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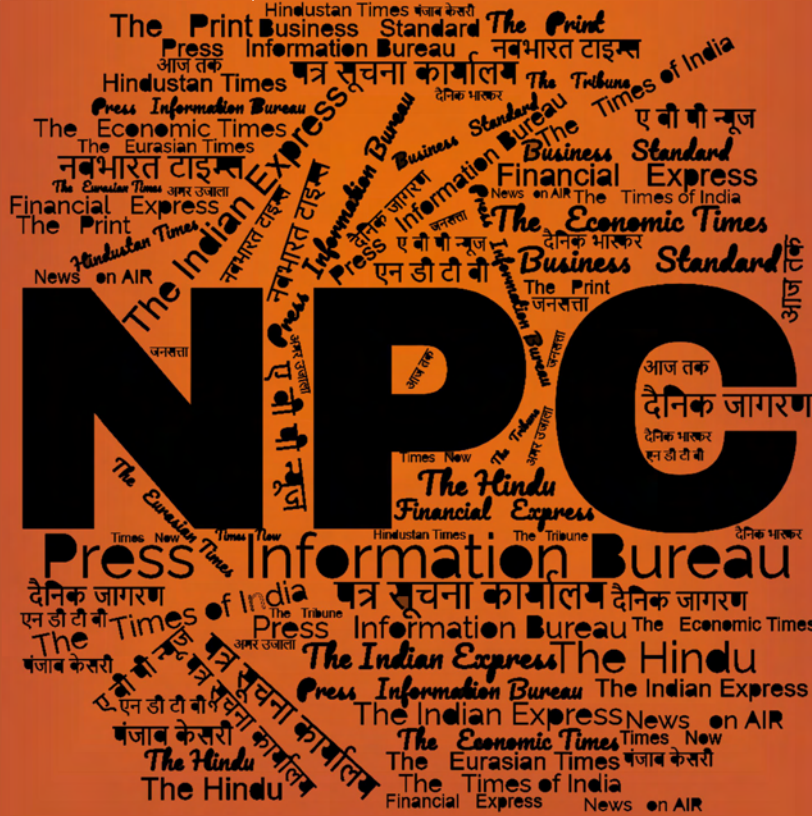
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# समाचार पत्रों से चयित अंश Newspapers Clippings

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## Defence News

### Defence Strategic : National/International



Wed, 22 Mar 2023

### **BrahMos Missile Project has Achieved 75% Indigenous Capacity, says Scientist**

Atul Dinkar Rane, CEO and Managing Director, BrahMos Aerospace, said on Wednesday that 75% indigenous capacity has been achieved in the BrahMos missile project.

Mr. Rane was participating in a function to launch the 27th BrahMos Missile Checkout Equipment (COE) produced by Data Patterns Private Limited, in Siruseri near the city.

Thanking the team of Data Patterns for designing and building the COE, he said the BrahMos project, a joint venture between India and Russia, had come a long way in creating indigenous capacity which was only 30% in 1998 when it was initiated.

Mr. Rane said the COE was an important component for the testing of the missile and the project was aided by more than 200 Indian industries, including the Data Patterns, who are involved in the critical supply chain. The missile project has helped create 25,000 jobs.

He promised continued support for Data Patterns which has shown that a private company has the capacity to manufacturing critical electronic components. Srinivasagopalan Rangarajan, Chairman and Managing Director, Data Patterns, thanked Mr. Rane for being associated with BrahMos project for more than two decades, and said the company which started with 30 persons had now grown with more than 1,000 employees. The company had been designing and producing radars across all platforms for the Defence Department and had also started exporting radars and nano satellites. The COE was a test system used to check the health and functionality of the electrical sub-systems of the BrahMos missile, he added.

<https://www.thehindu.com/news/national/brahmos-missile-project-has-achieved-75-indigenous-capacity-says-its-ceo/article66649771.ece>

**United News of India**  
India's Multi Lingual News Agency

Wed, 22 Mar 2023

### **BrahMos Missile Checkout Equipment Unveiled**

Data Patterns (India) Limited a vertically integrated Defence and Aerospace electronics solutions provider catering to the indigenously developed defence products industry, on Wednesday

unveiled the 27th BrahMos Missile Checkout Equipment. The equipment, which was ready for delivery, was formally unveiled by Atul Dinkar Rane, Outstanding Scientist, Director General BrahMos, DRDO and CEO & MD, BrahMos Aerospace Private Limited, at Data Patterns' facility here.

Talking to reporters, Mr. Srinivasagopalan Rangarajan, CMD of Data Patterns (India) Limited said, "We are delighted to unveil the 27th BrahMos Missile Checkout Equipment that is ready for delivery and a privilege to have the BrahMos Chief to do the honours."

"BrahMos is an important customer of Data Patterns. We have always delivered all their requirements on schedule, maintained the quality standards, and provided maintenance support consistently exceeding the uptime requirements. Indigenous development of the COE by Data Patterns has resulted in a direct cost savings of about 75% in foreign exchange for BrahMos", he said.

Data Patterns has designed and built the BrahMos Missile Checkout Equipment based on the requirements and support of DRDO and BrahMos Aerospace Private Limited.

This unit validates the complete performance of the Missile through interfacing with its umbilical and maintenance connections. The shelter mounted checkout equipment is utilized to test the articles on the field during its life cycle, thus ensuring readiness for launch on demand. The Checkout Equipment (COE) for "BrahMos Missile" is a VME based three Bay test system used to check the health and functionality of the electrical sub-systems of Brahmos Missile.

The test system consists of three major subsystems. The first subsystem is the main processor unit which is used for the Man Machine Interface (MMI) such as Keyboard, Joystick, Printer, Monitor and External interface for Storage media.

The second is an Input Output Subsystem which interfaces with the Missile for carrying out the test. The third is dedicated to self-control and self-test. The COE is designed for transportability. "The COE has been deployed by all the 3 Armed Forces at multiple locations across India today. We are delighted to see Data Patterns, an Indian Company leading the way in this industry. On behalf of the entire BrahMos team, I take this opportunity to commend them for having delivered mission critical systems on all the programs that they have partnered with us on time. We are proud to be associated with Data Patterns and look forward to a long-standing collaboration," Atul Dinkar Rane said.

<https://www.uniindia.com/brahmos-missile-checkout-equipment-unveiled/south/news/2938465.html>



*Wed, 22 Mar 2023*

## **No Other Defence System, Manned or Unmanned, is as Cost-effective as Aerostats**

With geopolitical instabilities becoming increasingly severe and with vast borders comprising of 15200 km of land and a coastline of 7517 km presenting a challenging security scenario, India

has been looking to bolster and secure both its land and maritime borders as part of a holistic approach to strengthening the air defence environment in the country. It will also enhance its offshore patrol capabilities.

