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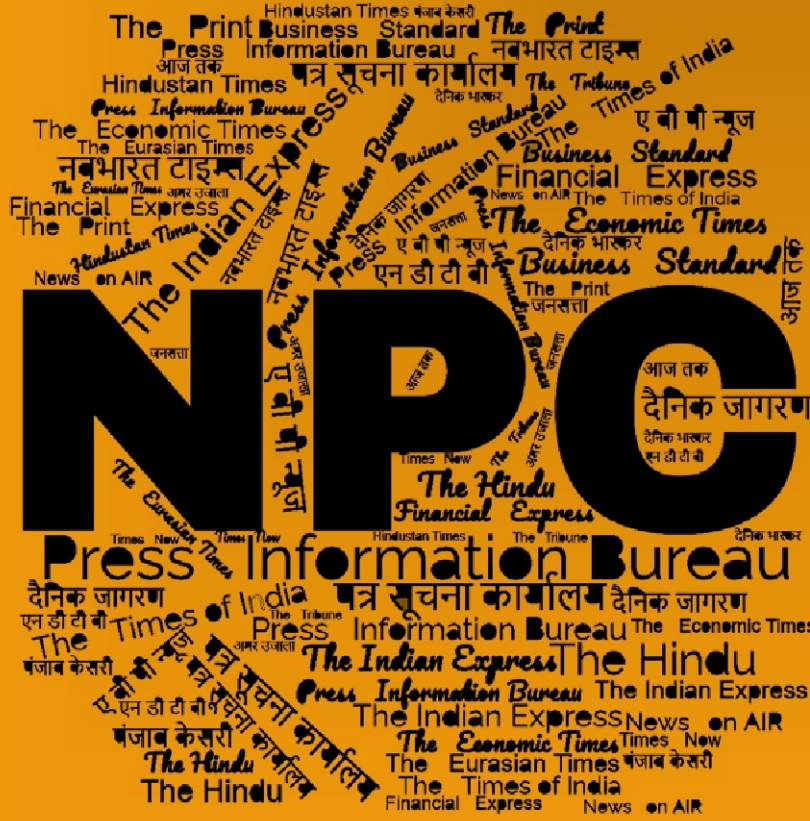
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समाचार पत्रों से चयनित अंश Newspapers Clippings

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CONTENTS

S. No.	Title	Source	Page No.
Defence News			1-16
Defence Strategic: National/International			
1	Centre for Joint Warfare Studies releases two critical publications on Contemporary Security Challenges	<i>Press Information Bureau</i>	1
2	Defence industry in India at cusp of massive expansion: Defence secretary	<i>The Economic Times</i>	2
3	Bharat Forge takes a major step towards closing one of India's biggest defence gaps	<i>The Economic Times</i>	3
4	Igla-S: रूस की डील से भारत को फायदा... दुश्मन के हवाई हमले होंगे बेकार	<i>Aaj Tak</i>	5
5	The Indian Army Is Marching Towards Renewable Energy, And Fast: How Is It Doing This?	<i>Times Now</i>	6
6	MShield 2.0 App: Indian Army's answer to cyber threats and honeytrap	<i>News Nine</i>	8
7	Navy's Rs 60,000 crore Rafale deal to boost Air Force's refuelling capability	<i>India Today</i>	9
8	Amid China concerns, India ramps up its 5th gen fighter jet programs	<i>India Today</i>	10
9	India 'considering' Russian offer of manufacturing fifth-generation Su-57 fighter jets in India: Official	<i>The Week</i>	11
10	India "Chooses" Indigenous Combat Choppers Over 'Delayed' LCA Tejas For Exports; Aims To Boost Revenues From 1% To 25%	<i>The Eurasian Times</i>	12
11	How US tech giants supplied Israel with AI models, raising questions about tech's role in warfare	<i>The Economic Times</i>	14
Science & Technology News			17-25
12	Thermal structure of solar coronal holes and their magnetic fields unveiled	<i>Press Information Bureau</i>	17
13	How Chandrayaan-3 lander made surprise Moon 'hop'	<i>The Indian Express</i>	18
14	Where is ISRO heading?	<i>The Hindu</i>	19
15	Zeiss India sets up research lab for AI in eyecare at IISc	<i>The Hindu</i>	24

Defence News

Defence Strategic: National/International

Centre for Joint Warfare Studies releases two critical publications on Contemporary Security Challenges

Source: Press Information Bureau, Dt. 18 Feb 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2104355>

The Centre for Joint Warfare Studies (CENJOWS), under the Headquarters Integrated Defence Staff (HQ IDS), Ministry of Defence, in a significant step towards advancing strategic thought and policy discourse, unveiled two critical publications on 18 February 2025. Chief of Integrated Defence Staff & Chairman CENJOWS Lt Gen JP Mathew launched the February 2025 issue of the flagship journal Synergy, themed 'Information Warfare Impacting Joint Warfighting' and a monograph titled 'Russia-Ukraine War: Navigating the Ramifications for Europe and India'.

The specially curated edition of Synergy – February 2025, the peer-reviewed journal widely recognized for its in-depth analyses and thought provoking discussions, provides a comprehensive perspective on contemporary security dynamics and future-oriented strategies. It examines the role of Information Warfare in Joint Warfighting in modern conflicts, including cyber, psychological, and electronic warfare. It explores Technological Disruption, assessing AI, cyber tools and digital deception in shaping the future of warfare and evaluates Strategic & National Security Impact and India's challenges, particularly in response to adversarial IW tactics. It further discusses Operational Convergence while exploring the integration of IW within Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) systems to enhance joint force effectiveness.

The monograph, titled 'Russia-Ukraine War: Navigating the Ramifications for Europe and India', provides an in-depth analysis of the geopolitical, economic and security implications of the ongoing Russia-Ukraine conflict. It assesses the war's impact on European stability, Indo-Russian relations and India's strategic positioning in a rapidly evolving global order. The study explores key aspects such as geopolitical realignments, energy security challenges, India's diplomatic balance, NATO's Indo-Pacific expansion, EU-India collaboration and long-term global security implications.

With the release of these two significant publications, CENJOWS reaffirms its commitment to fostering intellectual engagement on contemporary strategic issues. Both the monograph and Synergy journal are now available, serving as essential resources for the policymakers, military professionals, researchers and academic institutions.

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Defence industry in India at cusp of massive expansion: Defence secretary

Source: The Economic Times, Dt. 18 Feb 2025,

URL: <https://economictimes.indiatimes.com/news/defence/defence-industry-in-india-at-cusp-of-massive-expansion-defence-secretary/articleshow/118348758.cms>

The defence industry in India is at the "cusp of a massive expansion", Defence Secretary Rajesh Kumar Singh said on Monday even as he suggested that public-private-partnership would be "critical" in making the country a hub for advanced manufacturing in the sector. In his address at a defence conclave here late evening, he also said the intention of the government is to build a "technologically advanced" and "combat-ready force" that can effectively address the "complexities of modern warfare".

The event was hosted by Axis Bank to bring together different stakeholders, including government officials, industry members, financial institutions, among others under one roof. Singh said the conclave fosters collaboration among different stakeholders from the defence industry ecosystem, including those who would finance them. Creating a unified platform for discussions on 'Atmanirbhar Bharat', empowering the defence ecosystem is a "critical issue" right now, he added.

"It is an ongoing effort which we sort of need to continue to focus on. It is also in line with our priorities of modernising and reforming the defence ecosystem in our quest for 'Atmanirbharta' or strategic self-reliance," the defence secretary said. He recalled that the Ministry of Defence recently declared 2025 as the "year of reforms", saying the objective is to make systems and procedures more efficient, streamlined in order to deliver timely outcomes.

"The intention is to build a technologically advanced and combat-ready force that can effectively address the complexities of modern warfare," he said.

In his address, Singh emphasised about working together with different stakeholders to create a robust defence ecosystem. Relaxation in the FDI policies and industrial licensing procedures are other elements that will propel the growth in the Indian domestic defence industry, he said.

"Our exports have increased to Rs 21,000 crore, almost a 30 times jump in the last ten years. It is very obvious that the defence industry in India is at the cusp of a massive expansion," the defence secretary said. The current industrial ecosystem of India, which comprises various defence PSUs, licensed companies and MSMEs are the "pillars of this expanding industrial base", he added.

