

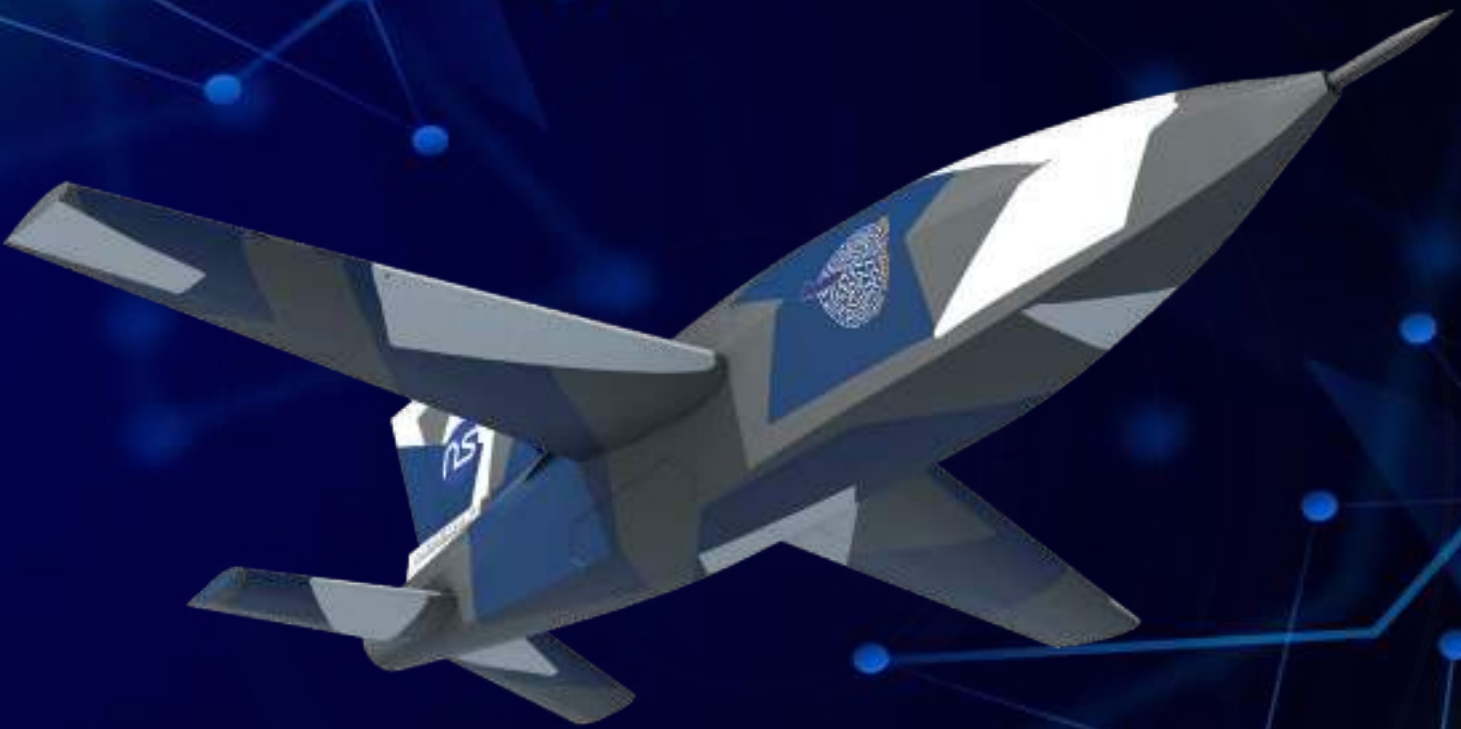
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Challenges

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Three Paths

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# EDITORIAL

## RETHINKING INDIA'S DEFENCE ROADMAP



**Ajit Kumar Thakur**  
Editor & Business  
Director

“  
India must overcome its technology strategy dilemma and its dependence on foreign deep-tech ecosystems. Faced with a long-term strategic vulnerability, India will, by necessity, have to place greater emphasis on core technologies, platforms, and foundational capabilities to emerge as a technology powerhouse.”

The Ministry of Defence's declaration on the very first day of 2025, proclaiming it the “Year of Reforms,” signalled an urgent need to accelerate the *Aatmanirbharta* (self-reliance) drive. Analysing the “Make in India” initiative over the last decade clearly indicates that, in terms of expected outcomes, it has fallen short of its goals.

Is this due to the labyrinth of systemic complexities or the nation's overregulation, which has shrunk the manufacturing sector's share of the economy and diminished its competitive edge? Should the focus now be on a “Make in India, Make for the World, and Make for India” combination? Will *Aatmanirbharta* in a new avatar ensure a seamless journey of the nation, through the nation, and to the nation, with enhanced qualitative R&D spending and greater private sector participation? In this “Year of Reforms,” will India witness substantive change in real terms?

The Defence Budget 2025-26 fell short of being aspirational, despite the 13 percent increase in the capital budget outlay for defence research and technology development and the 400 per cent increase in the allocation for “Make” projects over the revised estimates. A key concern remains the under-utilisation of the overall capital outlay by seven per cent. Can we expect it to be fully utilised in the “Year of Reforms”?

For too long, we have perseverated on the complex procurement process and complacent execution approach without sincerely attempting to resolve these challenges. The “Year of Reforms” perhaps provides an opportunity to embark on a course correction.

India's biggest challenge, amidst the changing global geopolitical landscape and the tense neighbourhood situation, has been closing gaps in conventional strength and keeping pace with military technological advances worldwide. At least a generation behind the five permanent members of the United Nations Security Council in terms of the technological capability of its armed forces, India needs to focus on quality rather than quantity.

As an aspiring global power, India must now advance on the technological frontier to position itself more advantageously on the geopolitical battleground. The long-term strategy should be to sustain economic growth with incremental increases and strengthen its indigenous innovation ecosystem to realise the vision of becoming a world leader in technology. After all, true global power demands pole position in the economic, technological, and military arenas.

Unwarranted distractions from neighbouring countries have at times hampered India's growth trajectory. It is crucial for both India and China to normalise their complex relations and provide them with a linear direction by first addressing the overarching trust deficit. In the near and distant future, India and China will need each other and must diligently work through economic, military, and political drivers to maximise their bargaining power in the global marketplace.

To fast-track the “Rising India” momentum, the country must rework its national security strategy, backed by mature political resilience, technological competence, enhanced economic capacity, and military strength. Discarding the unwarranted stasis that has lately become the norm, India must overcome its technology strategy dilemma and its dependence on foreign deep-tech ecosystems. Faced with a long-term strategic vulnerability, India will, by necessity, have to place greater emphasis on core technologies, platforms, and foundational capabilities to emerge as a technology powerhouse.