The Indian Air Force (IAF) and the Border Security Force (BSF) are continuously looking for emerging technologies to integrate into their systems for stakeouts at critical border locations. India uses surveillance drones in transnational border areas that allow border agents to monitor areas that are difficult to access. Smart video monitoring, movement sensors, perimeter intrusion detection systems, radar systems and aerostats are also in play. While each plays a crucial role in safeguarding India, aerostats are fast becoming a very attractive prospect.

While the country presently deploys large aerostats for wide area radar-based monitoring of border areas, airships, new cargo airships, mid-sized aerostats and tactical aerostats, it is not nearly enough for a country of India's size with intricate terrain, including valleys, plateaus, snow-capped mountains and other such inhospitable areas.

The Indian Air Headquarters has been looking at Indian private tech companies, research and development establishments and academic institutes that have the requisite technical expertise and financial capability, as well as experience, in developing and testing aviation-related equipments. Why?

### **Aerostats are compelling**

An aerostat is a low-cost, effective way to raise a payload in the sky. They are quite insensitive to weather and work equally well in both tropical and Arctic climates. Typical payloads are day and night cameras, surveillance radars, VHF and UHF repeaters and TV & radio transmissions.

Filled with helium and fitted with an air ballonet to compensate for changes in temperature and altitude, tethered aerostats can be made in almost any size. Smaller aerostats can be easily packed away and re-inflated in only half an hour.

The larger size aerostat systems have a greater capacity that allows systems to operate at higher altitudes for greater surveillance range while remaining aloft for up to two weeks at a time, ensuring persistent round-the-clock surveillance for highly trafficked areas and maritime borders.

Since 2013, Israel has been India's biggest supplier of aerostat systems. These aerostats have been deployed along India's north-eastern border to tighten control over this sensitive area.

Push for indigenous production by the government under 'Make in India' mission and the obsolescence of existing surveillance equipments is bringing Indian private players to the fore.

### **Tech companies & new horizons**

With the government offering subsidies and ensuring ease-of-doing-business, it's likely that India will have a robust homegrown aerostat tech system in place in the not-too-distant future.

ACSG Corp. is one such private tech company investing in the research and development of aerostats. As a Critical Infrastructure Protection company, ACSG has been analysing, as part of research, the various challenges that the Indian security system currently faces in critical regions along its border. The company wants to build tailor-made solutions.

Major Vijay (retd.), spokesperson ACSG, says, "We are studying existing deployments and exploring innovative add-ons to make surveillance more effective through aerostats. For border security applications, we are looking at elevated-awareness aerostats capable of persistent

surveillance solutions with unique advantages over traditional ground-based radar and onboard surveillance systems”.

<https://www.dailypioneer.com/2023/technology/no-other-defence-system--manned-or-unmanned--is-as-cost-effective-as-aerostats.html>

# THE ECONOMIC TIMES

*Thu, 23 Mar 2023*

## **Air Force Slashes Procurement Budget on Russia Supply Delays**

With military supplies from Russia facing roadblocks given the war in Ukraine, the Indian Air Force has sharply reduced its projected spending on procurement for FY24. The cut has taken place due to delays in the supply of the critical S400 air defence system and spares for the air force fleet.

The air force informed a parliamentary panel that while there is no paucity of funds available from government for modernisation, it reduced the capital budget projections as "stage-wise payment" expected to take place are unlikely to happen due to delays.

"There is a major project... where the deliveries have been stopped because of the war (that is) going on. So, we had a major delivery in this year, which is not going to take place," an air force representative told the parliamentary standing committee on defence recently. "They have given us in writing that they are not able to deliver it. That is why the major part of projection has been reduced."

India has received three S400 squadrons, two of which have been deployed on the east and west borders.

### **Issues over payments**

The remaining two squadrons that were to be delivered in FY24 are likely to be delayed, with no clear indication on fresh timelines, said people with knowledge of the matter. The \$5.43 billion deal for five S400 squadrons was inked with Russia in 2018, with deliveries scheduled to be completed by mid-2024.

For FY23, the air force had projected capital expenses of Rs 85,322 crore, though the actual allocation was less. However, in the FY24 budget, it projected expenses of Rs 58,808 crore, with the entire amount being allocated.

"As far as projection is concerned, our projection last year was Rs 85,000 crore and we finally got allocation of Rs 57,000 crore which we consumed," the air force representative said. "This year, the projection itself has been less because of this Russia-Ukraine war as some of our deliveries are not taking place. So, we have already been told that those deliveries will not take place. So, we have taken that part of the component out."

Beyond delays in supplies, issues over payments from India to Russia are still to be resolved. Last year, the air force surrendered Rs 1,837 crore from its capital budget, mostly on account of payments not being processed to Russian entities that are facing western sanctions. India has

been taking steps to move towards indigenisation, with big orders for light combat aircraft and helicopters, but the legacy fleet still is dependent on Russian support. A bulk of India's jet fighters - from the Su 30MKI to MiG 29s and in-service MiG 21s - are of Russian origin. Some of these, like the Su 30MKI, are likely to stay in service for the next two decades.

<https://economictimes.indiatimes.com/news/defence/air-force-slashes-procurement-budget-on-russia-supply-delays/articleshow/98927147.cms?from=mdr>

## THE TIMES OF INDIA

*Thu, 23 Mar 2023*

### **India Needs Capabilities to Tackle 'Grey Zone' Warfare from China, Pakistan: Army Chief**

India needs capabilities to not just negate or mitigate the 'grey zone' warfare being pursued by China and Pakistan but also to keep them on the backfoot, General Manoj Pande said on Wednesday, while also underlining the criticality of “strategic deterrence instruments” to ward off full-blown wars.

“Our legacy challenges of unsettled borders continue to engage us. It is important to recognise that infirmities in border management can lead to wider conflict. Therefore, the first imperative that comes across is that - possession of strategic deterrence instruments is essential,” the Army chief said.

Though Gen Pande did not elaborate on this point while speaking at a conference here, it was an obvious reference to the sheer utility of India’s nuclear weapons in deterring China and Pakistan.

Grey zone warfare, in turn, is to exploit the operational space between peace and war to change the status quo or coerce an adversary, which China has mastered over the years with its salami-slicing and other tactics.

“Grey zone aggression is increasingly becoming a preferred strategy of conflict prosecution, with its scope enhanced by technological advancements. Here, I would like to emphasize that our adversaries’ pursuits against us in the grey zone continue even as we speak,” Gen Pande said, without naming China and Pakistan.

“These entail all aspects under the gambit of security and not just exclusive to the military domain. We need capabilities to not just negate or mitigate such attacks, but instead keep the adversary in a reactive mode perpetually,” he added.

Dwelling at length on the lessons learnt from the ongoing Russian-Ukraine, the Army chief said the “most critical conclusion” is that self-sufficiency in critical defence technologies and investments in R&D is an inescapable strategic imperative. “In other words, the nation’s security can neither be outsourced, nor be dependent on the largesse of others,” he said.