"Our focus has to be on reducing industry barriers for new players and new technologies. So that our defence industrial ecosystem becomes adaptive, agile, and capable of responding quickly to the changing nature of warfare, as we have seen in recent geopolitical conflicts," he said.

Citing the defence budget figures, Singh said, it was Rs 6.21 lakh crore that will go up by 9.5 per cent to 6.81 lakh crore in 2025-26. "And we should be spending over the next decade, something between USD 20-25 billion, perhaps even USD 30 billion per annum, "as per our modernisation initiatives", he added.

Earlier in his address, the top official in the ministry underlined that an industrial ecosystem is being envisioned where "incumbency advantage would not prevail over the ability of start-ups of agile private sector entrepreneurs," to bring into the ecosystem and to bring in disruptive technologies.

In this direction, the Ministry of Defence intends to work towards "streamlining our acquisition process, reduce timelines of various activities without impacting the integrity of the system", with the intention of ensuring faster contract awards, greater visibility to the industry regarding procurements on the anvil, and all-round efforts to deliver projects and fulfil contracts on time.

"Additionally, enhancing self-reliance in production with focus on 'Atmanirbhar Bharat', as enunciated by our honourable Prime Minister repeatedly, requires an integrated approach by the government, financial institutions and by the industry," he said.

"We are partners in this process, and we need to enhance our interactions through engagements like today's. Strengthening collaboration to accelerate indigenous defence production and establishing a robust defence ecosystem requires collaboration between the military and the civilian sector, supporting the industry to create cutting-edge defence technologies by investing in research and development will strengthen our strategic capabilities," Singh said.

Sanjeev Kumar, Secretary, Department of Defence Production in the defence ministry; Michael Williamson, president, Lockheed Martin International also addressed the gathering in a separate session during the conclave. Williamson in his address, said, "We face an increasingly complex and threatening geopolitical environment."

US-based Lockheed Martin has been associated with India for over seven decades and a trusted partner for the country for over three decades, he said.

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Bharat Forge takes a major step towards closing one of India's biggest defence gaps

Source: The Economic Times, Dt. 18 Feb 2025,

URL: <https://economictimes.indiatimes.com/news/defence/bharat-forge-takes-a-major-step-towards-closing-one-of-indias-biggest-defence-gaps/articleshow/118350247.cms?from=mdr>

Bharat Forge is pushing the boundaries of India's defence and aerospace ambitions, unveiling its first fully indigenous UAV engine at Aero India 2025. The company, known for its expertise in forging and precision engineering, is looking to close one of the most significant gaps in India's defence ecosystem: jet engine technology.

India has long grappled with relying on foreign-manufactured gas turbines for drones and UAVs. Though several startups entered the drone space, they virtually exclusively depend on propulsion units imported from China or Europe. That is what Bharat Forge seeks to reverse.

"India has not had gas turbine technology, but we now have an indigenously developed solution—conceived, developed, and produced in India," stated Guru Biswal, CEO, Bharat Forge's Aerospace Division. This achievement is a major milestone in the defence self-reliance of India in line with the government's 'Atmanirbhar Bharat' initiative.

From Airbus to AMCA: Bridging Key Gaps in Aviation

Jet engines are not the only horizon for Bharat Forge. The company is also working on another significant deficit—landing gear systems. "India has no proven technology for landing gear systems, whether for commercial or defence aviation," Biswal observed.

To bridge this gap, Bharat Forge is producing landing gears in Pune, already catering to 100% of Airbus' commercial aircraft parts. With the high-quality standards of commercial aviation, this know-how will facilitate a smooth entry into defence platforms such as the Advanced Medium Combat Aircraft (AMCA). "As commercial aviation has very high-quality requirements, learning this will enable us to easily transition into defence programmes like AMCA," Biswal said.

Yet one glaring problem lingers: raw material. "99% of the raw material for these products are still imported from the US, Europe, Russia, or China," Biswal conceded. To offset this, Bharat Forge's sister firm, Sarloha, has started manufacturing indigenous steel for landing gears, taking India one step closer to actual self-reliance in defence production.

Growing Beyond Conventional Defence: AI, Hypersonics, and Space

Apart from engines and landing gear, Bharat Forge is also investing in the latest technologies that are defining the future of warfare. From AI-powered UAVs to hypersonics and directed energy weapons, the company is venturing into the next frontier. "Modern warfare is moving away from conventional aircraft and into cyber warfare, AI-powered systems, and directed energy weapons," Biswal said.

Bharat Forge has also entered into a Memorandum of Understanding (MoU) with VEDA Aeronautics for co-development of high-speed aerial weapon systems and next-generation UAVs. As part of the agreement, Bharat Forge will provide VEDA's unmanned systems with microjet engines, with its 40 and 45 Kgf engines already in serial production. In the future, the company is developing an indigenous jet engine with thrust capacities of up to 400 Kgf for future defence use.

Defence Exports: India's Stability as a Selling Point

Though Bharat Forge has concentrated mainly on the domestic market, exports are now central to its strategy. The global defence supply chain is being reconfigured by geopolitical tensions, forcing many firms to seek alternative suppliers in regions other than China, Russia, and parts of Europe. Indian manufacturers see this reconfiguration as a chance.

"OEMs are reassessing their supply chains because of geopolitical changes—shifting away from China, Russia, and even Europe. India's stability is making it a good alternative," Biswal added. India is its central market for the time being, but Bharat Forge anticipates that exports will make up 90% of its business in the years ahead.

The Bigger Picture: India's Defence Manufacturing Ecosystem

Bharat Forge's initiatives are part of a bigger national thrust towards self-reliance in defence production. The company spends 1.5% of its turnover on R&D so that it remains at the forefront of technology. Although its aerospace segment has not partnered with DRDO directly, Bharat Forge's larger defence segment does have projects in the pipeline, though details are not public yet.

Also, Bharat Forge is closing in on a big order with India's Ministry of Defence to buy 307 Advanced Towed Artillery Gun Systems (ATAGS) worth over ₹6,000 crore. Bharat Forge has come out as the lowest bidder and is expected to get 60% of the order worth around ₹4,000 crore.

Even with a 16.38% year-on-year decline in consolidated net profit to ₹212.78 crore and a 10.1% fall in revenues to ₹3,475.54 crore in the December quarter—attributed partly to poorer show by its European operations and defence business—Bharat Forge is keen to strengthen its defence presence.

A Defining Moment for India's Defence Industry

"Energy levels at Aero India 2025 are phenomenal. Attendance from 107 nations compared to about 70 last year indicates growing interest worldwide in India's defence sector," Biswal said.

As Bharat Forge produces indigenous jet engines, signs new orders, and ventures into new technologies, it is not only bolstering its own future—it is creating India's defence future. If this trend picks up speed, the vision of a genuinely self-sufficient Indian defence industry could be nearer than ever.

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Igla-S: रूस की डील से भारत को फायदा... दुश्मन के हवाई हमले होंगे बेकार

Source: Aaj Tak, Dt. 18 Feb 2025,

URL: <https://www.aajtak.in/defence-news/story/india-enhances-air-defense-capabilities-with-locally-produced-igla-s-systems-dskc-2169944-2025-02-18>

भारतीय सेना को एडानी डिफेंस द्वारा स्थानीय रूप से असेंबल किए गए इग्ला-एस सिस्टम प्राप्त होंगे, जो रोसोबोरोनएक्सपोर्ट के साथ एक टेक्नोलॉजी ट्रांसफर समझौते का हिस्सा हैं। डील में 48 लॉन्चर, 100 मिसाइलें, नाइट-विजन डिवाइस और एक परीक्षण स्टेशन शामिल हैं, जिसकी कीमत ₹260 करोड़ है। इस पहल का उद्देश्य भारत की छोटी दूरी की वायु रक्षा क्षमताओं को मजबूत करना है।