The release of the January-March 2025 (Aero India special) edition marks a significant milestone in *Raksha Anirveda's* seven-year journey. Transforming itself and holding its ground amidst intense competition, *Raksha Anirveda* has expanded its global outreach with the continuous support of its ever-growing well-wishers.

The cover story of this edition, “Collaborative Combat Aircraft,” highlights how India, backed by indigenous innovation and technological prowess, is enhancing its futuristic capabilities in air warfare. Team *Raksha Anirveda* hopes this power-packed edition, with its diverse content offerings, will find wider acceptance and resonate well with its esteemed readers.

Happy Reading! Jai Hind!!

(Ajit Kumar Thakur)

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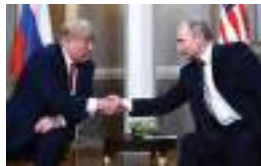
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-Editor

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## DIFFERENT STROKE

# INDIA'S AIR COMBAT DILEMMA: TO CONTINUE OR SCRAP THE MRFA PROJECT?

As India faces the stealth threat from two adversaries, the IAF's Medium-Role Fighter Aircraft project is coming under increasing scrutiny. In the background of rising costs, slow delivery and doubts about long-term viability, India should pursue a more strategic and collaborative approach in order to enhance its air combat capabilities

 **RAKESH KRISHNAN SIMHA**

**T**

wo key developments in military aerospace are poised to significantly impact the balance of air power in India's neighbourhood. Firstly, China's premier fifth-generation fighter jet, the J-20 Mighty Dragon, has entered mass production and is becoming a key component of the People's Liberation Army Air Force (PLAAF). The J-20 entered service in 2017, and the PLAAF already has over 200 fighter jets in its fleet. The goal is to take the number to 400 by 2027 and 1,000 by 2035. China has also deployed at least six J-20s less than 150 km from the border with India in the Sikkim region.

Secondly, China is in talks with Pakistan to sell its export model stealth fighter - the J-35 Shenyang. Beijing is expected to deliver forty J-35s in less than two years. The J-35's advanced radar evasion features will allow Pakistan to penetrate India's air defences more effectively, giving it a strategic advantage in any potential conflict. India had achieved air superiority over the subcontinent with the induction of the MiG-29 fighter-bomber in 1987, and the J-35 could see



AMCA

Pakistan wrest the advantage after 38 years. Losing the stealth fighter race would prove to be an acute embarrassment for India, which has an economy that's ten times larger than dirt poor Pakistan.

The two developments have added to the urgency for India to fast-track its own capabilities. At the heart of the IAF's ambitious defence modernisation plans, which have taken centre stage in recent years, is the ongoing Medium-Role Fighter Aircraft (MRFA) project. Originally kicked off to equip the IAF with cutting-edge fighter jets, the project has encountered multiple delays, rising costs and operational challenges.

One of the key issues is the high cost of foreign aircraft, notably the Rafale and Eurofighter Typhoon. While these platforms offer advanced capabilities, they come at a premium price. The Rafale, for example, is one of the most expensive fighter jets on the market, with each unit costing India over \$236 million. Additionally, slow delivery timelines mean that the IAF's urgent need for modern fighters may not be met in time to counter the threats from China and Pakistan.



Gripen C

LCA Mk1

**India had achieved air superiority over the subcontinent with the induction of the MiG-29 fighter-bomber in 1987, and the J-35 could see Pakistan wrest the advantage after 38 years. Losing the stealth fighter race would prove to be an acute embarrassment for India**

The MRFA project has also faced complications around technology transfer. Despite ongoing discussions, manufacturers like Dassault - which manufactures the Rafale - have been hesitant to transfer crucial technologies to India, limiting the country's ability to build a self-reliant defence industry. This dependence on foreign suppliers undermines India's long-term strategic objectives and leaves the IAF vulnerable to supply chain disruptions, especially during geopolitical crises.

Adding to the complexity is the Russian Su-57. The stealth fighter-bomber, touted as a fifth-generation aircraft, has been criticised for its operational shortcomings and production delays. In the 2010s, India had signed up for acquiring as many as 200 of these aircraft but the IAF withdrew from the project, citing lack of transparency from the Russian side. While India may engage with Russia on this platform during future Modi-Putin summits, pursuing this route is filled with uncertainty as Russian capabilities in the stealth domain are not proven yet. Plus, given India's

growing divergence from Russian weapons systems, pursuing this platform means back to dependence on Moscow. Given these considerations, the MRFA appears increasingly untenable, particularly in its current form. The question arises: Should India abandon the project and pursue a different route?

### **CASE FOR STRATEGIC COLLABORATION**

Collaborating with experienced international firms can enhance project management skills necessary for complex aerospace projects. This experience is vital for avoiding delays and ensuring adherence to stringent timelines, which have been a concern for Indian defence officials.

Partnering with established aerospace companies can also facilitate the transfer of critical technologies such as stealth features, advanced avionics and electronic warfare systems. Aircraft engines are an area where India currently lacks capabilities.

An outlier in the stealth arena is Saab which is stepping into the future of aerial warfare with

# DIFFERENT STROKE

the development of the Flygsystem 2020, a sixth-generation stealth fighter designed to reshape its air force. Built in Sweden, the Flygsystem 2020 is not just a fighter; it's a force multiplier, equipped with advanced stealth capabilities, artificial intelligence and manned-unmanned teaming features. The goal is to ensure superiority in high-threat environments, capable of executing a wide range of missions - from taking out ground targets to engaging enemy aircraft.

One of the most revolutionary aspects of the Flygsystem 2020 is its ability to control "Loyal Wingman" drones. These autonomous or semi-autonomous drones can carry out a variety of missions, including firing hypersonic missiles, gathering intelligence, conducting electronic warfare and even performing bomb damage assessments. This integrated approach allows the pilot to command a fleet of drones, greatly enhancing operational flexibility and survivability.

Sweden may seek to leverage similar collaborations to ensure the technology behind the Flygsystem 2020 stays on the cutting edge. Saab can be tapped to partner with India, and possibly other countries and defence companies, in order to develop a multinational stealth fighter with assured orders coming from the member countries.

## CAN SWEDEN BE TRUSTED?

Historically, Saab has never won a defence contract in India due to two reasons. One, Sweden is a geopolitical lightweight and cannot offer India any quid pro quo on the global stage. Secondly, Saab often sourced its engines and key technologies from the US and this gives Washington considerable leverage with Sweden. So, for instance, in case of war breaking out between say India and Pakistan, the US can pressure Sweden to turn off the spare parts supplies to India in order to protect Pakistan's breakup. In fact, the US may cynically block spares to prove Sweden's non-reliability as a defence partner.