The war has also reaffirmed the “relevance of hard power” and the notion of victory still being “land-centric”. Similarly, India needs to be prepared for “a full-spectrum conflict” for long durations, instead of just short swift wars.

“Information operations have assumed a whole new dimension, being unfolded at multiple levels through numerous tools and different domains. Competencies and dedicated strategies need to be

in place to win the war of narratives as well,” Gen Pande said. The Army has put into motion a “transformation roadmap” for infusion of technology into its war-fighting systems, with various focus areas identified for the infantry, mechanized forces, artillery, air defence, aviation, engineers, signals and logistics.

“The Indian defence industry is rising up to the challenge and the pay-offs are beginning to fructify. In the design & develop category, 14 projects worth over Rs 61,000 crore are being pursued,” Gen Pande said.

Seventeen projects, in turn, are underway with premier institutions like IITs in robotics, sensors, smart munitions, high-powered lasers, lightweight armour, low-light imaging, range extension of artillery shells, habitats for high-altitude areas and UAV jamming.

Under the ‘Make-II’ category projects, where prototype development is funded by the industry, 45 projects amounting to around Rs 28,000 crore are underway. The Army is also leveraging the vibrant start-up ecosystem with 42 projects under the iDEX (innovations for defence excellence) category. Of them, nine projects worth approximately Rs 300 crore are already under procurement.

“Our ‘desired military capabilities’ flow out from the aim that we define for ourselves. It is to deter war, achieve desired political aims by application of military power and foster a conducive internal and external environment for the unhindered socio-economic development of India, enabling it to assume its rightful role in the emerging world order,” Gen Pande said.

“The capabilities thus arrived at ought to prevent war by presenting a credible deterrence as also enable responding to threats in the entire spectrum of conflict,” he added.

<https://timesofindia.indiatimes.com/india/india-needs-capabilities-to-tackle-grey-zone-warfare-from-china-pakistan-army-chief/articleshow/98923368.cms>

## THE ECONOMIC TIMES

*Wed, 22 Mar 2023*

### **Non-lapsable Fund not Needed, Grant Process Changed: Defence Secretary**

The creation of a non-lapsable fund for defence modernisation is no longer required as a new consultative process has been put in place that will allocate capital budgets based on realistic assessment of the armed forces, a top defence ministry bureaucrat has said.

The non-lapsable fund, which has long been under discussion with even the government accepting in 2021 a Finance Commission recommendation for its creation, was aimed at providing a dedicated pool of money for capital-intensive purchases like fighter jets and warships.

Among reasons behind the demand for such a fund was the uncertain nature of defence purchases and the gap every year between projected expenses of the armed forces and the actual allocation granted by the government. For example, in FY23 the armed forces projected capital expenses of Rs 1.99 lakh cr but were allocated only Rs 1.36 lakh crore.



Explaining the change in stand over creation of the fund, defence secretary Giridhar Aramane has informed the parliamentary standing committee on defence that a new mechanism has been put in place that will ensure that the entire expenses projected by the armed forces will be met by the finance ministry.

"When it was recommended, the concept was right... Now, the process has been changed in the finance ministry. All our requirements have been met. So, there is no need for non-lapsable fund. If in a particular year, we require this much to pay for the equipment we have ordered, we will get that," the defence secretary informed the panel.

He added that "the concept of non-lapsable budget may not be possible in view of the parliamentary approval required every year for the budget process. We have a rolling budget". The panel was also informed that unlike in the past, the entire projected capital expense of Rs 1.48 lakh crore has been granted to the armed forces this year.

Explaining the new process, an army representative told the panel that a better system for estimating expenses has been put in place. "Earlier, when we were not automated and when we did not have a full idea of how much the committed liabilities would be, we tended to ask for a little more and it was generally accepted that we got a little lesser than that," the representative said, adding that allocations for FY 24 are "exactly equal to what we have asked for".

<https://economictimes.indiatimes.com/news/india/non-lapsable-fund-not-needed-grant-process-changed-defence-secretary/articleshow/98923469.cms>



*Wed, 22 Mar 2023*

## **Why Delay Fighter Jets for IAF, Says the Parliamentary Committee on Defence**

Observing the incessant delays over the procurement of fighter jets, the Parliamentary Standing Committee on Defence has said that the government should not delay the procurement of additional fighter jets.

The procurement of additional fighter jets should not be delayed any further said the Parliamentary Standing Committee on Defence in its report tabled in the House.

"The government should consider buying state-of-the-art fifth-generation fighter aircraft over the counter without losing time to keep the force in a comfortable position," the committee said.

The Committee also asked the government to make a final decision on having a third aircraft carrier, "In no uncertain words, [we] recommend that the Ministry of Defence may take a final decision, chalk out a trajectory and start the planning process for the third aircraft carrier which would eventually enhance India's maritime capabilities," the parliamentary panel said in its report on March 21.

The committee also said it found "considerable delay" in the supply of 40 LCA Tejas jets from Hindustan Aeronautics Limited (HAL), a public sector defence undertaking.

As reported earlier by Financial Express, the Indian Air Force (IAF)'s mega \$20 billion Multi-Role Fighter Aircraft (MRFA) programme is nowhere in sight. Against the fast-depleting squadron of the IAF, the MRFA programme which is about acquiring 114 Multi-Role Fighter Aircraft, is one such programme that the Indian Armed Forces and the Government are treating as important.

Besides, there are multiple projects underway in India's aerospace ecosystem. The HAL along with Aeronautical Development Agency (ADA) is working together to build Advanced Medium Combat Aircraft (AMCA). Tejas MK2 is another ambitious project which is evolving out of HAL's Tejas fighter aircraft design. Tejas MK2 is building upon Mark 1A.

While so many programmes are about taking a leap in India's manufacturing technology, the focus for IAF remains on the need for next-generation tech-ready combat jets for potential future conflicts. Simply put, the IAF has to fulfil its mandate if such situations arise. The IAF's Perspective Plan looks at it in terms of its combat asset which is broadly defined as 42 squadrons. At present, IAF has 30 squadrons. Further, the IAF is phasing out its remaining four MiG-21 squadrons by 2025, bringing the squadron strength to its lowest.

<https://www.financialexpress.com/defence/why-delay-the-fighter-jets-for-the-iaf-says-the-parliamentary-committee-on-defence/3019056/>



*Wed, 22 Mar 2023*

## **IAF Pilots Sharpen their Skills at Exercise Cobra Warrior in U.K.**

Over the past three weeks, five Indian Air Force (IAF) Mirage-2000 aircraft have been undertaking joint training involving high intensity, large force, and tactical air war fighting operations with six other Air Forces as part of the multilateral 'Exercise Cobra Warrior' under way in the U.K. The Mirages drawn from all three existing squadrons also include those that took part in the Balakot air strike in February 2019.