इनका नाम है Igla-S Manpads. यह खास तरह के एंटी-एयरक्राफ्ट मिसाइल सिस्टम हैं, जो किसी भी तरह के हवाई खतरे को नष्ट कर सकते हैं। भारतीय सेनाओं के पास इसके पुराने वर्जन मौजूद हैं। इसकी मदद से दुश्मन के इग्ला-एस एंटी-एयरक्राफ्ट मिसाइल का वजन 10.8 kg है।

पूरे सिस्टम का वजन 18 kg. सिस्टम की लंबाई 5.16 फीट होती है। व्यास 72 mm. इस मिसाइल की नोक पर 1.17 kg का विस्फोटक लगाते हैं। इसकी रेंज 5 से 6 km है। यह मिसाइल 2266 km/hr की स्पीड से अधिकतम 11 हजार फीट तक जा सकती है। नई इग्ला-एस हैंड-हेल्ड एंटी-एयरक्राफ्ट मिसाइल भारतीय सेना में शामिल पुरानी इग्ला मिसाइल को बदलेगी। पुरानी इग्ला मिसाइल 1990 के दशक में सेना में शामिल की गई थी।



रूस के साथ पुराने संबंधों का फायदा भारत इन मिसाइलों को मेक-इन-इंडिया मिशन के तहत देश में बनाना चाहता है. रूस कई सालों से भारत को हथियार देता आ रहा है. दोनों देशों के बीच सैन्य हथियारों को लेकर कई समझौते हुए हैं.

पाकिस्तान और चीन की सीमा पर तैनातीभारत ने S-400 एयर डिफेंस सिस्टम को पाकिस्तान और चीन की सीमाओं पर लगाया है. यह रूस का सबसे अत्याधुनिक हवाई सुरक्षा सिस्टम है. यह सतह से हवा में मार करने वाली मिसाइल प्रणाली है. यूक्रेन के साथ युद्ध के चलते भारत ने कभी भी रूस की सीधे तौर पर आलोचना नहीं की.

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The Indian Army Is Marching Towards Renewable Energy, And Fast: How Is It Doing This?

Source: Times Now, Dt. 18 Feb 2025,

URL: <https://www.timesnownews.com/india/the-indian-army-is-marching-towards-renewable-energy-and-fast-how-is-it-doing-this-article-118353828>

Power giant NTPC on Tuesday announced a significant agreement with the Indian Army to supply 200 kilowatts of round-the-clock renewable energy from a solar-hydrogen-based microgrid in Ladakh. The power purchase agreement (PPA), signed for 25 years, marks a big step in the military's transition to sustainable energy solutions.

NTPC's solar-hydrogen microgrid at Chushul, located at an altitude of 4,400 meters where temperatures plummet to -30 degrees Celsius, is poised to replace the Army's existing diesel

generators. This project is expected to eliminate the need for fossil fuel logistics and prevent 1,500 tonnes of CO2 emissions annually.

Describing the project as the world's most unique hydrogen-based off-grid microgrid, NTPC stated that its operation will set a new benchmark for decarbonization and modernisation of defence infrastructure in remote Himalayan border areas.

The Broader Green Energy Transition

As India pursues its ambitious target of achieving net-zero emissions by 2070, the Indian Army is taking decisive steps to reduce its carbon footprint, embracing renewable energy across multiple domains. With military forces globally accounting for approximately 5.5% of greenhouse gas emissions, according to a 2022 Conflict and Environment Observatory report, India's armed forces are positioning themselves at the forefront of sustainability-driven military transformation.

Experimenting with Hydrogen Fuel Cell Technology

Beyond stationary power solutions, the Army is actively testing hydrogen-powered transportation. In May 2024, it partnered with Indian Oil Corporation Limited (IOCL) for trials of hydrogen fuel cell buses. The agreement, signed by Army Chief General Manoj Pande and IOCL Chairman Shrikant Madhav Vaidya, marks a potential shift in how personnel and equipment are transported, replacing traditional fuel-powered vehicles with zero-emission alternatives.

The hydrogen fuel cell technology generates electricity through an electrochemical reaction, emitting only water vapor. If the trials prove successful, the Army could expand its adoption of hydrogen-powered mobility, cutting emissions in troop transportation and logistics.

Embracing Electric Vehicles

Complementing its push for hydrogen-based solutions, the Indian Army is gradually incorporating electric vehicles (EVs) into its fleet. In July 2024, it announced plans to procure 113 electric buses for troop transportation, aligning with the broader Ministry of Defence policy encouraging EV use in the Army, Navy, and Air Force. Since 2022, the Army has been inducting EVs in a phased manner at peace stations, deploying electric light vehicles, motorcycles, and buses in designated areas.

To ensure the success of this transition, military cantonments and bases are being equipped with EV charging infrastructure. Additionally, the Army has engaged the Indian Institute of Technology (IIT) Kanpur to conduct annual carbon audits of its cantonments, assessing the effectiveness of its decarbonization efforts.

Renewable Energy for High-Altitude Operations

Deploying troops in extreme climates presents unique energy challenges, particularly in the high-altitude regions of Ladakh, where temperatures plummet to minus 40 degrees Celsius. The Army is adopting renewable solutions to provide sustainable heating and power for personnel stationed in such inhospitable conditions.

The Defence Research and Development Organisation (DRDO) and the Defence Institute of High Altitude Research (DIHAR) in Leh have developed solar-thermal technology for heating military shelters. By harnessing Ladakh's abundant sunlight, these systems store heat in thermal fluids,

which is then released overnight to maintain warm living conditions. The technology reduces reliance on diesel generators and traditional fossil fuel-based heating, making forward deployments more energy-efficient.

Additionally, in October 2024, DIHAR introduced a renewable energy-powered solar thermal system tailored for cold regions, replacing diesel-fueled heating solutions such as the traditional 'bukhari' (fire pot). These advancements ensure soldiers remain well-insulated while minimizing environmental impact.

Solar-Powered Military Infrastructure

On the infrastructure front, the Indian Army is incorporating large-scale solar power projects to meet its operational energy needs. In January 2025, in collaboration with the Military Engineer Services (MES), it commissioned a 1-megawatt solar power plant at the Dronachal Military Campus in Bhopal.

The ₹9.5 crore project is designed to enhance energy independence and operational sustainability, demonstrating the Sudarshan Chakra Corps' commitment to integrating renewable energy into military facilities. There are also discussions about expanding the Dronachal site into a renewable energy research hub to foster innovation in sustainable military technologies.

Passive Solar Shelters: A Fuel-Free Approach

The Army's sustainability efforts date back to 2021 when it collaborated with Ladakhi innovator Sonam Wangchuk to develop Solar Heated Insulated Ladakhi (SHILA) shelters near Hanley Monastery in Ladakh. These shelters, designed for extreme cold conditions, maintain interior temperatures between 14-22 degrees Celsius even when outdoor temperatures drop to -30 degrees Celsius.

The SHILA shelters are constructed using eco-friendly materials such as Ladakhi bricks made from bio-waste, clay, and hay. They also repurpose non-biodegradable waste like plastic bottles for insulation. Crucially, these units do not rely on conventional fuel-based heating, instead passively capturing and storing ambient solar energy.

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MShield 2.0 App: Indian Army's answer to cyber threats and honeytrap

Source: News Nine , **Dt.** 18 Feb 2025,

URL: <https://www.news9live.com/india/mshield-2-0-app-indian-armys-answer-to-cyber-threats-and-honeytrap-2823922>

To counter the honey trap issue in the Indian Military, a new application has been launched to counter the efforts to get sensitive information related to India's defense mechanism. There have been various reports in the past under which officials of Indian armed forces were honey-trapped and sensitive issues leaked out of them.

To counter this, the Indian Army has launched the MShield 2.0 app. This app will be exclusively for the Indian defense forces and cannot be downloaded from the Play Store app. As per officials, there had not been a single case of honey trap since this app was launched.

The app will help in maintaining cyber hygiene

Speaking to TV9 Network, Indian Army officer Captain Shivani Tiwari said, “ There are several apps that are banned in the country so that no sensitive information is leaked by our defense personnel knowingly or unknowingly. As a commander, how will I know whether my troops have maintained cyber hygiene if they are deployed in far-off places? It is because of this that this app has been developed.”