Today, Saab is still reliant on US-based General Electric for its engines, but the company believes it can be trusted to become a reliable weapons supplier. While the Flygsystem 2020 is probably a decade away, in the meantime, Saab has aggressively pitched its Gripen E fighter as a potential solution for India's fighter aircraft gap, emphasising the following advantages:

**Local Assembly Line:** Saab has assured India of its commitment to set up a local assembly line in India, which would significantly enhance the domestic manufacturing capabilities.

**Technology Transfer:** Unlike other



manufacturers, Saab has offered full technology transfer, a critical requirement for India's self-reliance in defence.

**Future Upgradability:** The Gripen E comes with advanced software that can be upgraded to integrate new armament systems, improving the aircraft's lifespan and versatility.

Saab's offering could serve as the bridge between short-term needs and long-term strategic goals. The Gripen E, with its advanced features and Indian assembly line, could - along with the Sukhoi Su-30MKI - form the backbone of the IAF in the medium term, while the focus shifts to the development of the AMCA and Tejas Mk2.

Moreover, Saab's role could extend beyond simply fulfilling the IAF's immediate needs. The collaborative development of the Gripen platform could provide India with valuable experience in managing complex fighter jet programmes, laying the groundwork for the ambitious AMCA project.

### MULTINATIONAL SIXTH-GENERATION GCAP

Looking ahead, India has an exciting opportunity to participate in the Global Combat Air Programme (GCAP), a multinational effort led by the UK, Italy and

Japan to develop a sixth-generation fighter jet. India was invited to join this programme two years ago, and Italy has recently shown its willingness to collaborate with India on this front. Participation in GCAP would allow India to leverage the technological expertise of these nations while simultaneously accelerating the development of its own sixth-generation fighter.

Additionally, India has also been invited to join the Future Combat Air System (FCAS) programme. This programme is a unique collaboration among several European nations, aimed at establishing a European-made high stealth aircraft. FCAS is a family of sixth-generation air systems that includes a Next Generation Fighter (NGF) as its centralised product.

Such collaboration would not only bolster India's future capabilities but also solidify its role as a key player in the global defense ecosystem. It's an opportunity for India to leapfrog the current technological generation and move directly towards the next frontier in aerial combat.

### EMBRACE STRATEGIC PARTNERSHIPS

Given the pressing need to modernise the IAF's fleet and the technological race with China, it may be time for India to seriously reconsider the MRFA project. Rather than relying on slow, costly foreign acquisitions, India should focus on creating a strategic collaborative framework with OEMs willing to offer full technology transfer, local assembly, and long-term support.

A partnership with Saab, combined with involvement in international initiatives like the GCAP / FCAS, could provide the necessary technological base and geopolitical leverage to accelerate India's indigenous fighter jet programme. Plus, it would create a robust ecosystem for the development of the AMCA and Tejas Mk2, ensuring that India remains competitive in the evolving global air combat landscape.

India has the talent and resources, but it must act with vision and speed. The future of the Indian Air Force depends on a collaborative approach that transcends short-term procurement solutions and focuses on sustainable, indigenous capabilities.

While the MRFA project is important, India must pivot towards a more strategic, collaborative approach that will fast-track its journey to self-sufficiency, both in the medium-term - via Gripen and others - and long-term - via AMCA and GCAP / FCAS. Only then can India ensure air superiority in the decades to come, with or without its adversaries' latest fifth and sixth-generation fighters. ■

*- The writer is a globally cited defence analyst. His work has been published by leading think tanks, and quoted extensively in books on diplomacy, counter terrorism, warfare and economic development. The views expressed are of the writer and do not necessarily reflect the views of Raksha Anirveda*

**Saab's offering could serve as the bridge between short-term needs and long-term strategic goals. The Gripen E, with its advanced features and Indian assembly line, could - along with the Sukhoi Su-30MKI - form the backbone of the IAF in the medium term**



Su-57

# DEFENCE STARTUPS: INNOVATION AMIDST CHALLENGES

India's defence sector is slowly transitioning from heavy reliance on foreign technologies to a more self-sufficient model, with startups and MSMEs playing a key role. These smaller players are developing indigenous solutions in areas like drones, AI, and robotics, addressing gaps in respective sectors. While progress has been made, challenges remain in terms of funding, limited access to advanced manufacturing and testing infrastructure, complex procurement processes, regulatory delays and global competition

 **LT COL NARENDRA TRIPATHI**

**I**ndia's pursuit of Aatmanirbharta (self-reliance) in defence has reached a transformative phase, with startups and MSMEs playing a crucial role in driving innovation, developing indigenous technologies, and boosting defence production. Long reliant on foreign-origin products, India is breaking this dependency through initiatives like Startup India and Aatmanirbhar Bharat, fostering a culture of self-reliance and innovation. Traditionally dominated by large enterprises, the defence sector is witnessing a paradigm shift, as smaller players reshape the ecosystem by advancing critical technologies.

The modern startup ecosystem gained momentum in the 2000s, though Infosys (founded in 1981) is often regarded as an early pioneer. India's first unicorn, InMobi, achieved a \$1 billion valuation in 2011, while ideaForge (established in 2007) emerged as the country's first defence-focused startup, specialising in unmanned aerial vehicles (UAVs). By December 2023, India's defence sector included approximately 16,000 MSMEs, reflecting significant growth driven by self-reliance and indigenisation efforts. Defence exports, which grew from Rs 686 crore in FY 2013-14 to Rs 21,083 crore in FY 2023-24 (marking an increase of over 30 times in the past decade), underline the critical role of startups and MSMEs in strengthening India's defence capabilities and driving economic progress.

## ROLE OF STARTUPS IN DEFENCE INNOVATION

Startups are transforming India's defence sector by fostering innovation, enhancing self-reliance, and addressing critical challenges with agility. They are advancing technologies in unmanned aerial systems (UAS), artificial intelligence (AI), robotics, precision

manufacturing, IoT, and satellites, creating solutions tailored for the armed forces. Contributions such as high-altitude surveillance drones, thermal imaging, and AI-powered battlefield management systems have become vital for modern defence operations. Indigenous innovations have reduced import dependency, strengthened supply chains, and driven economic growth through job creation and industrial expansion. Collaborations with academia, private companies, and defence public sector undertakings (DPSUs) are further bolstering the ecosystem. Globally, startups are delivering disruptive, cost-effective solutions that are reshaping modern warfare and becoming decisive war-winning factors.

## POLICY FRAMEWORK

The Indian government has created a robust policy framework to support defence startups, fostering innovation and indigenisation through initiatives like the Defence Production and Export Promotion Policy (DPEPP), iDEX, and Make in India. By prioritising domestic procurement and offering financial support through grants, venture capital, and innovation hubs, startups can scale operations and deliver cutting-edge products. Access to advanced testing facilities accelerates development, while collaborations with research institutions, public sector undertakings, and global players enable rapid prototyping. Startups address grassroots challenges with cost-efficient solutions, driving economic growth, skilled employment, and decentralisation, positioning India as a leading player in defence innovation and self-reliance.

