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THE NEW INDIAN EXPRESS

Thu, 17 Feb 2022

Vijayawada: Architecture varsity to hold week-long science expo from Feb 22

DRDO, ISRO and other reputed organisations will participate in the exhibition and demonstrate their products and innovations during the festival.

Vijayawada: The Ministry of Culture, in association with Vigyan Prasar, will organise a week-long National-Level Science Festival from February 22 to 28 in various parts of the country including Vijayawada, School of Planning and Architecture (SPA) registrar KV Umamaheswara Rao said.

School of Planning and Architecture students celebrate at convocation ceremony in Vijayawada on Friday. (Representational photo I P Ravindra Babu)

A brochure in this regard was unveiled by the registrar along with other staff at SPA Campus here on Wednesday. Disclosing the details to the mediapersons, Rao said the week-long festival, which is open to all, will feature different types of programmes and expos aimed at inculcating scientific knowledge among the students.

DRDO, ISRO and other reputed organisations will participate in the exhibition and demonstrate their products and innovations during the festival. The event is organised as part of the "Azadi Ka Amrit Mahotsav" being celebrated across the country. Lectures, literary activities, science expo, book exhibitions, science magic, science experiments including hands-on activities, cultural shows, etc will be held at the institute, he said.

https://www.newindianexpress.com/states/andhra-pradesh/2022/feb/17/vijayawada-architecture-varsity-to-hold-week-long-science-expo-from-feb-22-2420478.html

DRDO on Twitter

Defence News

Defence Strategic: National/International

Thu, 17 Feb 2022

Army, Navy and IAF continue spadework on theatre commands amid delays in appointment of next CDS

News18 has learnt that at least two meetings have been held since January to discuss the structure of integrated theatre commands and other facets of their operations.

By Amrita Nayak Dutta

New Delhi: While the Narendra Modi government is yet to appoint the next Chief of Defence Staff (CDS), the Indian military's plans to transition into integrated theatre commands are in progress, with at least two meetings held since January this year to discuss their structure and other facets of their operations, News18 has learnt.

The latest of these took place in Lucknow last week and was attended by at least three Army commanders and one commander-in-chief each from the Navy and the Indian Air Force (IAF). Prior to that, in January, another discussion between top officers of the three services had taken place in Jaipur.

The Indian Army, Navy and Air Force currently have 17 commands together. The plans, at present, are to roll them into four integrated theatre commands. (Representational photo/PTI)

As per government sources, some internal deliberations on theaterisation had also taken place within the Army in the last week of January. Aside from these meetings, the services are also carrying out internal discussions to fine-tune the modalities.

In the two major tri-service discussions held at the Army's southwestern command in Jaipur and central command in Lucknow, aspects of employment of theatres in different operational scenarios were discussed, the sources said.

The sources told News18 that the IAF is examining its options and feasibility of employing its resources permanently in different theatres, even as the three services continue fleshing out the finer details of the theaterisation process and reaching a consensus on them.

The Indian Army, Navy and Air Force currently have 17 commands together. The plans, at present, are to roll them into four integrated theatre commands — one maritime theatre command, one air defence command and the two land-based western and eastern theatre commands.

The Army's northern command and the AOC (J&K) of the IAF will be kept out of the theatre commands at present, keeping in mind security implications.

Driving the theaterisation process was among the top charters of the Chief of Defence Staff and India's first CDS General Bipin Rawat was actively driving this transition by overseeing a series of studies and simultaneous deliberations between the three services.

As reported by News18 in September last year, the creation of the joint theatre commands was to take three to four years with four commanders-in-chief from the Army, Navy and Air Force first defining the organisational structure of the theatre commands and their composition.

They were to submit their reports within a year, based on which their structure would be finalised.

A senior government official said that the challenge to balance the needs of the three services will continue before the new CDS.

"The current series of meetings between Army's commanders-in-chief and their equivalents in the IAF and Navy is laying down the groundwork for restructuring of the forces into the various identified theatres. The new CDS, once appointed, would continue from there," the official said.

Once operational, the western theatre command is likely to be headquartered in Jaipur, while the eastern theatre command will likely be based out of Kolkata or Lucknow.

The air defence command will be headquartered in either Jodhpur, Gandhinagar or Allahabad and the maritime theatre likely in Karwar.

Once the theatre commands are formed, the operations branch from the existing commands will go to the theatre commands first. Subsequently, logistics and other departments will be subsumed into the theatre commands from the existing commands, after which they will cease to exist.

https://www.news18.com/news/india/army-navy-and-iaf-continue-spadework-on-theatre-commands-amid-delays-in-appointment-of-next-cds-4780169.html

ANI
South Asia's Leading Multimedia News Agency

Thu, 17 Feb 2022

Lt Gen C Bansi Ponnappa takes over as the Deputy Chief of Army Staff

New Delhi [India], February 16 (ANI): Lt Gen C Bansi Ponnappa has taken over as the Deputy Chief of Army Staff (IS & C) of the Indian Army, said the Indian Army today.

Indian Army from their official Twitter account posted that Lt Gen has the distinction of commanding the prestigious Vajra Army (ANI)

Lt Gen C Bansi Ponnappa takes over as the Deputy Chief of Army Staff

https://www.aninews.in/news/national/general-news/lt-gen-c-bansi-ponnappa-takes-over-as-the-deputy-chief-of-army-staff20220216135817/

THE ECONOMIC TIMES

Thu, 17 Feb 2022

Northern Army Commander Lt Gen Dwivedi reviews security scenario in Kashmir

Synopsis

"The Army Commander was briefed by Lt Gen D P Pandey, General officer Commanding Chinar Corps, on the prevalent security situation and measures instituted to counter adversaries' design," a defence spokesman said here.