The other countries include U.K., Finland, Sweden, South Africa, Saudi Arabia, U.S., and Singapore. Finland, India and Saudi Arabia joined the exercise for the first time. The initial idea was to bring in indigenous Light Combat Aircraft (LCA) Tejas but they were busy in another exercise, so the Mirage-2000s were deployed.

"We have done two stops en route, at Saudi Arabia and Greece, and covered a distance of 4,500 miles over three days with mid-air refuelling by IL-78 aircraft," said Gp. Capt. Pranav Raj, CO of 7 Mirage squadron 'Battle Axes' based at Gwalior, and the IAF's Exercise Director. On the challenges and lessons learnt he said, "The weather here is fairly challenging and quite different from what it is in Gwalior or Central India. In fact, more than 80% of my team has seen snowfall for the first time. The maintenance team has done a tremendous job in keeping all five aircraft available for missions." It has been a great experience, he further stated. "We have learnt quite a bit when flying with participating nations. We've flown with F-18s and F-16s carrying out entire spectrum of air operations in terms of offensive and defensive counter missions and others," he stated.

In addition to the fighters, the IAF is supported by two C-17 Globemaster III transport aircraft and an IL-78 mid-air refuelling aircraft. The 145-member IAF contingent departed from Jamnagar airbase. The exercise began on March 2 and concludes on March 24 (Friday), said Gp. Capt. M. Gangola. “It has been a great learning experience.” Exercise Cobra Warrior is held twice a year and is the largest air exercise hosted by the Royal Air Force. This edition, around 70 aircraft are taking part, and is being directed by staff at RAF Waddington airbase.

The purpose of this exercise is to invite participating nations to operate with each other and with U.K., said Group Captain James Calvert, Exercise Director of ‘Cobra Warrior’. “It is wonderful to have IAF here with Mirage-2000s.”

The Saudis are flying six Eurofighter Typhoons from RAF Coningsby base while the Indian team, Finnish team with six F/A-18 Super Hornets, and Belgian Air Force with six F-16s, are operating out of Waddington.

The Finnish participation is part of a wider training activity in support of the U.K.-led Joint Expeditionary Force (JEF), known as JEF Warrior.

The fighter jets in the exercise are supported by RAF Voyager mid-air refuelling aircraft flying from RAF Brize Norton. The RAF’s Air Mobility Force will be taking part in the exercise, with sorties including deploying elements of 16 Air Assault Brigade during an associated ground mission, that forms part of the overall exercise scenario, the RAF said.

Cobra Warrior provides an invaluable opportunity for international allies and partners to train together in developing operational tactics in the air, said Group Captain Mark Lorrinan-Hughes, the RAF Waddington Station Commander.

Over three weeks exercise participants will bring together their capabilities and deliver the full spectrum of air operations, including defensive and offensive counter-air as well as strike operations, the NATO’s Allied Air Command Public Affairs Office said in a statement. These also include RAF regiment precision-strike teams, air-manoeuve operations to support ground forces, and also further developing a joint personnel recovery capability.

“The exercise aims to synchronise multi-domain effects and so includes not just the air domain, but also space and cyber and for this iteration land as well,” it stated. The airspace for the exercise includes parts of north of England and Scotland and over the North Sea.

<https://www.thehindu.com/news/national/iaf-mirage-2000s-hone-war-fighting-skills-at-exercise-cobra-warrior/article66649715.ece>



*Wed, 22 Mar 2023*

## **Indian Army Chefs to be Trained in Millet Dishes: Defence Ministry**

The Indian Army has sought to procure millets flour up to 25% of the authorised entitlement of cereals in ration for troops starting from 2023-24 and issued advisories to extensively use them

in organised functions, canteens and in home cooking to give a boost to the nutritional profile of soldier's diet, the defence ministry said in a statement on Wednesday.

It also added that centralised training of chefs is being undertaken to prepare wholesome, tasty and nutritious millet dishes for soldiers.

The decision of adding millet to the daily meals for soldiers across all ranks will mitigate life-struggle diseases, the Army said.

The move is part of the government's emphasis on what many believe to be a superfood and in a year declared as the International year of millets.

Dedicated corners are also being set up in shopping complexes and 'Know your millet' awareness campaigns are also being conducted in educational institutions, as part of the entire campaign.

<https://www.hindustantimes.com/india-news/indian-army-chefs-to-be-trained-in-millet-dishes-defence-ministry-101679484708383.html>



*Wed, 22 Mar 2023*

## **Italian Defence Minister Guido Crosetto to Visit India, Rome and New Delhi Relations Expected to get Better**

With the "Marines problem" sorted out and India lifting the ban on Leonardo, closer defence ties between Rome and New Delhi are expected, with Italian defence minister Guido Crosetto, expected here in the coming weeks.

The visit by Crosetto comes after Prime Minister Giorgia Meloni's recent visit to India. Crosetto's visit is another sign of closer defence ties between the two countries. India is looking at two areas-- joint development and production of weapons systems and Make in India for the World-- as part of the Atmanirbharata programme. As Leonardo is one of the top ten defence manufacturers in the world, there is always the possibility of joint cooperation, particularly in the aerospace sector, meaning satellites and helicopters. There is always MBDA, which is partly Italian, the other bits being French and British and it is known for its air-to-air, surface-to-air and anti-ship and anti-tank missiles like the Exocet and the Milan (which India has) respectively.

One major point that India has already made to Leonardo is about selling weapons to Pakistan. The Pakistan Navy was very keen on Leonardo's torpedoes and a senior rear admiral had visited its HQ and got demonstrations. But India has made it clear that selling weapons to Pakistan, now that it has lifted the ban, is a worrying factor.

The Marines issue had been a prolonged problem between the two countries with two Italians detained in India for two and four years respectively. The marines had shot dead two Indian fishermen off the coast of Kerala in 2012, assuming they were acting aggressively. The Supreme Court, after almost a decade of litigation and diplomatic negotiations, closed the case in 2021.

<https://www.timesnownews.com/india/italian-defence-minister-guido-crosetto-to-visit-india-rome-and-new-delhi-relations-expected-to-get-better-article-98896045>

## **Border Issue Very Complicated; but Neither Side Want War, Confrontation: Chinese Envoy**

China and India will have to face the "difficulties" arising out of the border situation but none of the two countries want war or confrontation, Charge D'affaires at the Chinese embassy Ma Jia said on Wednesday. Addressing a media briefing here, Ma described the situation along the border areas as "very complicated" and said it was not easy to reach an agreement which was the reason the two countries were holding discussions through the established Working Mechanism for Consultation and Cooperation and the senior commander-level meetings.

She said the situation with regard to the Ukraine issue had "intensified" since the consensus at the G20 Summit at Bali and it was now "more difficult to reach the accommodation".

Her remarks come against the backdrop of a joint statement issued following a meeting of Russian President Vladimir Putin and his Chinese counterpart Xi Jinping indicating that the two sides will oppose the use of multilateral platforms to take up "irrelevant issues".