## CHALLENGES FACED

Despite their significant contributions, startups in the defence sector encounter several challenges that impede their growth and innovation. Securing sufficient funding

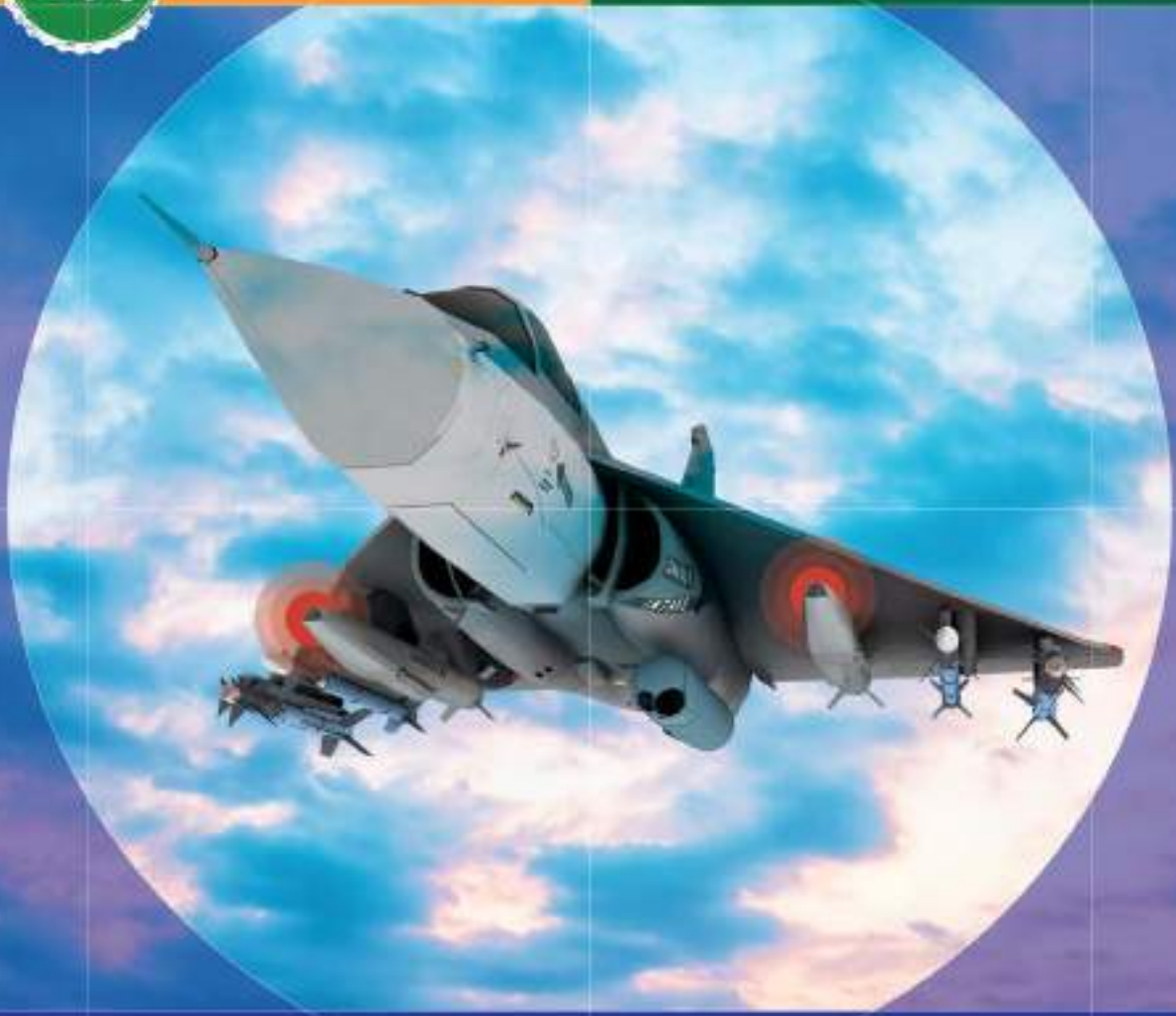
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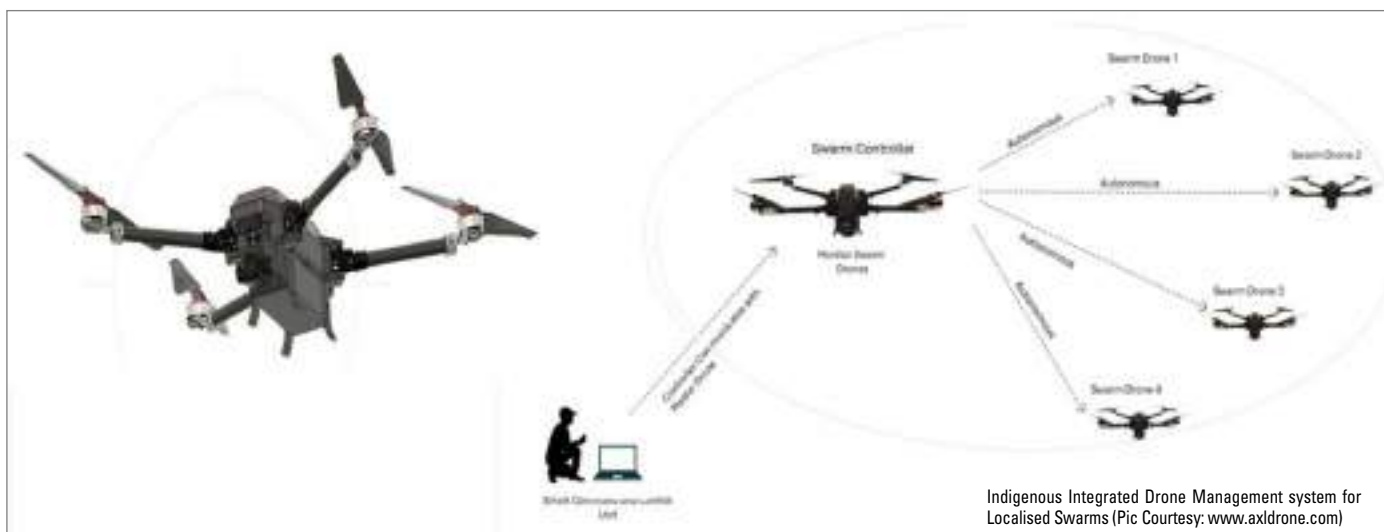
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## Startups in India are transforming the defence ecosystem by developing ground-breaking technologies across unmanned systems, robotics, and AI

for research and development remains a critical obstacle, limiting their ability to sustain long-term innovation. Hurdles such as complex procurement processes and regulatory delays often slow down the deployment of new technologies. Additionally, limited access to advanced manufacturing and testing infrastructure poses significant constraints on their growth and scalability. While the Indian defence industry aspires to establish itself as a global defence exporter, navigating international markets presents challenges for startups, further complicating their ability to compete on a global scale.