Over 14,000 users of the app so far

She added, “ We have over 14,000 users as of now. As soon as the troops generate reports from the app in their mobiles, the commander will be able to find whether they have installed any banned app on their phone or not. No personal detail of any user is collected. Only the verification of the app name is done. The app also helps to find out whether any user received any PIO call. If any report is found steps are taken accordingly. Information are gathered on what questions they were asked so that other troops can also be alerted.”

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Navy's Rs 60,000 crore Rafale deal to boost Air Force's refuelling capability

Source: India Today Dt. 19 Feb 2025,

URL: <https://www.indiatoday.in/india/story/navys-rs-60000-crore-rafale-marine-jet-deal-to-boost-air-forces-aerial-refuelling-capability-2682085-2025-02-19>

India's defence capabilities are set for a major boost as the Indian Navy moves closer to finalising its acquisition of 26 Rafale Marine jets from France. The deal, which is in the final stages of approval by the Cabinet Committee on Security, will not only strengthen the Navy's fleet for operations aboard aircraft carriers like INS Vikramaditya but will also enhance the Indian Air Force's aerial refuelling capabilities.

The contract includes provisions that will enable around 10 of the 36 Rafale jets in the Air Force fleet to conduct buddy-buddy refuelling, significantly extending their operational range. Defence sources have indicated that the deal will also provide the IAF with crucial ground-based equipment to support its operations, along with software upgrades to enhance combat efficiency.

Under the government-to-government agreement, the Navy will receive 22 single-seater and four twin-seater Rafale Marine aircraft. These advanced 4.5-generation jets will require extensive modifications and equipment installation on the aircraft carrier to ensure seamless operations from its deck.

Currently, the Navy operates MiG-29Ks from INS Vikramaditya, but as India moves towards strengthening its indigenous defence capabilities, plans are in place to develop a fifth-generation fighter aircraft through the Defence Research and Development Organisation (DRDO).

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Amid China concerns, India ramps up its 5th gen fighter jet programs

Source: India Today Dt. 18 Feb 2025,

URL: <https://www.indiatoday.in/india/story/indian-air-force-navy-army-fighter-jets-tedbf-amca-defence-ministry-2681848-2025-02-18>

India is looking to join an elite club with its two indigenous programs to develop fifth-generation fighter jets for the Air Force and the Navy. With China already having developed a sixth generation jet, India has intensified its AMCA (Advanced Medium Combat Aircraft) and the TEDBF (Twin-Engine Deck-Based Fighter) programs.

Currently, only two countries -- China (J-20, J-35) and the United States (F-22, F-35)-- possess two operational fifth-generation fighter jets.

The TEDBF is being designed specifically for the Indian Navy's aircraft carriers to enhance maritime defence capabilities. According to Amitabh Saraf, Project Director of TEDBF, the aircraft is currently in the Preliminary Design Review (PDR) phase and the primary design is expected to be completed by June 2025.

Once this phase is completed, the program will move into Critical Design Phase and Wind Tunnel Testing, ensuring the aerodynamic feasibility of the aircraft before prototype trials.

Saraf also emphasised that all technologies used in TEDBF are indigenous, reinforcing India's commitment to self-reliance in defence manufacturing.

Designed to meet the Indian Navy's operational needs, the TEDBF will be a multi-role fighter with an estimated weight of 26 tons. It will have an operational range of 800–900 km over the ocean, carry 7,000 kg of fuel, and feature mid-air refuelling capabilities. The aircraft will be equipped with 12 hardpoints for weapons, including BrahMos and Beyond Visual Range (BVR) missiles.

While it will not have full stealth capabilities, it will incorporate radar-evading technologies to enhance survivability. Additionally, TEDBF will serve as a mid-air refuelling tanker, capable of refuelling four to five other aircraft during missions.

India's naval aviation capabilities received a major boost in September 2022, when Prime Minister Narendra Modi commissioned INS Vikrant, India's first indigenous aircraft carrier. With this, India became one of the only six nations capable of building aircraft carriers. However, the Navy currently lacks an advanced indigenous fighter jet for its carriers.

The LCA Navy, while an important step in India's aviation development, was too heavy and had a single-engine design, making it unsuitable for carrier operations. Recognising the need for a twin-engine, more advanced fighter, the Indian Navy pushed for the TEDBF project.

China's J-35 and the US F-35B/C have been specifically designed for carrier-based operations, giving their navies a major strategic advantage. With TEDBF, India aims to bridge this gap and ensure greater operational strength in the Indian Ocean and beyond. The first TEDBF prototypes are expected to be ready for flight by 2028, and full deployment is projected by 2035, significantly strengthening India's naval capabilities.

The Advanced Medium Combat Aircraft (AMCA) is a cutting-edge project for fifth-generation stealth, multi-role combat aircraft to serve both the Air Force and the Navy. The AMCA is intended to perform a wide range of missions, including air supremacy, ground-strike, Suppression of Enemy Air Defences (SEAD), and electronic warfare (EW).

The AMCA is a single-seat, twin-engine aircraft with all-weather operational capability and is expected to weigh around 25 tonnes and can reach a maximum altitude of 55,000 feet.

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India 'considering' Russian offer of manufacturing fifth-generation Su-57 fighter jets in India: Official

Source: The Week, Dt. 18 Feb 2025,

URL: <https://www.theweek.in/news/defence/2025/02/18/india-considering-russian-offer-of-manufacturing-fifth-generation-su-57-fighter-jets-in-india-official.html>

Dmitry Shugaev, director of Russian Federal Service for Military-Technical Cooperation, claimed that New Delhi is evaluating the proposal by Russia to manufacture the fifth-generation Sukhoi Su-57 fighter jets in India.

"They are considering the issue in any case," Shugaev was quoted as saying on the sidelines of the international defence exhibition IDEX 2025, according to media reports.

The remark comes even as India and the US unveiled an ambitious plan to ink a new 10-year defence partnership, and President Donald Trump made the announcement that Washington would increase sales of military hardware to New Delhi by millions of dollars including the possible supply of F-35 stealth fighter jets to India.

Russia's premier stealth multi-role fighter Su-57 aircraft, designed for stellar air superiority and strike capabilities, is equipped with advanced avionics, supercruise capability, and stealth technology. The fighter jet had made an appearance at the recently-concluded Aero India 2025 where it impressed the audience with high-speed aerial manoeuvres. The American fifth-generation F-35 Lightning II too was part of the event held in Bengaluru.

Russia has been a major weapons supplier to India. A few days ago, a spokesperson for Russian state arms exporter Rosoboronexport had said the production of the fifth-generation fighter jet could begin this year itself if the government of India accepts Russia's offer regarding the same.

Making the aircraft in India, with a full transfer of technology, will ensure that production and maintenance will not be affected by Western sanctions on Russia, the spokesperson had said, according to news agency Reuters.

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India “Chooses” Indigenous Combat Choppers Over ‘Delayed’ LCA Tejas For Exports; Aims To Boost Revenues From 1% To 25%

Source: The Eurasian Times, Dt. 18 Feb 2025,

URL: <https://www.eurasiantimes.com/indian-aircraft-maker-awaits-breakthrough-defense-deal/>

Aiming to increase its export revenues from the current 1 percent of total revenue to 25 percent, Indian aircraft maker Hindustan Aeronautics Limited (HAL) has done a reality check. Instead of exporting homegrown fighter jets and Light Combat Aircraft, it will focus more on exporting Dorniers and helicopters to African, Middle Eastern, and South East Asian countries. The Narendra Modi government had set a target for all PSUs to get 25 percent of their revenues from exports. But at the moment, the HAL has zero export orders, and exports constitute just one percent of its total revenues.

Despite this, HAL’s order book is expected to touch Rs 2,50,000 crore (\$3B). As of December 2024, HAL had orders worth over Rs 1,30,000 crore. The next 12 months’ order accretion is estimated at Rs 1,65,000 crore. HAL is actively pursuing two major contracts in India – 97 LCA (Light Combat Aircraft) MK 1A and 156 LCH (Light Combat Helicopter) orders. These two orders will add Rs 1,30,000 crore to its order book.