The Northern Army Commander Lt Gen Upendra Dwivedi reviewed the security situation in Kashmir during his three-day visit to the valley which ended on Wednesday.

"The Army Commander was briefed by Lt Gen D P Pandey, General officer Commanding Chinar Corps, on the prevalent security situation and measures instituted to counter adversaries' design," a defence spokesman said here.

He said the Army Commander had arrived here on Monday on his maiden visit to Kashmir after taking over the reins of Northern Command of the Army.

This was the commander's maiden visit to Kashmir after taking over the reins of Northern Command of the Army.

Lt Gen Dwivedi interacted with the senior officers of Chinar Corps and lauded the strong counter infiltration grid along the Line of Control, the spokesman said.

He said the Army Commander also appreciated the strict control exercised by the formation to abide by the ceasefire understanding between the DGMOs of both India and Pakistan, which will complete one year on February 25, 2022.

"For the hinterland, the Army Commander complimented Chinar Corps for the conduct of operations with precision ensuring zero collateral damage.

He was appreciative of the excellent Soldier–Citizen connect activities, which have resulted in overall reduction in the terrorist recruitments," the spokesman said.

Let Gen Dwivedi also paid homage to the 40 bravehearts of CRPF who had made the supreme sacrifice during terror attack on the convoy three years ago in Pulwama.

The Army Commander also interacted with various civil functionaries and members of the civil society.

He appreciated the rapid steps that are being taken by all agencies for sustainable peace and development of Kashmir.

He lauded the synergy between all elements of the security forces and the Civil Administration.

https://economictimes.indiatimes.com/news/defence/northern-army-commander-lt-gen-dwivedi-reviews-security-scenario-in-kashmir/articleshow/89612570.cms

Hindustan Times

Thu, 17 Feb 2022

Former Navy Vice Chief takes over as maritime security coordinator

An alumnus of Sainik School, Amaravathi Nagar in Tamil Nadu, and National Defence Academy, Khadakvasla, Pune, Kumar was commissioned into the executive branch of the navy in July 1982.

By Rahul Singh

New Delhi: Former navy vice chief, Vice Admiral G Ashok Kumar, on Wednesday took over as India's first national maritime security coordinator (NMSC) amid growing threats to coastal security and changing power dynamics in the Indian Ocean Region (IOR), where China is trying to expand its sphere of influence, officials familiar with the development said on Wednesday.

Former navy vice chief, Vice Admiral G Ashok Kumar has taken over as India's first national maritime security coordinator (NMSC) (Sourced)

Kumar has been handpicked for the challenging role. He will report directly to national security adviser Ajit Doval. To be sure, NMSC will have no forces under him.

An alumnus of Sainik School, Amaravathi Nagar in Tamil Nadu, and National Defence Academy, Khadakvasla, Pune, Kumar was commissioned into the executive branch of the navy in July 1982. He retired as the navy's vice chief last year.

The Cabinet Committee on Security, headed by Prime Minister Narendra Modi, gave its nod to the creation of the post of NMSC last November. The appointment came two decades after a recommendation made by a group of ministers on the back of the 1999 Kargil war with Pakistan to

strengthen the national security architecture. The 26/11 Mumbai terror strikes gave new impetus to bolster maritime security.

Kumar, a specialist in navigation and direction, will be the principal adviser to the government on maritime security. The admiral is a graduate of the prestigious Defence Services Staff College, Wellington, and has attended the Army Higher Command Course at Mhow and been part of a specialised course on expeditionary operations at Quantico, Virginia, USA.

The warships he has served on include Beas, Nilgiri, Ranvir, Vikrant, Kulish and Brahmaputra. In his previous appointments, Kumar has served as India's defence adviser in Singapore, commandant of the National Defence Academy and the navy's deputy chief.

Experts said the appointment of NMSC was a significant development. "NMSC will coordinate the actions of all stakeholders in coastal security. The existing set-up had room for improvement without a doubt," said security affairs expert Vice Admiral Shekhar Sinha (retd).

https://www.hindustantimes.com/india-news/former-navy-vice-chief-takes-overas-maritime-security-coordinator-101645034959807.html

THE WEEK

Thu, 17 Feb 2022

IAF's war games near Indo-Pak border scheduled for March 5

The president and prime minister are expected to witness the demonstration

By Pradip R Sagar

Barely 100km from the Pakistan border, over 100 fighter jets of the Indian Air Force will be engaged in multiple war games to demonstrate India's firepower. For almost a year, the India-Pakistan border has been silent as both sides agreed to a ceasefire last February after a hotline conversation with the Director-General of Military Operations (DGMO).

Exercise Vayushakti-2022 (Fire Power Demonstration) is scheduled to be held at Pokhran, Jaisalmer, on March 5. About 140 aircraft including 100 fighters and helicopters will participate in it.

The Rafale fighter jet will be the main attraction at Exercise Vayushakti-2022 | Arvind Jain

President Ram Nath Kovind, Prime Minister Narendra Modi and Defence Minister Rajnath Singh, along with the three services chiefs and other dignitaries, are expected to witness the exercise. The firepower demonstration was earlier scheduled for February, but due to rising cases of Covid-19, the war games were postponed to March.