### SECTORS DRIVING STARTUP GROWTH IN DEFENCE

The defence sector has witnessed unprecedented growth, fuelled by startups innovating across various domains. These enterprises are addressing critical challenges and transforming India's defence capabilities through indigenous, cost-effective, and technologically advanced solutions. A closer look at key areas highlights the immense contribution of startups in shaping the future of defence:

### UNMANNED AERIAL SYSTEMS (UAS)/DRONES

India's defence sector has witnessed remarkable advancements driven by the contributions of startups

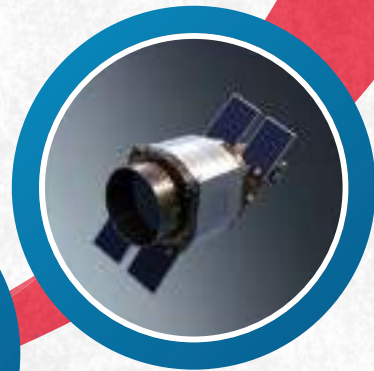
specialising in drone technology. Many firms have secured substantial contracts with the Indian Armed Forces, delivering cutting-edge unmanned systems for surveillance, reconnaissance, logistics, and combat operations. These startups are driving innovation by fostering design-level thinking and developing indigenous solutions. While there are many success stories, newer startups continue to gain prominence in tackling future challenges.

- Axldrone specialises in developing indigenous drones with critical hardware components such as remote controllers, GPS modules, and power distribution boards (PDBs). Their platforms, Aakash and Axl\_Viman, facilitate seamless drone management across applications such as surveillance, law enforcement, disaster relief, and agriculture. Axldrone also excels in providing end-to-end customised solutions for swarm drone operations and integrated drone management systems.
- BonV Aero has developed a fully autonomous logistics drone capable of operating in extreme environments, including high-altitude regions like Ladakh. The unveiling of the Air Orca in Bhubaneswar marked a significant milestone in indigenous drone innovation.
- EndureAir Systems, incubated at IIT Kanpur, focuses on drones with heavy payload capabilities and high endurance. Their Sabal 20 unmanned aerial vehicle, capable of carrying a 20-kilogram payload, has been deployed to support logistics in forward areas along the Eastern Theatre.
- Zebu Intelligent Systems set a Guinness World Record for the longest endurance electric-powered flight by a drone under 5 kg, with a flight time exceeding three hours. This achievement underscores their advanced propulsion technology and commitment to innovation.



Indigenous Drone capabilities (L to R) Sabal from EndureAir, World Record by Zebhu and Aero from Bonv (Pic Courtesy: respective firms)

# *Intelligent Imaging Systems*



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- Autonomous AI enabled Surveillance systems

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# OPINION

With policy frameworks like iDEX and Make in India, the Indian government has provided vital support to startups in the defence sector. Through strategic collaborations and cutting-edge R&D, these companies are pushing the envelope of innovation, securing India's position as an important player in global defence solutions and exports



Indigenous Drone Components are available as COTS over ecommerce sites (Pic Courtesy: www.axldrone.com)

With over 150 startups actively working on unmanned systems, India's indigenous UAVs are saving approximately Rs 1,000 crore annually while contributing to the nation's growing defence exports. These startups exemplify the growing strength of India's drone industry, setting new benchmarks in technological efficiency and operational capability while driving the modernisation and self-reliance of the defence forces.

## ROBOTICS

Robotics is being adopted as a critical component of modernisation. Startups are developing solutions tailored for diverse applications such as inspection, logistics, security, and surveillance. These systems integrate cutting-edge technologies, including AI, machine vision, IoT hardware, mesh networks, and edge computing, enabling adaptability to dynamic environments, predictive maintenance, and operational scalability.

Craic Precision from Bengaluru has been developing innovative IoT-based solutions such as firearm training systems, battlefield simulations, and situational awareness applications, collaborating with forces on projects like urban warfare and landmine training.

xTerra Robotics from IIT Kanpur excels in the development of autonomous quadruped robots like the SVAN M2, equipped with advanced sensors for inspection, security, and surveillance. Compared to a foreign-origin robodog, this homegrown technology is more versatile, with the potential to scale into a Robo Mule capable of



SVAN 2 Quadruped Robot being showcased to DGEME (Pic Courtesy: Xterra Robotics)

carrying larger payloads, thanks to the advancements achieved in software and design dynamics.

Gridbots excels in fully indigenous robotic systems, offering advanced autonomous mobile robots (AMRs) and robotic manipulators for industrial automation and defence applications. Their innovative solutions are designed to meet the complex demands of precision, adaptability, and operational efficiency, making them a key player in the robotics domain at global level.

In contrast, 8oL Robotics focuses on UAV support technologies, including TRL 7 flight controllers for robust data handling.



Indigenous Multipurpose Unmanned Combat vehicle (Pic Courtesy: Gridbot Tech)



Indigenous Flight Controller for UAVs (Pic Courtesy: 80L Robotics)

**Simulation-based training tools are transforming defence preparedness by offering immersive and cost-effective solutions for realistic training, operational planning, and enhanced readiness**

These companies emphasise indigenous development, reducing dependency on imported technologies while enhancing operational efficiency and adaptability. Their innovations are driving significant advancements in the defence and industrial sectors, ensuring readiness for evolving challenges.

### ARTIFICIAL INTELLIGENCE (AI)

In the ongoing global conflicts, we are seeing how AI is driving advancements in surveillance, battlefield management, and predictive analytics. As a cornerstone of modern defence strategies, AI-powered solutions are reshaping the landscape with real-time analytics, predictive insights, and seamless integration with drones and robotics to enhance decision-making and operational efficiency.

Innovative startups like Zenerative Minds, incubated at IIT Hyderabad, stand as a beacon of transformation in the defence sector. Known for its flagship product Tathya, a bespoke Generative AI solution for defence, and its

notable success in the Samvaad.AI iDEX challenge for the Indian Navy, Zenerative Minds excels in Generative AI and computer vision. The company delivers mission-critical solutions that enhance operational efficiency and innovation in defence applications, driving the sector forward through automation and state-of-the-art technology.

### SIMULATION AND TRAINING

Simulation-based training tools are transforming defence preparedness by offering immersive and cost-effective solutions for realistic training, operational planning, and enhanced readiness. Startups such as Kravis Tech are at the forefront of this revolution, utilizing advanced Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) technologies. These innovations provide detailed 3D terrain modelling and equipment simulations, effectively replicating real-world scenarios. These tools ensure high-quality training for soldiers and Agniveers across all three services, fostering efficiency and operational excellence. In 2023 alone, defence simulation startups contributed Rs 700 crore to various projects, with approximately 20 companies specializing in this field. Kravis Tech stands out for its AR/VR-based simulation solutions, creating meaningful and impactful training environments that align with the evolving needs of modern armed forces.