Along with this, the orders for the Su-30 Upgrade, Indian Multi-Role Helicopter design and development (IMRH D&D) sanction, and regular Repair and Overhaul (ROH) orders will take the total order book to Rs 2,50,000 crore by 2025-26. During the nine months of the current financial year (2024-25), HAL received fresh orders worth Rs 55,800 crore, comprising Rs 39,000 crore in manufacturing orders, including 240 AL 31 FP engines valued at Rs 25,350 crore and 12 Su-30MKI aircraft worth Rs 12,573 crore, and Rs 16,500 crore in ROH, spares, and D&D orders.

Contrary to this, it received export orders worth Rs 300 crores in the nine months of the financial year. The Indian government has made the indigenous Light Combat Aircraft (LCA) ‘Tejas’ the flagship product on its defense exports list. Not a single month passes without news of a new country’s interest in the fighter jet.

New Delhi has been aggressively pushing to sell the LCA to foreign air forces. Indian diplomats and HAL officials have been meeting foreign officials, throwing diplomatic weight behind the aircraft. However, the HAL has realized that buying fighter jets is a big-ticket item, and not many countries can easily make that decision.

“Export of LCA is a billion dollars plus deal because it requires spares and weapons. There are not many countries that can afford it. It is one of the difficult parts of selling LCA. The countries need to have that kind of financial muscle,” HAL Chief DR. DK Sunil said. He hoped the Indian government could help the countries by extending a Line of Credit.

Many countries have shown interest in the LCA, and HAL is trying to demonstrate its capabilities through test flights in these countries. LCA Mk1A opened Aero India 2025. Moreover, HAL has

established offices in Malaysia, the UK and Egypt. It is considering establishing offices in two more countries, the names of which are yet to be finalized. When asked if the HAL has the wherewithal to meet the export demands for LCA in case the deal comes through, Dr. Sunil said that the HAL can rope in private players like Larsen and Toubro (L&T) and Tata Aerospace.

“We have a private sector partnership, where we can get up to 10 fuselages from companies like L&T and Tata, which can build aerostructures. We think we can ramp it (the manufacturing) up, but our focus with the countries is to establish MRO and repair facilities rather than manufacturing lines because the investment is high.”

However, the HAL has a backlog of 6-7 years to meet the Indian Air Force’s (IAF) requirements. Considering this, the HAL has started investing in ramping up manufacturing facilities for helicopters and exporting Dornier 228.

Dornier 228 And Helicopters

HAL made a breakthrough when it exported Dornier 228 aircraft to Guayana in 2024. Since then, HAL has fielded Dornier in a tender in Malaysia and is confident it will win the contract to supply eight aircraft to Malaysia. Learning from its fiasco in Ecuador with its ALH Helicopters, HAL is putting more “boots on the ground.” After a series of accidents, Ecuador has grounded its ALH fleet.

“In Guayana, we have our people supporting the product. We are talking to local companies to develop the repair facility,” Dr. Sunil informed. The HAL intends to expand manufacturing lines for Light Utility Helicopters (LUH), Light Combat Helicopters (LCH), and Advanced Light Helicopters (ALH) to meet export demands, and the public sector aircraft maker is actively promoting helicopter platforms.

The HAL’s capacity is 30 helicopters per annum. When demand is at its peak, the HAL will try to scale it up to 60 helicopters, and plans are being made to ramp up production to 90 helicopters annually.

LCH, along with LCA, is one of the flagship products designated for exports from the HAL. Argentina and Nigeria have shown interest in rotary-wing aircraft. Argentina signed a letter of intent to purchase 20 ‘Prachand’ (Fierce) helicopters. During the 2023 visit of Argentinian defense minister Jorge Taiana, the two countries signed a letter of intent to purchase 20 LCH.

“Regarding the MoU with Argentina, it took some time due to their internal approval. Again, funding issues are still there for getting agreements. We discussed with Morocco, Rwanda, and Congo,” the HAL Chief said. The HAL Team even visited Congo to understand their requirements. The Philippines has also expressed interest in buying seven ALH MKIII helicopters for its coast guard. In 2023, the Chief of the Filipino Coast Guard visited India. However, the deal is yet to materialize.

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How US tech giants supplied Israel with AI models, raising questions about tech's role in warfare

Source: The Economic Times, Dt. 18 Feb 2025,

URL: <https://economictimes.indiatimes.com/news/defence/how-us-tech-giants-supplied-israel-with-ai-models-raising-questions-about-techs-role-in-warfare/articleshow/118361016.cms>

US tech giants have quietly empowered Israel to track and kill many more alleged militants more quickly in Gaza and Lebanon through a sharp spike in artificial intelligence and computing services. But the number of civilians killed has also soared, along with fears that these tools are contributing to the deaths of innocent people. Militaries have for years hired private companies to build custom autonomous weapons. However, Israel's recent wars mark a leading instance in which commercial AI models made in the United States have been used in active warfare, despite concerns that they were not originally developed to help decide who lives and who dies.

The Israeli military uses AI to sift through vast troves of intelligence, intercepted communications and surveillance to find suspicious speech or behaviour and learn the movements of its enemies. After a surprise attack by Hamas militants on October 7, 2023, its use of Microsoft and OpenAI technology skyrocketed, an Associated Press investigation found.

The investigation also revealed new details of how AI systems select targets and ways they can go wrong, including faulty data or flawed algorithms. It was based on internal documents, data and exclusive interviews with current and former Israeli officials and company employees.

Israel's goal after the attack that killed about 1,200 people and took over 250 hostages was to eradicate Hamas, and its military has called AI a "game changer" in yielding targets more swiftly.

Since the war started, more than 50,000 people have died in Gaza and Lebanon and nearly 70 per cent of the buildings in Gaza have been devastated, according to health ministries in Gaza and Lebanon.

"This is the first confirmation we have gotten that commercial AI models are directly being used in warfare," said Heidy Khlaaf, chief AI scientist at the AI Now Institute and former senior safety engineer at OpenAI. "The implications are enormous for the role of tech in enabling this type of unethical and unlawful warfare going forward."

Israel's Use of AI and Cloud Computing Soared During War

Among US tech firms, Microsoft has had an especially close relationship with the Israeli military spanning decades.

That relationship, alongside those with other tech companies, stepped up after the Hamas attack. Israel's war response strained its own servers and increased its reliance on outside, third-party vendors, according to a presentation last year by Col. Racheli Dembinsky, the military's top information technology officer.

As she described how AI had provided Israel "very significant operational effectiveness" in Gaza, the logos of Microsoft Azure, Google Cloud and Amazon Web Services appeared on a large screen behind her.

The Israeli military's usage of Microsoft and OpenAI artificial intelligence spiked last March to nearly 200 times higher than before the week leading up to the October 7 attack, the AP found in reviewing internal company information.

The amount of data it stored on Microsoft servers doubled between that time and July 2024 to more than 13.6 petabytes - roughly 350 times the digital memory needed to store every book in the Library of Congress. Usage of Microsoft's huge banks of computer servers by the military also rose by almost two-thirds in the first two months of the war alone.

Microsoft declined to provide any comment for this story and did not respond to a detailed list of written questions about the cloud and AI services it provides to the Israeli military.

In an expansive statement on its website, the company says "respecting human rights is a core value of Microsoft" and it is committed "to champion the positive role of technology across the globe".

In its 40-page Responsible AI Transparency Report for 2024, Microsoft pledges to "map, measure, and manage generative AI risks throughout the development cycle to reduce the risk of harm," and does not mention its lucrative military contracts.

Advanced AI models are provided through OpenAI, the maker of ChatGPT, through Microsoft's Azure cloud platform, where they are purchased by the Israeli military, the documents and data show. Microsoft has been OpenAI's largest investor.

OpenAI said it does not have a partnership with Israel's military, and its usage policies say its customers should not use its products to develop weapons, destroy property or harm people. About a year ago, however, OpenAI changed its terms of use from barring military use to allowing for "national security use cases that align with our mission".

The Israeli military declined to answer detailed written questions from The AP about its use of commercial AI products from American tech companies, but said its analysts use AI-enabled systems to help identify targets and independently examine them together with high-ranking officers to meet international law, weighing the military advantage against the collateral damage.

"These AI tools make the intelligence process more accurate and more effective," said an Israeli military statement to the AP. "They make more targets faster, but not at the expense of accuracy, and many times in this war they've been able to minimise civilian casualties."