The demonstration by the IAF, conducted once in three years, was first held on July 21, 1953, at Tilpat range in New Delhi. The last demonstration at Tilpat was conducted on March 18, 1989, and thereafter the event was moved to the Pokhran range in Rajasthan, where more land is available to carry out such drills.

The last edition of Vayuskhati happened two days after the Pulwama attack (February 14, 2019), in which more than 40 CRPF jawans were killed in a terror attack by Jaish-e-Mohammad.

IAF officials claim that Exercise Vayu Shakti is mostly about displaying the IAF's ability to strike targets on the ground—such as enemy convoys and tanks, radar stations, railway yards and military headquarters. "It is basically to showcase our (IAF) ability to punish, our ability to insert and extricate our troops from hostile territories," an IAF official said.

The newly inducted Rafale fighter jet and Apache and Chinook helicopters are going to be the main attraction of the event. MiG-29, Jaguar, Sukhoi Su-30MKI, Mirage-2000, transport aircraft

like AN-32, C130, Mi-17 VS and Mi-35 helicopters are among those that will demonstrate their capabilities in the exercise.

Women pilots of the Air Force are also expected to drop bombs from MiG-21 Bison fighter jets during the war games.

Dozens of diplomats, mostly foreign military officers posted in embassies in New Delhi, will also be flown out to Pokhran in an IAF aircraft to witness the airpower display.

It is not yet known whether there would be any diplomats invited from Pakistan or China, as New Delhi would like to send out messages of operational readiness to these two neighbours.

https://www.theweek.in/news/india/2022/02/16/iafs-war-games-near-indo-pak-border-scheduled-for-march-7.html

SHEPHARD

Thu, 17 Feb 2022

Singapore Air Show 2022: Military air programmes in Asia-Pacific - opportunities and threats

In a special report, Shephard Defence Insight investigates the market landscape for fixed-wing aircraft, helicopters and UAVs in the Asia-Pacific region.

By Ilker Aktaşoğlu

As near-peer threat scenarios return, Asia has become important in terms of military procurement programmes.

Shephard Defence Insight analyses the fixed-wing aircraft, helicopter and UAS segments, breaks down regional trends and highlights some potentially lucrative business opportunities in this highly competitive market.

A prototype of the fighter/trainer variant of the HAL Tejas light combat aircraft, developed in India. (Photo: Indian Air Force)

The evolution of adversary capabilities is one of the major factors driving Asian countries to upgrade their ageing fixed-wing and helicopter fleets.

Aircraft with advanced air dominance capabilities have emerged as a top acquisition priority for major countries across the region driven by the evolving geopolitical landscape. Several nations are pursuing fighter aircraft programmes, which are set to see significant progress over the next five years.

The Asian military fixed-wing aircraft, helicopter and UAS market is worth $121.03 billion, with a total of 6,077 new platforms forecast to be purchased between 2022 and 2026.

Around 56.3% of future spending will be allocated to new opportunities reaching to $68.2 billion in the next five years.

The regional UAS market is only equivalent to 5.1% of the total value of fixed-wing aircraft and helicopters but this proportion is expected to increase in the next decade due to indigenous development programmes.

India is the leading nation in expenditure with $86.01 billion, followed by South Korea and Taiwan ($31.76 billion and $24.11 billion, respectively).

https://www.shephardmedia.com/news/air-warfare/singapore-air-show-2022-military-air-programmes-in/

The EurAsian Times

Thu, 17 Feb 2022

Chinese media 'Gung-Ho' over new Air Defense Missile; Says no country has ever demonstrated such capabilities

China's newest portable air defense missile, the QW-12, is said to have shown remarkable performance in intercepting helicopters, aircraft, and cruise missiles in a live-fire test

By Ashish Dangwal

The state-run Global Times is gung-ho about the weapon, calling it world-class as it showcased an anti-decoy capability that "no foreign counterpart has ever demonstrated".

The test, which took place at a target range in North China, purportedly saw the QW-12 missile effectively take down a specifically designed target aircraft.

Credit: China Aerospace Science and Industry Corporation (CASIC)

The target was built to replicate an attack helicopter by simulating its infrared signal. When the QW-12 missile approached, the aircraft fired eight decoy flares which resembled the target aircraft's infrared signal in an attempt to deceive the missile.

However, the missile ignored the flares and hit the target, according to the report, which also claims that no other similar missile in the world has demonstrated similar capability publicly.

In another test, the missile was tasked with intercepting a faster target, a 122-millimeter-caliber rocket imitating a jet or cruise missile that soars at 360 meters per second.

The second test was also successful. However, given the speed of the target, a direct hit was not possible, therefore the missile used its laser proximity detonator to explode itself near the target. With shockwaves and fragmentation, the missile brought down the target, GT report claimed.

Shi Hong, the executive chief editor of the Chinese magazine *Shipborne Weapons*, told the Global Times that the test demonstrated the QW-12's ability to perform tasks in a complex battlefield situation.

The system can also be mounted on vehicles, giving the missile very high mobility, according to Shi, who added that each vehicle can carry several missiles, delivering even greater firepower.

China boasts about being one of the few countries in the world to independently manufacture portable air defense missiles. It is said the QW-12 was developed with cutting-edge technologies, resulting in a compact design, lightweight, and tremendous firepower.

QW-Series Missiles

Shi stated that China showcased QW series missiles at defense expos with the goal of providing various options to the world arms market. The QW-2, a predecessor of the QW-12, was used at the 2017 International Army Games' air defense competition.

The QianWei-2 (QW-2) is a third-generation man-portable shoulder-launched surface-to-air missile (SAM) manufactured by China Aerospace Science and Industry Corporation (CASIC) for the People's Liberation Army (PLA) and export customers. It is also known as Vanguard 2 in the export market.