GenAI and Computer vision-based AI solutions showcased at INS Valsura (Pic Courtesy: www.zenerativeminds.com)



AR/VR based solutions for equipment and 3D terrain (Pic Courtesy: Kravis Tech)

# OPINION

To unlock the full potential of startups in achieving Aatma-nirbharta, a strategic and comprehensive approach is essential. Streamlining defence procurement processes is critical to encouraging startup participation, minimising delays in sales cycle, and fostering innovation



## ELECTRONIC WARFARE/ ANTI DRONE SYSTEM

Startups are advancing communication, radar, and electronic warfare systems for secure and seamless defence applications. Aidin Technologies, based in Bangalore, excels in RF systems, custom power supplies, and electronic warfare. Its SECUDOME Counter-Unmanned Aerial System autonomously detects and neutralises drones with 360-degree detection, long-range jamming, and geo-fencing. With AS9100-Rev D certification and ISRO-certified facilities, Aidin sets a high standard in defence technology innovation.

These sectors collectively highlight the transformative impact of startups on India's defence landscape. By delivering innovative, indigenous solutions tailored to the unique challenges of the armed forces, startups are not only enhancing operational capabilities but also contributing to India's self-reliance and global competitiveness in the defence sector.

## THE PATH AHEAD

To unlock the full potential of startups in achieving Aatmanirbharta, a strategic and comprehensive approach is essential. Streamlining defence procurement processes is critical to encouraging startup participation, minimising delays in sales cycle, and fostering innovation. Enhanced support for research and development (R&D) through increased funding, grants, and targeted incentives will empower startups to develop and scale cutting-edge solutions tailored to India's defence needs.

Collaboration plays a vital role in this effort. Strengthening partnerships among startups, MSMEs,



Soft kill-based Indigenous Anti-Drone detection and jamming systems (Pic Courtesy: Aidin Systems)

DPSUs, academia, and private companies fosters a synergistic ecosystem that drives innovation and collective problem-solving. Startups, adept at addressing grassroots defence challenges, can deliver tailored solutions through iterative R&D and stakeholder support, overcoming limitations of traditional open tenders.

Targeted policies promoting defence exports will enable MSMEs and startups to access global markets, positioning India as a global leader in defence technology. Together, these measures will drive self-reliance and transformative growth in India's defence sectors. ■

*-The writer is an independent SME and military technology consultant. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*



# SABAL

## ABOUT SABAL

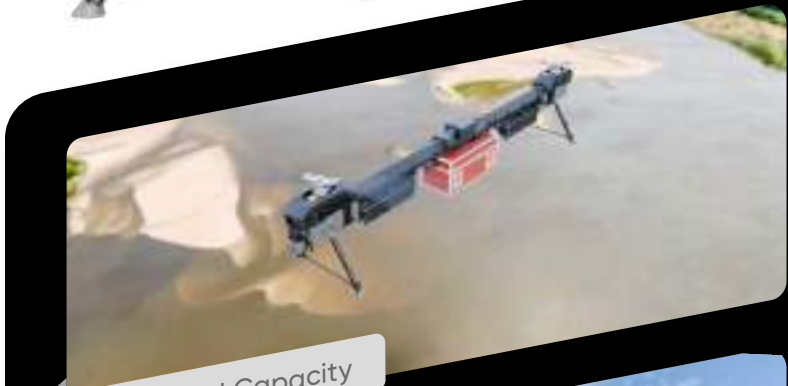
**Sabal**, a logistics drone inspired by Chinook helicopters, renowned for their operational efficiency. Sabal, currently deployed at the Indian Army's Eastern Theatre, is designed to address logistical and surveillance challenges in defense operations. With its advanced autopilot system and intuitive controls, Sabal excels during intense missions, showcasing engineering excellence and reliability in critical situations.

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# ISRO'S EXPANDING SKYLINE

Planning big for the future, ISRO's four important space projects include the next mission to the Moon. The Chandrayaan-4 will carry separate modules to space in two missions. These modules will be joined in space to become a complete satellite, which subsequently would start its journey towards the Moon. After landing, it would collect lunar soil samples and bring them back to the Earth

## DR AJEY LELE

**O**n September 18, 2024, the Government of India approved the Indian Space Research Organisation's ambitious future missions, marking a significant step forward in the country's space agenda. These projects are designed to boost India's technological capabilities, advance collaboration with the Indian industry, expand international collaborative efforts, and improve the nation's standing in the global arena of space exploration. With a clear vision for the future, these missions reflect India's commitment to advancing its space programme for the next 25 years.

The Union Cabinet has mainly approved four important space projects, including the next mission to the Moon, a mission to the planet Venus, expanding the mandate of the ongoing Gaganyaan project (human mission to space), and the conception of an Indian Space Station.

Particularly, with the success of the Chandrayaan-3 mission, Moon is finding increased attention from ISRO. For the Chandrayaan-4 mission, the government has approved Rs 2,014 crore for 36 months. This is going to be an interesting mission consisting of five modules. They would be carried to space in two different

missions. The parts (modules) launched during these two missions would be joined together in space to become a complete satellite, which subsequently would start its journey towards the Moon. It would be a sample return mission in which a unit would land on the Moon to collect lunar soil samples and bring them to the Earth.

Simultaneously, ISRO is also working on a joint mission to the Moon with Japan. The National Space Commission recently approved its fifth lunar mission, called the Lunar Polar Exploration Mission (LUPEX). This is an old project and in 2017, an agreement was reached between ISRO and Japan's space agency JAXA. However, owing to the failure of the Chandrayaan-2 mission, ISRO was keen to successfully land the lander-rover unit on the lunar surface first, before starting any other joint venture. It is expected that ISRO will shortly present this project for cabinet approval. This mission would involve JAXA building the lunar rover, and ISRO is developing the lander that will transport the rover to the Moon. There would be some sensors from various other space agencies onboard for this mission. It may be noted that both Japan and India are part of a US-led initiative called Artemis programme, which is aimed at transporting astronauts back to the Moon. India also wants to undertake its own human mission to the Moon by 2040.

With a successful mission to another planet namely Mars (2013/2014), India is now planning a mission to Venus. This mission, called the Venus Orbiter Mission (VOM), will be launched in March 2028. ISRO has received Rs 1,236 crore approval for this project. Studying Venus is important since this planet is viewed as Earth's twin, owing to some similarities (there are some differences too) regarding size, mass and density. Scientists believe that a better understanding of Venus could offer some evidence about the evolution of Earth. A major commonality between the Earth's Moon and the planet Venus is that both reside within what is known as the 'inner solar system.' ISRO already has a detailed plan in place for this mission. Experts Review Committee of ISRO, under well-defined broad science themes, has recommended 16 Indian payloads, two Indian and international collaborative payloads, and one international payload for this mission.