China is yet to name its Ambassador to India after Sun Weidong completed his tenure in October last year. Senior diplomat Ma has been in-charge of the mission in New Delhi.

Earlier, in her suo moto remarks, Ma has said the current situation on the border was stable and China and India were in maintaining communication through the established channels - Working Mechanism for Consultation and Cooperation and the senior commander level meetings.

"There are difficulties, I have just said that. But, we have to face it. We are also confident that China and India do not want war. Neither of us want a war. Neither of us want confrontation along the border areas," the top Chinese diplomat in India said, giving her assessment of the border situation.

She said the border issue has lived through the history of many years and it was not easy to reach an agreement.

"That is why we keep on talking about it. We have to face the problems and we have to talk. I think the intention on both sides is to improve relations. Our two leaders already have consensus on that and I think we can find a way out," Ma said.

Amid indications that Russia and China will oppose raising of the Ukraine issue on multilateral platforms, the Chinese diplomat said reaching a consensus at the G20 could be difficult if "prominent security issues" were raised at a forum established to deliberate on economic and financial matters.

"As long as you are out of the track and discussing prominent security issues on economic and financial platforms, it is very difficult to reach consensus. In G20, we have this consensus principle. Even if one country does not agree, it is not a consensus," she said.

<https://economictimes.indiatimes.com/news/defence/border-issue-very-complicated-but-neither-side-want-war-confrontation-chinese-envoy/printarticle/98921320.cms>

## What will be the Impact of Pakistan's New TPS-77 Radar Site Near India Border?

Pakistan is developing a TPS-77 radar site in Chorr Cantt, only 58 kilometers away from the international border (IB). This new site, with a range of over 400 kilometers, is being developed after the successful deployment of a similar radar site in Badin.

Lockheed Martin's TPS-77 product line includes the Multi-Role Radar (TPS-77 MRR), which has been designed to consume ultra-low power and is known for its high portability.

The surveillance capabilities of this equipment include a range of 463 km for long-range missions and 150 km for low-level flight surveillance missions like UAVs, Cruise Missiles and Fighter Aircraft. It is named after its ability to be customized for detecting both long and medium-range targets.

The TPS-77 MRR radar is capable of being moved via various means of transportation including C-130 cargo planes, helicopters, trucks, and trains due to its highly mobile nature. The TPS-77 radar family consists of the TPS-77 MRR, AN/TPS-77, and AN/TPS-117 radars, with the TPS-77 MRR being the easiest to transport.

The radar has a multi-purpose single scan technology that enables operators to choose particular functions for the radar, like long-range or medium-range surveillance of low-level flights in specific areas. This makes the radar adaptable and suitable for any circumstance.

### Implications for India

The second TPS-77 MRR radar site in Pakistan according to reports has the potential to impact India's air defence capabilities and also brings in focus the importance of advanced radar systems in modern warfare.

According to the information available in the public domain the TPS-77 MRR has air traffic control capabilities to the militaries globally and also to provide critical situational awareness.

In November 2021, to enhance their air defence monitoring the Pakistan Air Force (PAF) had deployed two new radar systems including TPS-77 MRR. This is a multi-role radar system which has the capability to detect low-level flight surveillance, maritime and ground based surveillance, and tactical ballistic missile warning.

<https://www.financialexpress.com/defence/what-will-be-the-impact-of-pakistans-new-tps-77-radar-site-near-india-border/3019030/>

Wed, 22 Mar 2023

## Is China's Nuclear Submarine Superior to Russia, India and US Subs?

*By Manish Kumar Jha*

In a series of war games organized by the Center for Strategic and International Studies in Washington, an attempt was made to find out the Chinese naval firepower based on their submarines. According to the analyst, the US submarines were able to enter the Chinese defensive zone and wreak havoc with the Chinese fleet. However, it happened at the cost of many submarines and thousands of lives lost.

The People's Liberation Army Navy (PLAN) has been building its submarine fleet based on its strategic maritime perspective and possible conflicts in the South China Sea, Pacific Ocean and Indian Ocean. The most lethal in its armament is the nuclear-powered and attack submarines. How is it unfolding?

### **Chinese nuclear attack submarines**

In the mid-1980s, the PLAN began the development of the Type 093 nuclear attack submarine in order to replace its first-generation Type 091 (Han-class) submarine. The most modern of China's current submarine fleet is the Type-093A Shang-II Class (aka 09-III A) and Jin-class Type 094A submarine, also known as the Long March-18. Long March- 18 was commissioned in service as part of celebrations to mark the 72nd anniversary of the PLAN.

However, the work progressed only after the Russian nuclear submarine technology was transferred to China in exchange for urgently needed money in the later 1990s. The central naval agency of Russia –Rubin Design Bureau for Marine Engineering– a submarine designer based in Russia, provided the key elements and technical support for the development of Type 093. In fact, Russian Design Bureau provided the overall hull design, machinery, combat and weapons systems, and countermeasures.

The Shang-class is a family of Chinese second-generation nuclear-powered attack submarines (SSNs) built by the China Shipbuilding Industry (CSIC) at its Bohai Shipyard in Huludao, Liaoning Province, China.

A total of six Shang-class submarines, including Shang I class SSNs (Type 093), Shang II class SSNs (Type 093A) and Shang III class SSNs (Type 093B), are in service with the PLAN. The Type 093A and Type 093B SSNs are improved versions of the Type 093 submarine.

In 2022, the US Department of Defense (DoD) published its annual report on China's Military Power. The report clearly outlines that China is likely to build a new Type 093B submarine by 2025. The submarine is also expected to provide a clandestine land-attack option when armed with land-attack cruise missiles (LACM) with improved anti-surface warfare capabilities.

### **The nuclear-powered and attack capabilities**

The most modern of China's current submarine fleet is the Type-093A Shang-II Class (aka 09-III A). The Tupe-093A weighs roughly 7,000-ton. The nuclear-powered submarine is in the same class as the Royal Navy's Astute Class. In fact, in size terms, it sits between the latest French Navy Suffren Class and the US Navy's Virginia Class.

China has deployed a new generation of submarine-launched ballistic missiles, for the first time placing the West Coast of the United States within credible striking range. The most important development is the induction of the new Ju Lang-3 (JL-3) missile which replaces the older JL-2 on China's ballistic missile submarines. However, reports indicate that despite the development, the Chinese submarines cannot reach the continental US from their existing patrol areas.

### **How advanced these submarines are?**

In a report published in 2009, the US Office of Naval Intelligence produced a chart showing that the Type 094, first launched in 2004, was noisier than the Soviet-era Project 667BDR (Delta III) SSBN.

However, the further modifications were so radical in terms of technological advancement that Type 093 and Type 094 were transformed into a hi-clibre nuclear-powered submarines.

In fact, based on the acquired expertise, China is striving to leapfrog into the third generation Type 095 SSN and Type 096 SSBN in the 2020s.