Its layout resembles that of the Russian 9K310/SA-16 Gimlet portable SAM system, which served as the foundation for the QW-1 SAM system. It was first displayed in 1998 at the Paris Air Show and entered service with the PLA by the late 1990s or early 2000s.

Pakistan is also manufacturing this weapon under the name Anza Mk-3 missile. This fire-and-forget missile has a two-color infrared seeker and a single-stage solid rocket, and it takes a two-man crew to operate. In 2007, the QW-2 SAM system was sold to Bangladesh.

Bangladesh Navy has received QW-18A man-portable air defense missile systems from China. The QW-18A is an enhanced variant of the QW-18, a portable air defense missile system with anti-infrared capability that can attack even very low altitude air targets with a flight speed of more than 300 m/s omnidirectionally.

The QW-18 can be combined with various air defense weapon systems. Air-to-air missiles, ship-to-air missiles, and missile-gun air defense armament systems are all possible extensions. Pakistan received 100 QW-18 systems from China.

The QW-18 can engage aerial targets with a range of 500 to 5,000 meters and a height of 10 to 4,000 meters. Electric-servo control actuators of the QW-18A given to the Bangladesh Navy improve guidance and flying characteristics of the missile, which can then effectively intercept supersonic cruise missiles.

The deployment of man-portable air-defense system (MANPADS) onboard ships, particularly those lacking a combat system, provides a low-cost defense against aerial threats such as anti-ship missiles, combat aircraft, helicopters, and unmanned aerial vehicles (UAVs).

https://eurasiantimes.com/chinese-media-gung-ho-over-new-air-defense-missile/

The EurAsian Times

Thu, 17 Feb 2022

China begins delivering 'Rafale Challenger' J-10C Fighter Jets to Pakistan? New images take social media by storm

Images of what is claimed to be Pakistan's first two J-10C multi-role fighter jets have surfaced on social media. Islamabad is reportedly acquiring the Chinese-made aircraft in response to India's purchase of Rafale jets.

By Ashish Dangwal

The first squadron of 25 J-10Cs, the latest variant of China's J-10, is likely to arrive soon, as previous reports said that these jets will perform a flypast at the Pakistan Day parade on March 23, 2022. The single-engine medium-weight fighters are being acquired to modernize the Pakistan Air force (PAF).

Chengdu 10 (via Wikipedia Commons)

The order is crucial for the Chinese aerospace sector because it's the first time the J-10 has been sold outside of China. The images were purportedly shot at the Chengdu Aircraft Corporation's (CAC) factory in Sichuan province. A jet with the PAF insignia is seen taking a test flight.

The serial numbers 22-102 and 22-106 are also visible in the close-ups, implying that at least two aircraft are being tested.

Equipped With WS-10B Engine

China is putting a lot of effort to reduce its reliance on Russian engines. One of the J-10s seen in the picture appears to be equipped with a Chinese-made WS-10B Taihang engine. The J-10A and J-10B variants are powered by the Russian AL-31F engine.

This suggests that Pakistan is purchasing the latest J-10C version, or more likely an export derivative. This could speed up the acquisition process because the transfer of engines and associated systems would not require Moscow's consent.

A few images doing the rounds on Twitter in December showed several rows of J-10s in CAC's assembly line, fuelling speculation that they were destined for Pakistan. China has not made any official announcements about the Pakistani order yet.

J-10C Fighter Jet

Pakistan's Interior Minister, Sheikh Rashid, told reporters in Rawalpindi on December 29 that a squadron of 25 Chinese-made "JS-10" planes would perform a flypast at the Pakistan Day parade on March 23. According to the ministry, the Chinese jets are being acquired in "reaction to India's Rafale jets".

Previous reports suggested that Pakistan was set to purchase 36 J-10C semi-stealth 4.5 generation aircraft from China, but neither side has confirmed this so far. However, there is no clarity on why this number has been reduced to 25. These aircraft will join Pakistan's existing fleet of JF-17 fighter jets, which were jointly developed by Beijing and Islamabad as part of a large-scale program. China and Pakistan are also producing the latest JF-17 Block III version, which features a new active electronically scanned array (AESA) radar, a helmet-mounted display, beyond-visual-range (BVR) missiles, as well as other improvements.

PAF pilots were introduced to the J-10 as part of the Shaheen series of joint Sino-Pakistani exercises. The J-10C is far more advanced in terms of aerodynamics and avionics than the JF-17 and is a considerably bigger jet with a higher payload.

An infrared search and track and laser rangefinder dome in front of the cockpit and a glass cockpit with a wide-angle holographic head-up display are salient features of the J-10C.

The diverterless supersonic inlet used on the J-10B has been retained on the new variant. The new AESA radar is housed in the radome and will work with the same active-radar-guided PL-15 air-to-air missiles that the PAF has previously purchased for its latest JF-17 Block III fighters. These missiles have a dual-pulse motor that provides them a longer range

J-10C To Counter India's Rafale?

It is said that Pakistan's decision to buy J-10s is to counter its key regional adversary, India. The Indian Air Force will soon receive the last of the 36 Rafale fighters ordered from France. Furthermore, the country is looking to procure 114 multi-role fighters.

The 4.5-generation Rafale has a number of advantages over the J-10, including improved all-around performance, advanced avionics, electronic warfare systems, and a potentially wider range of weaponry, including ramjet-powered Meteor BVR missiles.