Presently, the Gaganyaan mission may be delayed. However, it is expected that the human mission may happen in 2025. There is already a government approval and budget allocation for two uncrewed and one crewed mission. Now the Union Cabinet has approved eight more missions. Half of the approved missions are meant to set up

the Bharatiya Antariksh Station (BAS), Rs 20,193 crore has been approved for this.

The most important project that the government has approved is developing the Next Generation Launch Vehicle (NGLV). The main limitation of ISRO today is the non-availability of a heavy satellite launch vehicle. The project will cost Rs 8,239 crore and will take 96 months. The first launch is expected in 84 months.

As per some reports ISRO was to undertake the second mission to Mars in 2024, however, it has been delayed. ISRO is planning a very ambitious mission, when their craft is to land on the Martian surface, also they are planning to put a fully operative helicopter to fly in the thin Martian air. This mission is expected in 2026.

ISRO's primary launch vehicle, the Polar Satellite Launch Vehicle (PSLV), is reliable and cost-effective, but its payload capacity is limited. ISRO is developing the GSLV Mk III for heavier payloads but still can carry only about 4 tonnes to the geostationary orbit. Modern-day communication satellites are normally in the 6-to-

## **The mission to planet Venus - the Venus Orbiter Mission (VOM) will be launched in March 2028. ISRO has received Rs 1,236 crore approval for this project. Studying Venus is important since it is viewed as Earth's twin, owing to some similarities. Understanding Venus could offer some evidence about the evolution of Earth**

8-tonne category. Hence, for heavier payloads, ISRO depends on foreign launch services, such as French vehicles like Ariane 5. Also, there is some dependence on states like Russia and the United States/SpaceX. It would take another seven to eight years for ISRO to have the under-development NGLV operational. Hence, it looks like ISRO will continue to depend on outside agencies to launch heavy satellites for some time.

As the name suggests, ISRO is essentially a space research organisation. However, since ISRO was also required to look after India's commercial space interests for many years, ISRO was involved in undertaking various commercial activities. For a few years now the commercial space industry has been making rapid progress and it is expected that India's commercial space sector will play a critical role towards expanding India's commercial

# SPACE PROGRAMME



**The most important project is developing the Next Generation Launch Vehicle (NGLV). The main limitation of ISRO today is the non-availability of a heavy satellite launch vehicle. PSLV's payload capacity is limited. Hence, for heavier payloads, ISRO depends on foreign launch services, such as French vehicles like Ariane 5**

footprint in the global market. ISRO has already started to transfer some of its technologies to private space agencies. However, it would take some time to evolve an operational working model of public-private partnership. India's space startup setup is progressing, however could face some major challenges owing to the finding issues. One limitation that may befall is the availability of satellite launch facilities. Presently, India has only one satellite launch site at the Satish Dhawan Space Centre (SDSC), SHAR, Sriharikota. ISRO is developing one more launch pad but that is expected to cater essentially for the Small Satellite Launch Vehicle (SSLV). Some forward-thinking is required in this arena.

The government has now approved the development of the Bharatiya Antariksh Station

(BAS). In previous years, there were hints that the station could weigh between 20 to 30 tonnes. However, it now appears that the space station will weigh 52 tonnes. ISRO must, however, plan for a larger space station to meet future needs. It is important to recognise that such projects characteristically have long operational lifespans, potentially lasting three to four decades. Looking ahead, a space station weighing between 80 to 100 tonnes would be more suitable. This would house more than five astronauts for extended stays and provide ample space for a wide range of scientific experiments.

ISRO must move beyond the (unstated) policy of technology demonstration, as building a smaller station would have limited relevance. To make a meaningful impact, ISRO needs to think on a larger scale. The four important projects recently approved by the government indicate that ISRO has a well-defined plan to expand its horizons in scientific discovery and space research. These projects are expected to boost research, development, and innovation in the space domain, while also supporting the growth of the Indian space industry. ■

*- The writer is a Deputy Director General with MP-IDSA, New Delhi. The views expressed are of the writer and do not necessarily reflect the views of Raksha Anirveda*



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# NAVIGATING SHIFTING SANDS

Amid the turbulence gripping the Middle East, India continues to bolster its strategic partnerships and cooperation with regional countries. From navigating the Gaza conflict's aftermath to deepening ties with GCC nations and advancing initiatives like the IMEC, New Delhi's foreign policy demonstrates resilience amidst regional challenges

## DR MD. MUDDASSIR QUAMAR

# T

he situation in the Middle East in 2024 continued to simmer, with serious geopolitical, geoeconomic, and strategic consequences for the region and the wider world. India's ability to maintain its position as a leading partner of key regional countries and walk a complex diplomatic tightrope has enabled it to sustain cooperation across political divides. India approached the regional situation with deft diplomacy and adopted firm positions when necessary. For instance, India condemned the October 7, 2023, attack by Hamas on Israel as a terrorist act. Simultaneously, it supported a ceasefire in the Israel-Hamas war and urged regional countries to avoid a broader conflagration. Moreover, India reaffirmed its long-standing support for a two-state solution to the Israeli-Palestinian conflict.

As the geopolitical dynamics evolve, particularly with

the winding down of the Israel-Hamas war, the ongoing power transition in Syria, and the anticipation of potential policy shifts under Trump 2.0, India is poised to deepen its political, economic, and strategic engagements with the Middle East. India's primary focus will include energy security, the safety and welfare of Indian expatriates, maritime security, counter-terrorism, and defence and security cooperation. Developments in the Middle East will continue to significantly impact India, and its ability to manage and enhance relationships with regional powers will have far-reaching implications for its foreign policy and international relations.

## GAZA CRISIS

The war in the Gaza Strip persisted with serious consequences for the future of both Palestinians and Israelis. While Israel gradually regained a sense of control, fighting a multi-front war, it incurred massive political costs. The country faced mounting international criticism and condemnation for the dehumanising impact of the war, as the casualties in the Gaza Strip soared and allegations of war crimes by the Israel Defense Forces (IDF) in the densely populated Palestinian enclave gained traction. The policy of depopulating vast areas within the Strip displaced nearly 90 per cent of its 2.2 million residents.

