bureaucratic barriers to technology sharing in the second pillar of a trilateral defense agreement between Australia, Britain and the United States, British and Australian defense officials said on Wednesday. Shimon Fhima, director of Strategic Programmes at Britain's Ministry of Defence, made the comment referring to part of the 2021 AUKUS agreement dealing with advanced technology programs such as artificial intelligence and hypersonic weapons. Speaking at a virtual event hosted by Washington's Center for a New

American Security think tank ahead of an expected announcement of a way forward on AUKUS after an 18-month consultation period, Fhima cautioned that their adversaries did not share such bureaucratic constraints.

He said the political will was “absolutely there to ensure that the barriers that we have are broken through,” but this took time. Referring to the so-called Pillar One of the AUKUS agreement – under which Australia is to acquire nuclear-powered submarines, Fhima added:

“The willingness to share really sensitive technologies and capabilities in Pillar One; if we can do that, and we can do that at pace, we must be able to do that in Pillar Two.”

Asked if enough progress was being made in Pillar Two, Stephen Moore, first assistant secretary of defense industry policy at Australia’s Department of Defense, said there was “a frustration, I think amongst all of us, that our bureaucratic processes need to be better.”

He added: “We know our bureaucracies need to be more agile, better equipped to face some of the strategic challenges that we are looking at, and I think there is momentum there.”

The officials did not address details of how Australia will acquire nuclear powered submarines under AUKUS to counter the increasing threat posed by China in the Indo-Pacific region.

Leaders from Australia and Britain are expected to travel to Washington this month to announce the way forward.

The United States and Britain each have closely guarded nuclear submarine programs and the three allies have yet to say exactly how the capability will be transferred to Australia, which does not have a domestic nuclear propulsion industry. U.S. defense technology sharing is tightly controlled under International Traffic in Arms Regulations and it remained unclear whether Australia will acquire a U.S. or a British designed submarine and when.

The capabilities in Pillar Two of the AUKUS agreement are seen in part as a way to close a capability gap in the meantime.

Australia’s former defence minister said on Wednesday he favored Australia choosing a U.S. nuclear-powered submarine over a British model, comments swiftly labeled “irresponsible” by the government.

<https://theprint.in/world/more-work-needed-on-aukus-technology-sharing-british-australian-officials/1410744/>



Wed, 01 Mar 2023

Avalon 2023: BAE Australia Designing New Guided Munition for UCAVs, Helos

BAE Systems Australia has announced that it is designing and developing a new air-launched guided munition called the Razer. The company said in the announcement on 28 February that the Razer is being conceived as a “low-cost air-launched precision-guided munition that is

designed to transform a 40–50 kg standard non-guided munition into a precision air-launched weapon at low cost”.

According to BAE Systems Australia, the Razer system consists of a wing/body kit and tail unit. The kit also comprises a powered Global Positioning System/inertial navigation system (GPS/INS). The company said that the Razer is being designed to be carried by unmanned combat aerial vehicles (UCAVs) and combat helicopters.

The low-cost precision-guided munition (LCPGM) is being designed for operation in air and maritime environments, the company said in a statement.

The announcement of the Razer was made following the unveiling of the company's Strix unmanned aircraft system (UAS) during Avalon 2023 in Australia. The air show is being held from 28 February to 5 March.

Janes has reported that the Strix system is being designed for multirole and multidomain operations. The Strix UCAV has a maximum payload-carrying capacity of 200 kg, according to BAE Systems Australia. It can carry a 160 kg payload over a distance of 800 km.

The Razer will almost certainly be integrated with the Strix. “Razer can meet urgent local and overseas demand for low-cost sovereign munition solutions that could be deployed from the air,” said BAE Systems Australia CEO Ben Hudson.

He added that the guided munition “could deliver a powerful and affordable battlefield strike capability”.

<https://www.janes.com/defence-news/defence/latest/avalon-2023-bae-australia-designing-new-guided-munition-for-ucavs-helos>

Science & Technology News

THE TIMES OF INDIA

Thu, 02 Mar 2023

RRI's Archival Gallery Gives a Peek into Raman's Life, Science & More

In its 75th year, Raman Research Institute has developed a 500 sqft archival gallery, a one-stop place offering visitors an excellent opportunity to learn about the life and science of Nobel Laureate Sir CV Raman, the founder-director of RRI.