Nonetheless, by purchasing a similar '4.5 generation' fighter, PAF is trying to remain as modern as possible. The blend of modern sensors and weapons such as AESA and PL-15 missiles could give PAF J-10C an advantage over other fighter jets in IAF's inventory.

Considering China-Pakistan's hostile relations with India, it's possible that the PAF J-10s could be modified to carry airborne nuclear weapons in the near future. At present, PAF Mirage jets are tasked with such missions, although they are in urgent need of replacements.

https://eurasiantimes.com/china-prepares-to-deliver-rafale-challenger-j-10c-fighter-jets-to-pakistan/

DefenseNews

Thu, 17 Feb 2022

Israel plans 'laser wall,' but questions remain about effectiveness and cost

By Seth J. Frantzman

Jerusalem — Israel plans to create a "laser wall" that would see the country shift from investing large sums in interceptor missiles to using electric-based lasers that are less costly.

The system will be operational by next year, Prime Minister Naftali Bennett said earlier this month in announcing the plan. "This will allow us, in the medium to long term, to surround Israel with a laser wall that will defend us from missiles, rockets, UAVs and other threats. That will essentially take away the strongest card our enemies have against us," he added.

Israel has been working on laser air defense technology for decades, going back to the Tactical High Energy Laser system (also known as Nautilus), developed in the 1990s and early 2000s, although that project was canceled. But in January 2020, the Defense Ministry announced a breakthrough.

"We are entering a new age of energy warfare in the air, land and sea," said Brig. Gen. Yaniv Rotem, then-chief of the ministry's Directorate of Defense Research and Development. "The research and development investments made in the last years have placed the state of Israel among the leading countries in the field of high-energy laser systems."

Israel has also reportedly turned to the U.S. for cooperation on laser defense. In April 2021, the head of Israel's Missile Defense Organization said a ground-based laser would be incorporated into Iron Dome. Rafael Advanced Defense Systems, which makes the Iron Dome air defense system, has also demonstrated the use of lasers against small drones as part of its Drone Dome system. Israel's two laser systems are under development by two of its largest defense companies: Rafael works on the ground-based system, and Elbit Systems leads work on the airborne system.

But questions remain as to their effectiveness and eventual deployment: Where will Israel station the weapons? Will they be able to defend the country against rockets fired from the Gaza

Strip by Hamas, and threats from the north by the likes of Hezbollah or Iran? And there are budgetary considerations that go along with acquiring them. In addition, while the ground-based system will initially be on the Iron Dome battery, the platform for the airborne system remains to be seen.

Is a 'laser wall' viable?

"Supporters of laser solutions maintain that it is feasible and Israel can be fully defended with lasers; that there is no need for missile interceptors except on a rainy day and this will cost much less than defense using interceptors," said Uzi Rubin, the founder and first director of Israel's Missile Defense Organization.

Rubin, who is now a senior researcher at The Jerusalem Institute for Strategy and Security, told Defense News that while the cost of defeating an incoming threat with a laser may be low, the price of acquiring and maintaining the technology could be significant.

Lasers are also impacted by weather conditions, so any airborne laser system would benefit from being above the clouds. "It is feasible, but you would need to use UAVs for which you need a lightweight laser. The other option is taking manned aircraft and putting a laser in them, but then you need to maintain a significant number of aircraft in the air all the time. It's feasible, but the cost would be high," Rubin said.

A further challenge is the low rate of kill for this technology, as lasers heat up a target in order to destroy it.

"[With the] Nautilus laser, it took between 2-3 seconds to kill a Grad-like rocket," said Rubin, referring to a type of rocket often used by militants in Gaza and Lebanon. "So consider that they [the enemy] fire at a rate of two to four rockets per second; so you kill one, and several more have been launched already."

The May 2021 war between Israel and Hamas in Gaza illustrated this problem. Hamas increased its rocket fire rate from previous wars, firing up to 125 rockets in salvos over several minutes. "With Iron Dome, you fire your rockets and you fire two per second — and each Iron Dome is already locked on target, it is working in parallel. So they fire 20, and [we can] target 20, while a laser has to target each one individually," he noted.

Rubin said these challenges call into question the feasibility of a laser wall. "The last point is range. Laser beams have finite range. After a while it disperses and is not concentrated. These days a laser beam disperses by 8-10 kilometers [5-6 miles], so it's a local defense. That means you need a lot of them. You have to defend a lot of area and put more than one; it won't kill the salvo," he asserted.

At Rafael, Pini Yungman, the head of the company's air defense unit, noted the laser technology would not be a stand-alone system.

"We are developing the laser to be a launcher in the Iron Dome system. It means one or two of the launchers of each one of the batteries will be a launcher that comes with lasers," he told Defense News.

He did acknowledge the challenges lasers face when confronted with fog, poor weather conditions, or "any kind of interference in between the launcher and the target."

"You cannot rely on it by itself; you need a combination of kinetic kill and energy [lasers], a combination of ways to intercept, otherwise you won't be able to intercept threats," he explained.

Price tag

However, the executive pointed out that the cost of using a laser might be 10% that of using a missile interceptor. This "means by operating in combination in good weather, using laser and interceptors in Iron Dome, you can reduce the overall cost," he said.

Furthermore, lasers can operate faster than missiles, meaning deploying the systems near a hostile border can result in a shorter interception time because there's no longer the need to wait for launch and watch the missile fly toward its target.

This combination with Iron Dome is not yet operational, but Yungman said the development and integration effort is underway at Rafael, and that in the next few months "we will have [a] final integration test."