Chinese submarines can carry a payload of a single 1 MT yield nuclear warhead. Reports indicate that it might carry another 3 to 8 Multiple Independently-targetable Reentry Vehicles (MIRVs) warheads. Unlike the traditional missile, the MIRV can carry multiple warheads. In the case of Russia, the MIRV missile can carry up to 16 warheads, each in a separate re-entry vehicle. The most unique capability of the MIRV is its speed and multiple launch angle. Alongside, China has developed a vertical launch system (VLS) for land-attack cruise missiles.

However, in a similar league, the U. S. Navy's Ohio-class guided missile submarines carry up to 24 Trident nuclear-tipped ballistic missiles. In fact, even after the international convention and restrictions, Ohio-class boats can now carry a whopping 154 Tomahawk missiles. That is the highest in its class. In terms of firepower, Russia's new Severodvinsk-class guided missile submarines are equally formidable loaded with a total of 72 torpedoes and missiles.

In addition to that, the nuclear-powered Los Angeles-class SSN carries Tomahawk land-attack cruise missiles (LACMs) and MK-48 torpedoes. But on top is the Virginia-class next-generation U.S. nuclear attack submarines. The Virginia class can carry up to 37 Tomahawk cruise missiles with two VLS.

On the other side, submarines are a relatively bright spot in Russia's undersea fleet. Here, the Yasens- class, which NATO calls the Severodvinsk class, is a next-generation submarine with impressive capabilities. Loaded with Tsirkon hypersonic cruise missile and dozens of other cruise missiles, the Severodvinsk is capable of attacking warships and land targets with precision.

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 Chakra does have long-range torpedoes and nuclear warheads with Russian lineage.



Taking on China, the Indian navy does have the strike capability as it could hit closer by virtue of being submerged. However, the concern is the sheer numbers that China's overall submarine force will have 76 boats (8 SSBNs, 13 SSNs and 55 SSKs) by 2030. In terms of numbers, Russia has 17 Nuclear-powered attack submarines (SSNs) and 9 Nuclear-powered cruise missile submarines (SSGNs). While China is catching fast, the US remains ahead of the curve with Russia.

<https://www.financialexpress.com/defence/is-chinas-nuclear-submarine-superior-to-russia-india-and-us-subs/3018805/>

## The Statesman

*Thu, 23 Mar 2023*

### **China's Gradualism Faces a Fast and Furious America**

*By Narain Batra*

While China builds up its diplomatic presence in the Middle East and is perhaps looking forward to brokering a ceasefire deal between Ukraine and Russia, in the South China Sea it has been gradually building strategic advantages that threaten the vital interests of the United States and its allies. This has been happening over the years when the United States was engaged in Afghanistan, Iraq, and other Middle East conflicts. Today China has become an important military force in the South China Sea, an area through which trillions of dollars of trade flows every year and is critical to the defence of Taiwan.

China made itself indispensable to the United States in its dealing with North Korea, climate initiative, and other global issues. In fact, China was using North Korea as a weapon to browbeat the United States to soften its stand on other issues. The United States lowered its guard, overlooked what was happening in the South China Sea, and ignored the fact that China was stealing American intellectual property and spying on its vital trade secrets.

The entire disputed area in the South China Sea, consisting of 250 islands, atolls, shoals, and reefs, including the Paracel and Spratly Islands, is claimed by several countries in the region including the Philippines, Malaysia, Brunei, Vietnam, and Taiwan. Japan's geopolitical interest in the region is indisputable. Nevertheless, under the benign umbrella of cooperation with the United States, China kept pursuing its own hegemonic interests in the region. China has finished the build-up of all the seven Spratly artificial islands with complete military infrastructure, and aircraft hangars, docks, satellite communications, and shelters for missiles and missile platforms, according to reports. While China was building artificial islands, it went on politely asserting that it had no intention of militarising the islands. The region is rich in oil and gas and abundant in fisheries.

China's build-up in the South China Sea threatens not only the security of American allies including Taiwan, South Korea, Japan, and the Philippines but also poses threat to vital industries such as advanced semiconductors manufactured in Taiwan. According to American military experts, the strategic advantages that China has made over the years in the region are irreversible. Only a major conflict could remove China from its firm hold on the regional

geography. In future conflicts, China could interfere with international trade. China has been accusing the United States of interfering in the region implying that the whole region is under its hegemony.

Today there's an overwhelming bipartisan consensus in the United States that China is a major security challenge for the country, as it became clear after the spy balloon incident which resulted in heated exchanges between the two countries.

In order to play a global role on the world stage President Xi Jinping has been asserting his power in many ways, militarily, economically, and diplomatically. On 10 March China shook up the world by announcing that it had brokered a deal between two long bitter rivals in the Middle East, Saudi Arabia and Iran, and brought them together to reopen their embassies which had been closed for seven years, following the execution of a Shia cleric by Saudi Arabia.

This is of course a major diplomatic development that may have a tremendous impact not only upon the leadership role which the United States has been playing in the Middle East but also on Israel's complicated geopolitical relations in the region. China is a major trading partner of both Iran and Saudi Arabia. Forty per cent of its oil imports come from the region and no doubt it serves its interest if there's peace between two rival countries. Just as China has been building bases in the South China Sea without raising any alarm until recently, it has been trying to do the same thing in the Himalayan region also. Since its conflict with India in 1962 it has been gradually advancing and craftily building its bases in the Himalayan region and encroaching upon Indian territory in spite of several agreements based on the international boundary and the lines of actual control. A major conflict took place in 2020 in Galwan Valley in Ladakh during which 20 Indian and four Chinese soldiers were killed.

India knows that an agreement with China does not mean anything if it does not suit China's interests. As a revanchist power questioning established historical facts in order to advance its claims, China has been trying to rewrite history. First, it lays a cartographic claim based upon its own interpretation of history, and afterward, it nibbles small territories, nimbly and incrementally, establishing its presence without raising any alarm; and when its physical position becomes strong and irreversible, then it claims that this is the reality, and the present actualities should be accepted as *fait accompli*.

China plays a long-term game. Its slow and gradual manoeuvres leave its opponents puzzled as to what kind of response would be proportionately adequate. Whether it is nipping territory in the Himalayas, hill by hill, valley by valley, or it is the reclamation of reefs and atolls in the South China Sea, China's international conduct has been destabilizing. While India has yet to find out how to deal with the coercive and deceptive behavior of China, the United States is determined not to allow China to get away with its aggrandizement.

The Indo-Pacific region has become central to US foreign policy, despite Russia's aggression against Ukraine, which eventually, when the war is over, would become integrated with Europe. Apart from its renewed alliance with the Philippines regarding the establishment of new military bases, and the quadrilateral alliance Quad, including India, Australia, and Japan, President Biden recently signed the AUKUS deal with the United Kingdom and Australia that would enable Australia to build nuclear-powered submarines to face China's challenge.