The gallery in Bengaluru offers research outcomes from its four core themes - astronomy and astrophysics, light and matter physics, soft and condensed matter physics and theoretical physics - along with the support facilities that help in running the institute. Work on the gallery began in 2018 and it has now been inaugurated.

"The visualisation and work for setting up the gallery, which began in December 2018, is a joint effort by staff across the institute in consultation with a hired expert architect. It took more than

two years to reach fruition," RRI said. The gallery's four carefully curated walls narrate a gradually evolving story starting 1888, the year CV Raman was born. It covers the institute's history, science and its current research besides highlighting milestones of both Raman and the institute. RRI library's rich heritage collection of archival material, including photographs, newspaper clippings, letters and research articles of Raman, were extensively used to weave the story chronologically.



In its 75th year, Raman Research Institute has developed a 500 sqft archival gallery, a one-stop place offering visitors an excellent opportunity to learn about the life and science of Nobel Laureate Sir CV Raman, the founder-director of RRI.

"The gallery's design was inspired by a Chettinad house's courtyard, where the pillars connote the institute's rich history. The sunlit centre will display the institute's current research. The vacant centre encourages space for student discussions and deep scientific engagements. The red-coloured circular 'story cards' possess the lesser-known facts and tit-bits about Raman, his approach towards science and the humongous efforts behind erecting the institute over seven decades ago," RRI added.

A schematic map gives a sneak peek into the 22-acre RRI campus, its major buildings, facilities and landscaping. Capturing the greenery and the flora on the campus, the gallery provides visitors with the scientific names and details of some of the rare trees, including the much-loved Raman Tree. Also mentioned are some of Sir Raman's prominent awards, medals and citations.

<https://timesofindia.indiatimes.com/city/bengaluru/rris-archival-gallery-gives-a-peek-into-ramans-life-science-more/articleshow/98347786.cms>

Research, Innovation Crucial to Sustain Growth of Pharma Sector: Mandaviya

Research and innovation are necessary for the sustained growth of pharmaceuticals sector, said health minister Mansukh Mandaviya. Addressing the first governing council meeting of National Institute of Pharmaceutical Education and Research (NIPERs), the minister said that the focus must shift from self-sustenance model to profit model through expanding research base, creating industry connect and ramping up infrastructure. Mandaviya added that the expertise of human resources should be utilized along with implementation of best practices from other institutions. "Only then we will be able to make National Institutes of Pharmaceutical Education and Research (NIPERs) as the centre for high quality research and create a fundamental base for pharmaceutical innovation in the country."

In a tweet, the minister reiterated the government's commitment towards strengthening the holistic research ecosystem in the pharma sector and the brand NIPER. Highlighting further on the necessary interventions that can be taken, he said that the government has initiated various steps such as pharma innovation, new programme to promote research and innovation in pharmaceuticals is being taken up through Centres of Excellences (CoEs). "We will also encourage industry to invest in research and development in specific priority areas, such as medical devices and health technologies. We must come up with competitive and commercially viable solutions through our NIPERs."

The minister added that this is possible only through robust collaboration and consultations not just among NIPERs but relevant research institutions like the Department of Biotechnology, Department of Scientific and Industrial Research, ICMR, DRDO etc. "In this regard, formal and informal interactions among peers, researchers need to take place." Speaking about strengthening institutional capacities, Mandaviya said that the participants should adapt to the fast-paced world of technology and focus on making the country self-sufficient in most critical technologies of the future.

"We must work with the needs of modern times and the country's requirements. Best practices from the world must be adopted and implemented after being modified to the local needs." To give a push to R&D efforts and more exposure for commercialization, he suggested expanding the research repository for better visibility to all stakeholders. "This will further create better coordination among researchers and synergize efforts in creating more translational research towards commercially viable products."

The union minister released a research compendium showcasing compendium which is a compilation of Research and development in drugs and pharmaceuticals being carried out at NIPERs. It enumerates the outcome of R&D activities in the form of patents, publications, extra-mural, Industry sponsored projects.

<https://www.livemint.com/news/india/research-innovation-crucial-to-sustain-growth-of-pharma-sector-mandaviya-11677671078837.html>