Currently, Rafael is partnered with American firm Raytheon Technologies to produce the non-laser version of Iron Dome. Israel has already supplied two batteries of the system to the U.S. military, and one was deployed to Guam.

But unlike the missile interceptors Raytheon makes, where a large quantity is produced to meet demand, a laser system requires making fewer devices, and Israel is locally developing the system.

He said power is not an issue for integrating lasers, as the missile battery will have the options of using its own generator or connecting to a electrical grid. "I believe in 10 years or 15 years, we will have high-power energy lasers that will be able to be carried by UAVs or airplanes," he added, referring to intercepting larger threats such as theater ballistic missiles and possibly hypersonic weapons. The current plan is to develop and operate the laser with Iron Dome, but Yungman said the company could also incorporate the technology on other air defense systems it makes.

Likewise, he added, the United States might seek the laser upgrade to its Iron Domes. "It only depends on the U.S. Army request. If they request, then no one in Israel will say no, especially not me."

Technological progress

In June, Israel's Directorate of Defense Research and Development said the Defense Ministry, Elbit Systems and the Air Force successfully intercepted several drones using an airborne high-power laser weapon system. The system was mounted on a Cessna aircraft, and a photo showed it burning a hole in a midsized drone over the sea.

The test was the first phase of a multiyear program to develop an airborne laser. Israel said at the time that "the ability to intercept and destroy airborne threats is groundbreaking and offers a strategic change in the air defense capabilities of the State of Israel." The government also said the airborne system will complement the country's multitier missile defense, which includes the Iron Dome, David's Sling and Arrow missile interceptor systems.

Elbit already makes the J-MUSIC direct infrared countermeasures system, which uses a plane-based laser to deflect missile threats. And the airborne laser system that is currently under development will be used on aircraft above the clouds, which should solve some weather-related challenges. Deploying it in the air also provides the chance for the interceptor to follow up with attacking the missile launcher.

Israel's Defense Ministry would not provide a comment for this story, and based on discussions with several people in the private sector, this topic appears particularly sensitive.

Tal Inbar, a senior research fellow at the Missile Defense Advocacy Alliance, agrees that air defense systems can't rely solely on lasers because of the weather factor as well as the thickness of rockets. The thicker the material, the longer it would take for a laser to destroy the threat.

"The answer, regardless of other issues, is to have much more laser systems — so even the economic excuse for such a system is collapsing. But if it's a complementary defense system, then there are advantages if weather permits for short-range projectiles like mortars [to be intercepted]," Inbar told Defense News. "So [the] laser is good, but it will [have to] be another part of a whole missile defense system."

Rubin, the founder of the Missile Defense Organization, agreed.

"Lasers will work. It's not a question of whether it works — it will be able to kill rockets. My doubts are about the cost effectiveness."

(The writer Seth J. Frantzman is the Israel correspondent for Defense News. He has been covering conflict in the Middle East since 2010. He has experience covering the international coalition against the Islamic State group in Iraq and Syria, and he is a co-founder and executive director of the Middle East Center for Reporting and Analysis.)

https://www.defensenews.com/industry/techwatch/2022/02/16/israel-plans-laser-wall-but-questions-remain-about-effectiveness-and-cost/

The Statesman

Thu, 17 Feb 2022

India's semiconductor moment

The message is piquantly relevant. India should have had its own semiconductor fab decades ago. In 1987, India was just two years behind the latest chip manufacturing technology. Today, we are 12 generations behind. Our semiconductor dream has been sabotaged by red tape, lack of infrastructure, bureaucratic lethargy, corruption, and a lack of visionary leadership. We have missed the bus several times, for reasons that are unpardonable.

By Choodie Shivaram

New Delhi: The computer chip industry is an immensely complex chain that forms a half trillion-dollar (Rs 37.4 lakh crore) ecosystem with thousands of companies globally. Yet only a handful of facilities build these chips, used from mobile phones to satellites. These fabrication foundries, or 'fabs' are linchpins of the semiconductor industry, and are in renewed focus as the world grapples with a severe chip shortage.

As India seeks to become an 'Aatmanirbhar', $5 trillion economy, where can it fit in this picture? Much like building a skyscraper, chip design and manufacture has many steps. Today, there exists an entire ecosystem of 'fabless' companies, which make and sell chips without having their own manufacturing fabs. India's chip design capability is unbeatable; every chip design company in the world has the imprint of an Indian hand.

However, much of the fab and post-fab work is done in facilities in East and Southeast Asia. Without its own fab, India depends on US, Taiwan, and Southeast Asian countries to make its chips, including those used in critical areas such as defense, space, railways, and finance. "Once we send the chips out for fab, we have to share our designs. It no longer remains your IP. The security risk is always there", says a senior DRDO scientist.

representational image(iStock photo)

The message is piquantly relevant. India should have had its own semiconductor fab decades ago. In 1987, India was just two years behind the latest chip manufacturing technology. Today, we are 12 generations behind. Our semiconductor dream has been sabotaged by red tape, lack of infrastructure, bureaucratic lethargy, corruption, and a lack of visionary leadership. We have missed the bus several times, for reasons that are unpardonable.

In the 1960s, at the beginning of the silicon revolution, Fairchild Semiconductor considered building a fab here, but bureaucratic lethargy chased them away to Malaysia. After the 1962 war, Bharat Electronics Ltd. set up a fab to manufacture silicon and germanium transistors. "Our silicon transistors were in such demand that companies would queue up to place orders", says N. Ravindra, retired Senior DGM. BEL.