China's aggressive behaviour has alienated its neighbours. In spite of the militarization of the artificial island bases, China has not been able to dominate the region – not at present. Other

regional powers have begun to assert themselves. They have also upgraded their military installations on islands under their control. They have begun to explore oil and gas reserves on their own thereby challenging China's efforts to control the region totally. Once again, the United States has become indispensable for free trade and security of the region.

The biggest challenge to China has come from the Philippines. When China took control of the disputed Scarborough Shoals, the Philippines took the case to the International Court of Arbitration, and won the case. But China rejected it. Its rejection of the international arbitration decision shows that China doesn't care for the international rule of law when it does not suit its strategic interests. This however opened the door for the United States to re-establish its security relations with the Philippines resulting in the Enhanced Defence Cooperation (2014) agreement, which was a landmark diplomatic achievement.

Unlike Barack Obama who bent over backward to seek China's goodwill as a rising global power, Donald Trump totally rejected China's hegemonic claims on the South China Sea – the policy which the Biden administration has continued with greater vigour and determination and with the full support of Republicans and Democrats.

In the Middle East, China seeks peace, but in the Himalayas and the South China Sea, China has been behaving like a bully.

<https://www.thestatesman.com/opinion/chinas-gradualism-faces-a-fast-and-furious-america-1503165276.html>

## THE ECONOMIC TIMES

*Wed, 22 Mar 2023*

### **South Korea, US to Hold Largest Live-fire Drills amid North Korea Tension**

South Korean and U.S. forces will hold their largest-ever live-fire exercises in June in a show of force to North Korea, which has ratcheted up tension with numerous missile launches, South Korea's defence ministry said on Wednesday.

The exercises are part of a series of events marking the 70th anniversary of the alliance between the two countries this year.

"We've planned various anniversary programmes focusing on realising 'peace through strength' through action based on our strategic deterrence capabilities and the solid combined defence posture amid North Korea's evolving nuclear and missile threats," the ministry said in a statement.

"During the live-fire exercises, the combined forces will demonstrate the alliance's formidable firepower and mobility on an unprecedented scale."

South Korea plans to mark the 75th anniversary of the founding of its military in September with a display by the allies' forces of their "overwhelming deterrence and response capabilities" against the North, that will include South Korea's missile defence system, the ministry said.

In recent weeks, North Korea has been ramping up its military tests, firing an intercontinental ballistic missile last week and conducting a nuclear counterattack simulation against the U.S. and South Korea over the weekend.

The United States has about 28,500 troops in South Korea.

U.S. and South Korean forces have been carrying out various types of military training in recent weeks including air and sea drills involving American B-1B bombers, and their first large-scale amphibious landing exercises in five years.

North Korea has reacted furiously to those drills, calling them a rehearsal for its invasion.

<https://economictimes.indiatimes.com/news/defence/south-korea-us-to-hold-largest-live-fire-drills-amid-north-korea-tension/articleshow/98894384.cms?from=mdr>

## ThePrint

*Wed, 22 Mar 2023*

### **China, Australia Defence Officials Hold First Formal Meeting since 2019, says Beijing Govt**

Chinese defence officials met their Australian counterparts in Canberra on Wednesday, China's Ministry of National Defense said, in their first formal meeting since 2019. The talks were helpful in developing a stable relationship between their militaries, the Chinese defence ministry said, and further enhanced mutual understanding.

Australia's defence department confirmed the meeting, adding that dialogue was conducted "in a professional atmosphere with both sides exchanging views on regional security issues".

The talks come after Chinese foreign minister Qin Gang said that the two countries have restarted institutional dialogue and consultation in multiple areas, in a meeting with his Australian counterpart on the sidelines of the G20 meeting earlier this month.

Ties between the two countries deteriorated in recent years, with China imposing sanctions on Australian exports after Canberra called for an international inquiry into the origins of the novel coronavirus.

They are now making progress towards the resumption of Australian timber exports to China in the latest sign of the normalisation of trade.

But as they work to improve ties, the alliance of the United States, Australia and Britain has made moves to counter China's ambitions in the Indo-Pacific.

Last week, the AUKUS alliance unveiled details of a plan to provide Australia with nuclear-powered attack submarines from the early 2030s.

China's foreign ministry criticised the deal, saying that the AUKUS has disregarded concerns of the international community and "gone further down a dangerous road".

<https://theprint.in/world/china-australia-defence-officials-hold-first-formal-meeting-since-2019/1463696/>

# The Statesman

Thu, 23 Mar 2023

## N.Korea Fired 4 Cruise Missiles in a Day: Seoul's Defence Minister

South Korea's Defence Minister Lee Jong-sup on Thursday said that North Korea fired four cruise missiles the previous day, though a detailed analysis is still underway to confirm the specifics.

Seoul's Joint Chiefs of Staff has said it detected "multiple" missile launches from the North's eastern city of Hamhung on Wednesday morning, reports Yonhap News Agency.

"We believe four (missiles were fired)," the Minister said during a session of the National Assembly's committee on national defence.

"We have conducted the initial analysis, and the South and the US are examining it in a more detailed way."

Commenting on whether the North has secured technologies to miniaturize a nuclear warhead and mount it on tactical weapons, the Lee said the country is seen as having achieved "considerable" progress. The North has been ratcheting up tensions through missile provocations, including a Hwasong-17 intercontinental ballistic missile launch last week, as the South and the US are conducting a major combined military exercise.

It followed the launch of two short-range ballistic missiles on March 14 and of what it claimed to be two "strategic cruise missiles" from a submarine two days earlier.

<https://www.thestatesman.com/world/n-korea-fired-4-cruise-missiles-in-a-day-seouls-defence-minister-1503165342.html>

## Science & Technology News

### पंजाब केसरी

Wed, 22 Mar 2023

## चंद्रयान तृतीय एवं आदित्य एल प्रथम के प्रक्षेपण को लेकर ISRO प्रमुख ने दी बड़ी अपडेट, जानें क्या बोले?

भारतीय अंतरिक्ष अनुसंधान संस्थान (इसरो) के प्रमुख एस सोमनाथ ने बुधवार को कहा कि भारत के तीसरे चंद्र अभियान चंद्रयान-तृतीय और देश के पहले सौर अभियान आदित्य-एल प्रथम

का प्रक्षेपण संभवतः 2023 के मध्य में हो सकता है। उन्होंने यहां फिजिकल रिसर्च लेबोरेटरी में आयोजित चतुर्थ भारतीय ग्रह विज्ञान सम्मेलन में “अंतरिक्ष एवं ग्रहीय खोज में भारतीय क्षमता” विषय पर उद्घाटन वार्ता में यह बात कही। इसरो प्रमुख ने कहा, “चंद्रयान-तृतीय यान पूरी तरह से तैयार है। इसका पूर्णतः समन्वय कर दिया है। निश्चित रूप से सुधार के कुछ काम किए जा रहे हैं।