Other US Tech Firms Also Work With Israel's Military

Google and Amazon provide cloud computing and AI services to the Israeli military under "Project Nimbus", a USD 1.2 billion contract signed in 2021, when Israel first tested out its in-house AI-powered targeting systems.

The IDF has used Cisco and Dell server farms or data centers. Red Hat, an independent IBM subsidiary, also has provided cloud computing technologies to the Israeli military, while Palantir

Technologies, a Microsoft partner in US defence contracts, has a "strategic partnership" providing AI systems to help Israel's war efforts.

After OpenAI changed its terms of use last year to allow for national security purposes, Google followed suit earlier this month with a similar change to its public ethics policy to remove language saying it wouldn't use its AI for weapons and surveillance.

Google said it is committed to responsibly developing and deploying AI "that protects people, promotes global growth, and supports national security."

What Is Commercial AI Used For?

The Israel Defence Forces uses Microsoft Azure to compile information gathered through mass surveillance, which it transcribes and translates, including phone calls, texts and audio messages, according to an Israeli intelligence officer who works with the systems. That data can then be cross-checked with Israel's in-house targeting systems and vice versa.

He said he relies on Azure to quickly search for terms and patterns within massive text troves, such as finding conversations between two people within a 50-page document. Azure also can find people giving directions to one another in the text, which can then be cross-referenced with the military's own AI systems to pinpoint locations.

The Microsoft data AP reviewed shows that since the October 7 attack, the Israeli military has made heavy use of transcription and translation tools and OpenAI models, although it does not detail which. Typically, AI models that transcribe and translate perform best in English.

OpenAI has acknowledged that its popular AI-powered translation model Whisper, which can transcribe and translate into multiple languages including Arabic, can make up text that no one said, including adding racial commentary and violent rhetoric.

Are Israel's AI Systems Reliable?

Errors can happen for many reasons involving AI, said Israeli military officers who have worked with the targeting systems and other tech experts. Intercepted phone calls tied to a person's profile include the time the person called and the names and numbers of those on the call. But it takes an extra step to listen to and verify the original audio, or to see a translated transcript.

The Israeli military says a person who knows Arabic is supposed to check translations. Still, one intelligence officer said he had seen targeting mistakes that relied on incorrect machine translations from Arabic to Hebrew.

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Science & Technology News

Thermal structure of solar coronal holes and their magnetic fields unveiled

Source: Press Information Bureau, Dt. 18 Feb 2025,

URL: <https://pib.gov.in/PressReleasePage.aspx?PRID=2104369>

A new study has accurately estimated the physical parameters of thermal and magnetic field structures of solar coronal holes which have significant influence on space weather that affects satellites, as well as the Indian summer monsoon rainfall.

Coronal holes, which are dark regions in X-ray and extreme ultraviolet images of the Sun, have open magnetic field lines and are hence important for understanding the interplanetary medium and space weather. The latitude dependence of temperature and the magnetic field strengths of these coronal holes have now been characterised accurately by astronomers from the Indian Institute of Astrophysics.

Discovered in the 1970s by X-ray satellites, "coronal holes" in the sun's atmosphere are dark in the X-ray and EUV wavelengths, and are low-density regions that have open magnetic field structures in the interplanetary space. These solar activity phenomena are intense sources of fast (450-800 km/sec) solar wind—streams of charged particles that escape from the sun, more easily into space.

At present, this high-speed solar wind can interact with the Earth's magnetic field, causing disturbances like geomagnetic storms. Effects of sunspots on the Earth's atmosphere and climate are well recorded.

Interestingly, a recent physics-based study came to the conclusion that, in addition to influence of sunspots, parameterized study of radiative effects of coronal holes explains satisfactorily the variability of Indian Monsoon rainfall. Moreover, occurrences of coronal holes are associated with disturbances in the Earth's ionosphere, the layer of the atmosphere that reflects and modifies the radio waves, leading to further communication issues.

Considering these imminent dangers of space weather effects and long-term influence of the solar coronal holes on the Indian Monsoon rainfall it is important to study their thermal, magnetic field structures and their origin. Thermal means, estimation of temperature, radiative flux and energy of the coronal holes that emanate on the sun and at Lagrangian point at space, near the Earth. If one knows the temperature structure of coronal holes, from their latitudinal variation on the sun, one can estimate their depths of origin during their initial evolutionary stage in the deep solar interior.

On the other hand, estimation of radiative flux and energy of the coronal holes will be useful for estimation of input of this thermal energy into the interplanetary space. Moreover, information of latitudinal variation of temperature structure of coronal holes indirectly leads to estimation of magnetic field structure of coronal holes that ultimately give the clue for understanding the formation of coronal holes.

Keeping these important facts in mind, astronomers of Indian Institute of Astrophysics (IIA), an autonomous institute of Department of Science and Technology, used eight years of full-disk calibrated images observed by the Solar and Heliospheric Observatory (SOHO) space probe to study these coronal holes. These were unambiguously detected and physical parameters of thermal and magnetic field structures of coronal holes were accurately estimated.

“The study published in published in the journal Astronomy and Astrophysics also offers a comprehensive understanding of how these near-equatorial coronal holes evolve as they traverse the solar disk. In addition to estimation of different physical parameters of coronal holes, two important findings emerged from this study,” said Dr Manjunath Hegde of IIA, and lead author of the study.

“We found that there is no latitudinal variation of temperature structure of coronal holes and also that there is a latitudinal variation of strength of magnetic field structure of coronal holes that increases from the solar equator to the pole. The first result suggests that coronal holes are likely to originate from the deep interior, whereas the second result suggests that coronal holes might have formed from the superposition of Alfvén wave perturbations”, said Dr K.M. Hiremath from the same institute.

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How Chandrayaan-3 lander made surprise Moon ‘hop’

Source: The Indian Express, Dt. 19 Feb 2025,

URL: <https://indianexpress.com/article/technology/science/how-chandrayaan-3-lander-made-surprise-moon-hop-9843505/>

Days after the Chandrayaan-3 lander, Vikram, made a soft landing on the Moon in August 2023, scientists at ISRO found a dilemma on their hands.

Vikram still had some propellant left, and a section of scientists did not want it to go unused. Others, however, were not in favour of any additional experiments as the mission was already a success.

Finally, ISRO decided to go off book.

This is how the Vikram lander ended up carrying out an unexpected “hop” experiment on the Moon — rising to a height of 40 cm before landing around 30-40 cm away from its original landing site.

Recalling the days leading up to the surprise experiment was ISRO chief V Narayanan, one of the key players in the Chandrayaan-3 mission. “To be very frank, on the day of landing, there was terrible tension. But the propulsion systems functioned perfectly and Chandrayaan-3 landed. The mission was a huge success,” he said in a video lecture at the Physical Research Laboratory in Ahmedabad Tuesday.

“With unused propellant, S Somanath, the former ISRO chairman, and I had a discussion and we were considering why not simply lift the lander again and place it nearby. Many scientists of the

Chandrayaan-3 teams, though, were not interested. This, as the original goal of the mission, that is, soft landing on the moon had been successfully achieved,” Narayanan said.

After a lot of back-and-forth, in September 2023, Vikram’s engines reignited with last remaining bit of fuel and made the “hop”.

In the process, ISRO demonstrated its capability to get the lander to fire its engines and produce the thrust to lift it off the ground. This capability is key to future lunar missions which will involve return journeys to Earth.

The successful hop experiment came as a surprise for everyone since ISRO had never talked about it previously, and it was never a part of original mission.

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Where is ISRO heading?

Source: The Hindu, Dt. 19 Feb 2025,

URL: <https://www.thehindu.com/sci-tech/science/where-is-isro-heading/article69235431.ece>

Only three decades ago, the Indian space programme was a diminutive affair, dominated by the newfound successes of the Polar Satellite Launch Vehicle (PSLV) and a then-fledgling clump of communications satellites. Today, the programme is a large tree with a flourishing canopy. There is a slew of ongoing projects accompanied by projects being ideated, developed, tested as well as retired.