When cheaper integrated circuits (ICs) from China, Taiwan, and South Korea entered the market, BEL couldn't match global quality and price standards, and many of the fab units had to be shut down. In the mid-1980s, IISc professor A.R. Vasudeva Murthy helped establish Metkem Silicon Limited which, in partnership with Bharat Electronics Limited (BEL), produced polysilicon wafers for solar cells and electronics. This could have catalyzed an electronics revolution in India.

Unfortunately, without governmental support, especially the promised supply of subsidised electricity, Metkem couldn't produce high quality polysilicon wafers. In the 1990s, another visionary, E.S. Ramamurthy ventured to grow silicon in BHEL. "Growing silicon demands

tremendous infrastructure, one of them being a zero-shake environment. We had a railway track running beside the factory. We'd work all night when the trains wouldn't run. We had the talent and commitment, but we did not get the support from the parent body.

People did not adhere to the protocols required for entering the clean room. How can any innovation succeed in such an environment? We had to abandon the project", narrates S.K. Premchandran, former AGM, BHEL. The most tragic story is that of Semiconductor Complex Ltd. (SCL), Chandigarh. Starting with a 5000 nm process in 1984, SCL rapidly advanced to the 800 nm technology, which was the cutting edge only a year or two before. At that time China and Taiwan had not even entered the fab space. Intriguingly, the entire complex was gutted in a devastating fire in 1989, and our semiconductor progress was set back by a decade. ISRO revived SCL and used it for low volume manufacture of chips for its programs, but it is only a shadow of what it could have been.

DRDO's fabrication and packaging units, GAETEC, STARC, and SITAR were set up for strategic use by Defence and ISRO. "Unless fab is made on a large scale it's not economical. There is no state-of-the-art fab for high-end, commercial semiconductors. I ran SITAR (Society for Integrated Circuit Technology & Applied Research) for 20 years, it was hell of a problem. Equipment was imported and each time there was a failure we had to depend on experts from abroad. We made just 5,000- 10,000 chips per year", says Dr. K.D. Nayak, former Director-General DRDO.

In mid-2005, a major multinational semiconductor company started operations in South India, hired seasoned experts, and set up a class100 cleanroom for checking impurities of semiconductors. Facing roadblocks at each step, the endeavor became a stillborn child. Equipment imported from the US was stuck at the port for several months. Leave alone any concessions, they were levied heavy import duties and had to pay huge sums as demurrage. Several trips to South Block to convince the government did nothing to move the bureaucratic needle.

Eventually, the equipment left India without touching its soil. China grabbed this opportunity and welcomed the project, giving the company everything it needed. India not only lost a good semiconductor facility, but also gave away 4000 jobs to China. Another multinational semiconductor company in the process of setting up their fab here withdrew after seeing the horrific experience of this MNC.

As for the cleanroom, it was sold as scrap. Dr. Manmohan Singh's government allocated Rs. 39,000 crore in 2012-13 to build two fabs. JP group, along with IBM and HSMC bid for it. The Gujarat government readily offered all the infrastructure and allocated 300 acres land around Gandhinagar. Unfortunately, HSMC could not assure their investors an encouraging market in India, and the bidders withdrew. An earlier plan in 2005 for an impressive 200-acre fab city outside Hyderabad, which would have created an ecosystem for fab and other semiconductor companies failed miserably. The land allocated then became a lucrative real estate deal.

"There was no vision, there was no political will to support, infrastructure was absent and there was no market to promise investors", say experts. How will India now optimize the opportunity that stands before her? "Building a fab takes years and costs billions of dollars. We have to learn from our past mistakes. Ease of doing business is most critical now", says Lakshminarayanan, veteran HR leader with experience in Hitech MNCs.

"Every ten years, there is a fab cycle and if we miss it now, we will miss it for the next ten years", cautions Uma Mahesh, co-founder of Innatera. "This is a mammoth business, technology changes fast. Intel was almost catching up on everything till 14 nm and they couldn't get to 10 nm fast enough. TSMC overtook Intel and announced their 7 nm chip. Soon they will be ready with their 5 nm and 3 nm chips. In the semiconductor business speed matters, we must drive our R&D aggressively. Partnering with academia and a relook at the curriculum in our technical institutions is important", says Shiv Turmari, semiconductor expert and consultant.

Governmental support is vital. US has offered $25 billion to TSMC to set up a fab in Arizona and proposed $52 bn in funding through the CHIPS Act to subsidize companies to make their chips

in the US. Chip shortage, global pandemic, supply chain issues, and geopolitical tensions in Taiwan have made an alternative fab location an attractive proposition. India must seize this opportunity to reenter the chip manufacturing game. In December 2021, the Indian government announced a funding of Rs 2,30,000 crore ($30.7 billion) towards semiconductor manufacturing, aiming to position India as a global hub for electronics manufacturing. Now, semiconductor experts are upbeat.

"The dynamics have changed. Our economy is fairly mature. The time is ripe for India to join the semicon revolution and have its own fab", opines Dr. Nayak. "None of the East Asian countries have the kind of talent that India has. The seeds of excellence are here, we have the muscle. If we create chips in India, the entire geographic area of Taiwan can be our chip factory. That is the kind of scale we have", says Lakshminarayanan. Today, India can confidently offer quality electricity, water, better roads and infrastructure. The government has announced incentive schemes for electronics manufacturing (PLRI) to attract investors and start-ups.