हम अनुकरण एवं परीक्षणों आदि के माध्यम से मिशन को लेकर काफी विश्वस्त हो रहे हैं। और संभावना है कि इस वर्ष के मध्य तक प्रक्षेपण हो सकता है।” उन्होंने कहा कि भारत के पहले सौर अभियान आदित्य-एल 1में बहुत ही अनूठी सौर पर्यवेक्षण क्षमता होती है। उन्होंने कहा कि इसके लिए उपकरणों की आपूर्ति कर दी गयी है तथा इसरो इनका उपग्रह में समन्वय कर रहा है। इसरो प्रमुख एवं अंतरिक्ष विज्ञान विभाग के सचिव सोमनाथ ने कहा, “मैं इसके (आदित्य-एल1) के प्रक्षेपण की बहुत उत्सुकता से प्रतीक्षा कर रहा हूं जिसके इस साल मध्यम में होने की संभावना है और मुझे विश्वास है कि हम इस मिशन को एक बहुत बड़ी सफलता में बदलने जा रहे हैं।”

इसरो के अनुसार चंद्रयान-तृतीय चंद्रयान-द्वितीय मिशन की अगली कड़ी होगा। इसमें चंद्रमा की सतह पर उतरने एवं चलने की पूर्ण क्षमता का प्रदर्शन किया जाएगा। इस मिशन में लैंडर और रोवर का गठजोड़ शामिल होगा। चंद्रयान तृतीय का उल्लेख करते हुए सोमनाथ ने कहा कि इसका ढांचा चंद्रयान-द्वितीय की तरह होगा और इसमें आर्बिटर (कक्ष में घूमने वाली), लैंडर (सतह पर उतरने की क्षमता) और रोवर (सतह पर चलने की क्षमता) होगी। उन्होंने कहा, “निश्चित रूप से आर्बिटर को उन सभी भार (पेलोड्स) के साथ विकसित किया गया है जो कि चंद्रयान द्वितीय में थे। इसमें बहुत कम भार होगा।

किंतु मूलभूत लक्ष्य लैंडर को चंद्रमा की कक्ष में ले जाना और उसे चंद्रमा की सतह पर उतारना है।” सोमनाथ ने कहा, “चंद्रयान-तृतीय का प्राथमिक उद्देश्य सटीक ढंग से उतरना है (चंद्रमा की सतह पर)। उसके लिए आज बहुत काम किया जा रहा है, जिनमें नये उपकरण शामिल करना, बेहतर कलन गणित विकसित करना और विफलता के माध्यमों का ध्यान रखना शामिल है।” उन्होंने कहा कि मिशन के इन पक्षों को वर्तमान में मजबूती दी जा रही है तथा वैज्ञानिक लक्ष्य कमोबेश वैसे ही रहेंगे जो पूर्व चंद्र मिशन में रहे थे। इसरो प्रमुख ने कहा, “किंतु निश्चित रूप से चंद्रयान तृतीय के लिए हमने उन्हें विस्तार देने पर पर्याप्त ध्यान दिया है।

हमें यह उम्मीद करनी चाहिए चंद्रयान-तृतीय लैंडिंग के काम को सही से अंजाम देगा, रोवर बाहर निकालेगा और चंद्रमा की सतह पर कम से कम चंद्र दिन के समय वह पर्यवेक्षण करेगा, जो वास्तव में काफी रोचक होगा। उन्होंने आदित्य-एल 1 के बारे में कहा कि यह उस सुविधाजनक

बिन्दु तक जाएगा जहां से सूर्य का पर्यवेक्षण दीर्घ अवधि तक बिना किसी बाधा किया जाता रहे। सोमनाथ ने कहा, “और यह हमारे द्वारा बनायी जा रही एक बहुत अनूठी सौर पर्यवेक्षण क्षमता होगी। इसके लिए उपकरण पहले ही विकसित कर लिये गये हैं और हम इन उपकरणों को उपग्रह में लगाने की प्रक्रिया में हैं।”

उन्होंने कहा कि प्रयुक्त किए जाने वाले उपकरणों का उपग्रह के साथ समन्वय करने को लेकर वर्तमान में परीक्षण किया जा रहा है। इसरो प्रमुख ने कहा कि इस मिशन के लिए भेजे जाने वाले यान में जो उपकरण होंगे उनके अंदर न केवल सूर्य का अध्ययन करने की अनूठी क्षमता होगी बल्कि उनकी सहायता से सूर्य से उत्सर्जित होने वाले कणों का अध्ययन, सूर्य से पृथ्वी तक इन कणों के पहुंचने के दौरान उनकी गणना और सूर्य कैसे हमारे मौसम को प्रभावित कर रहा है, इसका अध्ययन करने की क्षमता होगी।

<https://www.punjabkesari.in/national/news/isro-chief-big-regarding-launch-chandrayaan-iii-and-aditya-l-i-1790021>

## ThePrint

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### **Mind-control Robots could be a Reality: Research**

Researchers from the University of Technology Sydney (UTS) have developed biosensor technology that will allow you to operate devices, such as robots and machines, solely through thought control.

The advanced brain-computer interface was developed by Distinguished Professor Chin-Teng Lin and Professor Francesca Iacopi, from the UTS Faculty of Engineering and IT, in collaboration with the Australian Army and Defence Innovation Hub.

As well as defence applications, the technology has significant potential in fields such as advanced manufacturing, aerospace and healthcare — for example allowing people with a disability to control a wheelchair or operate prosthetics.

“The hands-free, voice-free technology works outside laboratory settings, anytime, anywhere. It makes interfaces such as consoles, keyboards, touchscreens and hand-gesture recognition redundant,” said Professor Iacopi.

“By using cutting edge graphene material, combined with silicon, we were able to overcome issues of corrosion, durability and skin contact resistance, to develop the wearable dry sensors,” she said.

A new study outlining the technology has just been published in the peer-reviewed journal ACS Applied Nano Materials. It shows that the graphene sensors developed at UTS are very conductive, easy to use and robust.

The hexagon patterned sensors are positioned over the back of the scalp, to detect brainwaves from the visual cortex. The sensors are resilient to harsh conditions so they can be used in extreme operating environments.

The user wears a head-mounted augmented reality lens which displays white flickering squares. By concentrating on a particular square, the brainwaves of the operator are picked up by the biosensor, and a decoder translates the signal into commands.

The technology was recently demonstrated by the Australian Army, where soldiers operated a Ghost Robotics quadruped robot using the brain-machine interface. The device allowed hands-free command of the robotic dog with up to 94% accuracy.

“Our technology can issue at least nine commands in two seconds. This means we have nine different kinds of commands and the operator can select one from those nine within that time period,” Professor Lin said.

“We have also explored how to minimise noise from the body and environment to get a clearer signal from an operator’s brain,” he said.

The researchers believe the technology will be of interest to the scientific community, industry and government, and hope to continue making advances in brain-computer interface systems.

<https://theprint.in/tech/mind-control-robots-could-be-a-reality-research/1463842/>