The Indian Space Research Organisation (ISRO) — employer of several thousand engineers, scientists, and administrators — is now accompanied by IN-SPACe, a new nodal agency to oversee and enable private space enterprises’ activities, and NewSpace India, Ltd., to manage commercial launch commissions and commercialise Indian space technologies. ISRO’s spaceport in Andhra Pradesh has expanded to two launch pads while a second port is under construction in Tamil Nadu.

Its PSLV rocket is likewise joined by five others — three operational and two in the works — with bespoke features to meet specific civil and national needs while serving commercial markets when opportunities arise. ISRO operates more than 50 satellites in earth orbit and has launched more than 400 in commercial missions paid for by foreign governments and companies. It has also hoisted four missions to the moon, one to Mars, two space telescopes, and a solar physics probe. Missions in the near future include a synthetic aperture radar satellite co-built with NASA, more interplanetary missions, an orbital space station, and of course human spaceflight.

Its experts are designing next-generation engines (especially the SCE-200), green(er) fuels, and high-performance materials. The organisation is currently transferring SSLV and PSLV manufacturing to industry while government reforms from 2019 invited private enterprises to build and operate virtually any technology.

Defining success

Against the backdrop of India’s history, a national space programme of this magnitude is by all means very successful. ‘Success’ here refers to the programme’s ability to plan and execute longer-

term projects with crore-rupee budgets, coordinate activities across multiple centres, manage procurement, logistics, and accounts with industry contractors, and balance political ambitions and public expectations. Unfortunately, neither ISRO nor the programme has the luxury of having their efforts vis-à-vis spaceflight, space exploration, and commercialisation judged only by the yardstick of how far India alone has come.

The fact is the Indian space programme can take great strides and still remain uncompetitive with the other countries belonging to the same elite club to which it has repeatedly claimed to belong. While the U.S. and Russia (including the erstwhile USSR) had a head start of many decades, China, Japan, and Europe for a long time enjoyed more funding, technological sophistication or both.

But it's also possible to flip this tension the other way. The dramatic rise of commercial opportunities in space technologies and spaceflight — led by the successes of and radical innovation by companies like SpaceX and aided by the struggles of regulatory agencies to catch up — has placed the carts of profit and/or primacy before the horse of national needs.

For example, India is committed to an increasingly complex series of scientific missions to the moon, to be complemented in due course by the Bharatiya Antariksh Station and crewed moon missions. The cumulative cost will be in the tens of thousands of crore rupees and lakhs of work-hours — yet neither ISRO nor the Department of Space have explicitly articulated what the ultimate purpose is here. Simply put, what's in it for Indians?

Long-term priorities

In 2019-2020, the Department of Space reorganised the space programme to allow ISRO to focus on research. It hived off the responsibility of organising and executing commercial launches to NewSpace India, Ltd. (a public-sector undertaking), in 2019 and that of overseeing the activities of the country's young and ambitious space startups to IN-SPACe (an autonomous body) in 2020. This division of labour was intended to improve each arm's ability to better define its goals and work towards them in an era in which space technologies are both diversifying and becoming more sophisticated.

At the same time, the division is still open-ended to the extent that there isn't a policy or law that specifies what long-term goals they are collectively working towards and why. This is in and of itself not a bad thing if the space programme is also finding its footing, but it can't afford to take its time. Some important inefficiencies linger in the reorganisation that could lead to the uneconomical use of valuable resources. For example, IN-SPACe is both promoter and regulator of private space enterprises; there is no independent tribunal to settle disputes between private companies and IN-SPACe; and there is no space law attuned to the needs of this new, wider ecosystem of participants.

Nonetheless, the more vehement supporters of India's plans have advanced three typical arguments: (i) partaking of the comity of nations, (ii) not losing out on future opportunities, and (iii) the value of spin-off technologies. Speculative though the value of all three are, they can't be dismissed out of hand. Argument (i) in particular is quite valuable: countries working together on space missions can reduce the per-country costs as well as open new channels for soft diplomacy.

The value of (ii) and (iii) is more obvious: to keep opportunity costs in future from surging while amortising them in the interim by taking advantage of the new technologies that become available in the course of achieving those overarching goals.

But a direct counterargument here is that the cost of attaining these new technologies can be much lower if we pursued them in a more direct manner rather than anticipating them as spin-offs. More broadly, if there is one correct answer to how ISRO and India should orient themselves — joining the pursuit of greater goals versus being led by Indians' needs — it has yet to present itself. The leaders of the Indian space programme also haven't explicitly articulated what their long-term priorities are nor how they are to be determined.

The launch vehiclesAs things stand today, at least a significant part of the answer lies with India's launch vehicles. The reason is simple: both national and commercial missions are affected by their capabilities and availability.

ISRO can currently access four launch vehicles: the PSLV, the Geosynchronous Satellite Launch Vehicle Mark 2 (GSLV Mk-2), the Launch Vehicle Mark 3 (LVM-3), and the Small Satellite Launch Vehicle (SSLV). It has also just started work on the Next-Generation Launch Vehicle (NGLV) and is conducting what appear to be mid-stage tests of the Reusable Launch Vehicle (RLV). It is also making good progress on a human-rated version of the LVM-3, called HLVM-3, for its Gaganyaan human spaceflight missions. In addition, the Department of Space pays launch service providers abroad to buy payload capacity on their rockets when India's own don't fit the bill.

For many years, ISRO followed a supply-driven model of launch services: it would build and launch satellites onboard rockets, then promote the availability of these services in order to induce demand. But as it acquired newer, better rockets as well as access to more launch options, and together with reforms in the space sector, ISRO switched to a demand-driven model: until a customer — within India or international — requested a particular service, ISRO wouldn't build the corresponding satellite and/or launch vehicle.

The problem now is that people and/or industries have to want a service before it can exist, and they may not think to want it unless the want is acute or, more likely, they may not even be aware of the possibility that a satellite-based service could fulfill their requirements. Because the provision of these launch services is an important revenue source for ISRO as well as the industry member that will operate the satellite, the question is who will be responsible for seeding demand: ISRO or industry. The answer isn't yet self-evident.

This said, India's budding space startups could help bridge this gap to a meaningful degree. Soon after the Government of India opened the door to private sector participation, it has also been trying to give the first people through the door a push, or at least is giving an impression to that effect. The government has sweetened startups' involvement by opening up and/or expanding foreign direct investment (FDI) in rockets and launch facilities and in satellite manufacturing, operations, and data products; floating an interest-free loan pool of Rs 1 lakh crore for all tech startups; an investment pool of Rs 1,000 crore for space tech startups; a 24% hike in the allocation for IN-SPACe; and proposed removing the angel tax — all in 2024 alone.

When she announced the 2024-2025 (post-poll) budget, Finance Minister Nirmala Sitharaman also said the government hopes the national space economy will expand fivefold in the next 10 years. While the size of the venture capital fund read together with this comment elicited mixed reactions from startup operators, the government's aim is clear: for private enterprises to take advantage of opportunities in the global space economy — and make use of the available launch options.

Many startups are doing good work. Some notable ones include Bellatrix Aerospace (small-satellite manufacturing and in-space mobility), Digantara (space surveillance and satellite traffic management), GalaxEye Space (multi-sensor earth observation), PierSight (persistent maritime monitoring with synthetic aperture radar satellites), Pixxel (hyperspectral imaging), SatSure (infrastructure and agriculture intelligence based on satellite data), and Skyroot Aerospace (launch vehicle design and construction). I haven't included many others here strictly due to space constraints.

There's a chicken-and-egg problem here as well, however. The growth stories of North American and European startups teach us that for them to really break into a traditionally state-held bastion, the government needs to be an anchor customer in their early days: i.e. provide repeating and high-value business. Thus far, the Indian government has failed to do this, instead choosing to provide financial incentives and investment capital. Startup leaders sincerely hope it will resolve this lacuna soon.

The Gaganyaan supremacy

This said, the availability of four launchers with two more in the works doesn't mean demand is the only problem. There is a significant confounding factor that influences which launcher is picked for which mission, and which becomes clearer when the options are considered one at a time.