"Four well thought of schemes were announced in December, giving a push for 'make in India', laying out a red carpet to investors. MeitY (Ministry of Electronics and Information Technology) secretaries are personally in discussion with anyone who shows interest. I'm seeing a very positive environment to attract industry" says Sanjeev Keskar, semiconductor veteran and CEO, Arvind Consultants.

Many nations, including India, are wooing TSMC, the largest chip manufacturer. Reports suggest that TSMC might partner with Tata Group to set up a fab in India, with the possible involvement of Raja Manickam, founder-CEO of Tessolve. "We must create an ecosystem for TSMC to want to come to India. Tatas carry the stamp of credibility; the world trusts them. TSMC partnering with Tatas is the best thing that could happen", says Uma Mahesh. "In my 35 years of being in DRDO, this is the first time I'm seeing a policy from the government towards the semiconductor industry. This also needs political stability, in the next few decades whichever government that comes in, they must handhold the industry and make it succeed", says Dr. M. U. Sharma, former Director, SSPL.

The onus is on MeitY now. With Taiwan not being recognized as an independent country and China threatening to invade in the coming years, India must quickly work towards bringing TSMC on board. The dream of India becoming the hub for semiconductor manufacture is near. It is time to secure all fronts and set sail.

As I was writing this story, my domestic help, 25-year-old Tara, a primary school dropout, would watch the laptop screen with interest. Seeing her curiosity, I explained to her the basic chip manufacture process by showing her some visuals. A quick learner, her immediate question stumped me, "yeh sab India me kyu nahi banathe hai". That's the question which has made India arrive today; this is India's moment to capture.

(The writer is an independent journalist.)

https://www.thestatesman.com/opinion/indias-semiconductor-moment-1503046515.html

Thu, 17 Feb 2022

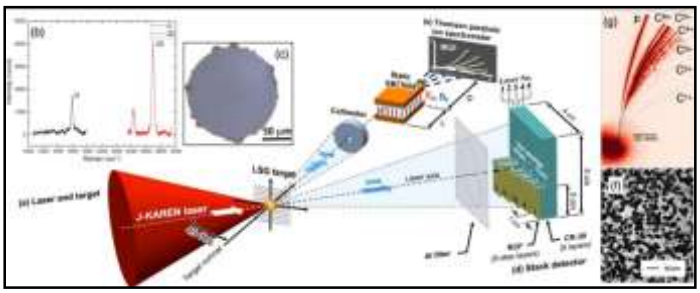
Graphene and an intense laser open the door to the extreme

Laser-driven ion acceleration has been studied to develop a compact and efficient plasma-based accelerator, which is applicable to cancer therapy, nuclear fusion, and high energy physics. Osaka University researchers, in collaboration with researchers at National Institutes for Quantum Science and Technology (QST), Kobe University, and National Central University in Taiwan, have reported direct energetic ion acceleration by irradiating the world's thinnest and strongest graphene

target with the ultra-intense J-KAREN laser at Kansai Photon Science Institute, QST in Japan. Their findings are published in Nature's *Scientific Reports*.

It is known that a thinner target is required for higher ion energy in laser ion acceleration theory. However, it has been difficult to directly accelerate ions with an extremely thin target regime since the noise components of an intense laser destroy the targets before the main peak of the laser pulse. It is necessary to use plasma mirrors, which remove the noise components, to realize efficient ion acceleration with an intense laser.

Thus, the researchers have developed large-area suspended graphene (LSG) as a target of laser ion acceleration. Graphene is known as the world's thinnest and strongest 2D material, which is suitable for laser-driven ion sources.



(a)Schematics of experiment. By irradiating a large-area suspended graphene target (LSG) with the ultra-intense J-KAREN laser, energetic ions are generated. (b) and (c) show the Raman spectrum and microscope image of graphene, respectively. (d) and (e) show the schematic drawing of stack detector using solid state path trackers and Thomson parabola spectrometer (TPS), respectively. (g) and (f) show the typical data from TPS and stack, respectively. Credit: 2022 Y. Kuramitsu et al. Robustness of large-area suspended graphene under interaction with intense laser. *Scientific Reports*

"Atomically thin graphene is transparent, highly electrically and thermally conductive, and light weight, while also being the strongest material," study author Wei-Yen Woon explains.

"To date, graphene has seen a variety of applications, including those in transportation, medicine, electronics, and energy. We demonstrate another disruptive application of graphene in the field of laser-ion acceleration, in which the unique features of graphene play an indispensable role."

Direct irradiations of the LSG targets generate MeV protons and carbons from sub-relativistic to relativistic laser intensities from low contrast to high contrast conditions without a plasma mirror, evidently showing the durability of graphene.

"The outcomes of this research are applicable to the development of compact and efficient laser-driven ion accelerators for cancer therapy, laser nuclear fusion, high energy physics, and laboratory astrophysics," study lead author Yasuhiro Kuramitsu explains.

"Direct acceleration of energetic ions without a plasma mirror evidently shows the robustness of LSG. We will use the atomic-thin LSG as a target mount to accelerate other materials which cannot stand by themselves. We also show the energetic ion acceleration at non-relativistic intensity. This will allow us to investigate laser ion acceleration with relatively small laser facilities. Furthermore, even without a plasma mirror at the extremely thin target regime, energetic ion acceleration is realized. This opens up a new regime of laser driven ion acceleration."

More information: Y. Kuramitsu et al, Robustness of large-area suspended graphene under interaction with intense laser, *Scientific Reports* (2022). DOI: 10.1038/s41598-022-06055-4

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https://phys.org/news/2022-02-graphene-intense-laser-door-extreme.html