The SSLV has been designed such that a new rocket can be built and launched in one week, with a payload capacity of 500 kg to low-earth orbit (100 km and above from the surface) and 300 kg to a sun-synchronous orbit. In transferring the manufacturing specs to industry, ISRO's plan seems to be for companies to sign on launch contracts by satellite providers in such volumes as to keep the SSLV launch manifest busy, and free up the PSLVs and GSLVs for higher-value missions. But it's not clear whether there is enough demand for small-satellite launches to sustain the SSLV programme.

The GSLV Mk-II is unavailable for commercial launches. In the early days of ISRO's cryogenic engine programme, it received a few units from the Soviet Union based on which it developed its own variant. ISRO called the three-stage medium-lift rockets that flew with the Soviet KVD-1 cryogenic engines the GSLV Mk-I and those with the Indian variant, called CE 7.5, became the GSLV Mk-II. The GSLV Mk-III is powered by ISRO's even-better CE 20 engine and a more powerful booster stage. The vehicle was later rechristened the LVM-3 for its distinct design.

The RLV and the LVM-3 need to be understood together. A preamble: ISRO has had a tough time manufacturing launch vehicles for successive missions fast enough. This is why, for example, it had to postpone the launch of the Chandrayaan-3 mission in 2022 to secure a commercial launch contract from the London-based satellite internet services provider OneWeb. The company had

originally been scheduled to launch its satellites onboard a Russian Soyuz rocket, but then Russia invaded Ukraine, the UK imposed sanctions on the Asian country, and OneWeb was forced to terminate its contract and look for another provider. This was ISRO, which at the time could build one LVM-3 unit only every eight months and thus had to postpone the Chandrayaan-3 mission to the next year. Even now, given the investments already made as well as the political mileage its successful execution is expected to yield for the national government, Gaganyaan's HLVM-3 remains ISRO's primary focus (as launch vehicles go), leaving other missions to become subordinate to its deadlines. The RLV is one such casualty.

The RLV's final payload capacity to low-earth orbit is unclear. Even assuming it's (a high) 20 tonnes, it probably won't be useful for commercial missions. The SpaceX Starship already offers a higher payload capacity at a lower per-kilogram price. Instead, its features indicate the RLV will be a runway-capable 'space plane' that can carry experiments into low-earth orbit, stay there for some time, and bring its payload back. Thus, it's more like Boeing's X-37B, somewhat like the Soviet Union's Buran project, and little like the NASA Space Shuttle. The RLV's launch profile also means its payload will have particular volume constraints.

This said, thanks to HLVM-3, ISRO has been making slow progress. Even now, it's not clear when the organisation plans to have the RLV ready for operational missions. And because ISRO currently doesn't have access to a homegrown launch vehicle for satellites heavier than six tonnes, it has to pay Arianespace or, as it did recently, SpaceX to get super-heavy payloads to orbit. While these foreign options are available, they are expensive, don't have leeway for the launch vehicle to be adjusted to the payload's needs, and don't allow defence technologies to be present onboard. Finally, and fortunately, there's little uncertainty about the NGLV's purpose: it will be a bulkier version of the LVM-3 capable of lifting even heavier payloads to the geostationary transfer orbit, up to around six tonnes. It will also be partially reusable and thus potentially offer a per-kilogram cost for payloads considered reasonable for commercial missions. Work on it could be delayed in the short term by Gaganyaan, but no further.

Better versus good enough

All delays bear the risk of opportunity costs. For example, ISRO's plan to launch a Venus orbiter has been repeatedly delayed thanks to the unavailability of a launch vehicle, so much so that ISRO wasn't able to finalise a design until late 2024, six years after announcing payload opportunities aboard the orbiter. ISRO may of course learn important lessons en route to developing a new rocket but, as mentioned earlier, there will have been cheaper ways to learn them. This need for (reasonable) speed also speaks to the importance of all the arms of the Department of Space — ISRO, IN-SPACE, and NSIL — working coherently towards common goals while keeping the regulatory environment for startups unclouded by conflicting priorities.

As it stands, developers looking to place satellites in the low-earth orbit have greater access to the SSLV if the payload mass is 500 kg or lower and the PSLV if it's 1.8 tonnes or lower. If the satellite is heavier and/or the target orbit is the much higher geostationary transfer orbit (36,000 km above sea level), their options are the LVM-3 or a foreign vehicle, since the GSLV Mk II is no longer an option. The LVM-3 of course can't be availed on short notice while launches onboard

foreign rockets are already more affordable than they could be onboard less feature-rich Indian launchers of the future.

This is in fact an important reason why ISRO's scientific missions have thus far been restricted to simple designs. The Mars Orbiter Mission was only a technology demonstrator. The forthcoming Chandrayaan-4 mission will require ISRO to launch its components in two separate launches, assemble them in space, and then send them to the moon. For all its virtues, AstroSat's launch mass was restricted to 1.5 tonnes and its primary mirror was only 30 cm wide. The Hubble Space Telescope had a 2.4-metre-wide mirror and altogether weighed 12 tonnes. The 'Pragyan' rover of the Chandrayaan-3 mission on the moon's surface weighed a mere 26 kg; most other scientific rovers have weighed an order of magnitude more. There is no doubt the scientific instruments onboard all these spacecraft were/are capable of good science, but going ahead — if it isn't the case already — they will need to be capable of much more.

An important if also finer point here is that science is a global enterprise. The Chandrayaan missions, AstroSat, Aditya-L1, etc. are increasing Indian scientists' access to in-situ data from different parts of the earth's neighbourhood in the Solar System — but the scientists themselves will need more and better data if their communities in India are to remain competitive with their counterparts in other countries. This in turn means more sophisticated payloads capable of conducting longer and/or better studies, which means a higher payload mass and more frequent launch opportunities, which means the availability of better launch vehicles.

Taken together, ISRO needs to buck up on its launch vehicle options: there are many but qualitative and/or logistical deficiencies often render them unsuitable. ISRO is already working with industry to improve the pace of manufacturing. But the sluggishness thus far has rendered ISRO incapable of working on more than one major mission at a time. Instead it has serialised them, forcing each mission to wait for ISRO to finish working on the one at the front of the line. The only reason this isn't yet another chicken-and-egg situation is that it is easily broken by giving ISRO more money to expand its workforce, and to administer it, so that it can work on multiple major missions at a time. As the Indian space programme faces up to more opportunities, it may be better off having the capacity and not needing it rather than needing it but not having it.

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Zeiss India sets up research lab for AI in eyecare at IISc

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URL: <https://www.thehindu.com/news/cities/bangalore/zeiss-india-sets-up-research-lab-for-ai-in-eyecare-at-iisc/article69233824.ece>

Optics and optoelectronics technology company Zeiss India has collaborated with the Indian Institute of Science (IISc) to start a research lab for AI in eye care at the IISc campus.

The initiative aims to leverage AI to drive advancements in eyecare solutions and enable researchers at IISc to explore the technology's potential in facilitating early diagnosis, treatment personalisation, and accessibility in ophthalmology.

Ashish Modi, Head of Centre of Application Research India (ZEISS India's R&D Division), told The Hindu that the lab is being set up with high-end IT infrastructure for Master's and PhD students. "We will sponsor these students. As of now, we have two Master's students who have enrolled and we are looking for two PhD students," said Mr. Modi adding that the plan is to have around 8-10 researchers working in the lab over the next three years.

Creating database

The lab which is part of Zeiss India's CSR initiative would initially look at research on creating datasets for glaucoma, AI-enabled early screening of diabetic retinopathy and early identification of ageing-related cognitive impairment.

On top of this, it would also look at building handheld devices that can be taken to remote areas, enabling AI to do large-scale screening, thereby reducing the load on healthcare workers, and working with hospitals to gather, standardise and annotate data to develop high quality data.

Intertwining twoDr. Rajesh Sundaresan, Dean of Division (Electrical Electronics, and Computer Sciences Division), IISc, told The Hindu that the lab fits well into the institute's plan of setting up a medical school and hospital.

"Clinical research is somewhat separated from practice in India. Intertwining these two is important and the hospital at IISc is one such experiment. We have to think of healthcare, diagnostics and delivery of healthcare in a modern way, and AI can enable the acceleration of better healthcare today. There is a concerted effort to bring together AI-enabled healthcare with the hospital and the medical school, and the technology and science at IISc," he said.

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