Meanwhile, the perpetrators of the October 7 attack, Hamas and Palestinian Islamic Jihad (PIJ), faced an uncertain future. Although they managed to endure the Israeli military onslaught, the price paid by the Palestinians, in political and humanitarian terms was immense. This raised profound questions about the tactics employed by Hamas and PIJ. The October 7 attack and the subsequent war proved to be the





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## IN FOCUS: MIDDLE EAST



**India's primary focus will include energy security, the safety and welfare of Indian expatriates, maritime security, counter-terrorism, and defence and security cooperation**

most catastrophic episode in the decades-long Israeli-Palestinian conflict, likely extinguishing any remaining prospects for a political resolution in the foreseeable future. The situation underscores a grim reality for Palestinians, who continue to grapple with statelessness and a belligerent Israel unwilling to compromise.

The Israel-Hamas war preoccupied the world as the Israeli onslaught on the Gaza Strip resulted in mounting casualties, with the death toll reaching 46,000 by December 2024, the majority being civilians, including women and children. The humanitarian cost of Israel's military campaign to defeat and decimate Hamas and secure its southern border was staggering, leaving a lasting scar on Israeli politics and international relations.

However, Israel's capability to carry out high-profile assassinations—such as those of Hamas political chief Ismael Haniyeh in Tehran in July, Hezbollah Secretary General Hassan Nasrallah in Beirut in September, and the suspected mastermind of the October 7 attack, Yahya Sinwar, in the Gaza Strip in October—helped restore a degree of military invincibility lost due to the October 7 attack. Further, the ability to simultaneously fight on multiple fronts, including full-scale wars in the Gaza Strip and Lebanon and carrying out bombings in Syria, Iraq, Iran and Yemen, underlined the Israeli military capabilities and the political will to fight. Notably, Israel could sustain the war due to the active military, political and financial

support from the United States and its other regional and international allies.

### ROLE OF IRAN

While the Israel-Hamas and Israel-Hezbollah wars dragged on, a significant question emerged regarding Iran's role in supporting militant groups across the region and the devastating consequences of such support. The conflict and its catastrophic outcomes called into question Iran's regional policy and its effectiveness in securing the Islamic Republic's strategic goals.

The clashes with Israel in April and October starkly exposed Iran's military weaknesses when compared to Israel. Moreover, Iran's inability to significantly alter the trajectory of the war in the Gaza Strip, despite mobilizing the "axis of resistance" through Hezbollah in Lebanon and the Houthis in Yemen to bolster Hamas's efforts against the Israeli military, highlighted its limitations. This failure underscored Iran's vulnerabilities in challenging the US-led regional order and raised doubts about its capacity to assert influence effectively in the face of escalating conflicts.

In the meantime, Iran grappled with significant internal challenges stemming from an economic downturn largely driven by devastating US and international sanctions over its nuclear programme. The situation worsened following the tragic death of President Ebrahim Raisi, his Foreign Minister Hossein Amir-



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## IN FOCUS: MIDDLE EAST

Abdollahian, and several other national and local leaders in a helicopter crash in northwest Iran in May. This incident not only deepened the country's political instability but also complicated an already looming succession crisis, as Raisi had been widely regarded as a potential successor to the ageing Supreme Leader Ali Khamenei.

The political turmoil was further highlighted by record-low voter turnouts in the parliamentary and presidential elections held in March and June-July, respectively. These dismal figures underscored the mounting political challenges facing Iran and reflected a growing sense of public disillusionment with the country's leadership amidst its ongoing crises.

### ARAB GULF STATES

Amidst the ongoing regional crisis, the role of Gulf Cooperation Council (GCC) countries—particularly Saudi Arabia, the United Arab Emirates, and Qatar—along with Egypt, Jordan, and Türkiye, drew significant attention. Saudi Arabia's attempts to forge a united Arab and Islamic response to the Gaza Strip crisis did not yield substantive results. However, the ability of regional Arab powers to remain focused on their developmental agendas despite the war in Gaza was noteworthy.

Saudi Arabia and its GCC and Arab partners continued implementing internal reforms while also taking a firm stance against Israeli military operations in the embattled Gaza Strip. Egypt and Qatar emerged as key facilitators of diplomatic efforts, working alongside the United States to broker a ceasefire and ultimately bring the war to

an end. These efforts led to a ceasefire in Lebanon by November, and optimism grew for a truce in the Gaza Strip before Donald Trump's return to the White House on January 20, 2025.

### FALL OF ASSAD IN SYRIA

While global attention remained fixated on the Gaza Strip and its regional and international implications, Syria underwent an unprecedented and historic transformation in December 2024. The fall of the Assad regime, following a devastating decade-long civil war, marked a seismic shift in the region. This development further weakened Iran's "axis of resistance" and cast the future of millions of Syrians into uncertainty.

The new leadership in Syria, now under Hayat Tahrir al-Sham (HTS) and its figurehead Ahmed al-Sharaa, widely known as Abu Mohammed al-Golani throughout most of the civil war, faces the monumental challenge of governing a fractured nation and forging a better future for its people. Although initial rhetoric from the new administration has inspired cautious optimism, the task ahead is daunting.

Türkiye, which has long supported HTS and other armed factions, has gained significant leverage in shaping Syria's internal affairs. However, its persistent inability to reconcile with Kurdish political aspirations is likely to generate serious tensions, further destabilising the country. These unresolved conflicts could have devastating consequences for Syrians, who continue to endure the aftershocks of years of war and displacement.





## INDIA'S STRENGTHENING ENGAGEMENTS WITH THE MIDDLE EAST

Amidst the evolving political and geopolitical landscape in the Middle East, India has continued to strengthen its partnerships and deepen strategic cooperation with like-minded regional countries. Relations with the Gulf Cooperation Council (GCC) nations—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates—have flourished, expanding into diverse areas such as defence collaborations, security cooperation, military-to-military ties, space exploration, joint manufacturing of military equipment, and coastal and maritime security.

In a historic diplomatic outreach, Prime Minister Narendra Modi visited Kuwait on December 21-22, 2024, marking the first visit by an Indian Prime Minister to the Gulf state since Indira Gandhi's trip in 1981. Earlier in February, he had also visited Qatar and the UAE. These high-profile visits underscored India's unwavering commitment to fostering robust economic, diplomatic, and strategic ties with the GCC nations, which remain central to India's Middle East policy.

Additionally, External Affairs Minister S. Jaishankar undertook numerous visits to the region, reflecting India's sustained diplomatic engagements. His trips included Iran in January, Kuwait in August, Saudi Arabia in September, the UAE in both June and November, Qatar in June and December, and Bahrain in December. These visits, alongside several other ministerial exchanges between India and Middle Eastern countries, signify the

deepening of strategic partnerships and the growing importance of the region in India's foreign policy.

## CHALLENGES AND OPPORTUNITIES FOR INDIA

The Middle East's regional geopolitics is poised to remain volatile in the coming months and years as the ramifications of the Gaza war continue to unfold. This situation presents both significant challenges and opportunities for India.

Challenges will arise from ongoing conflicts, radicalism, terrorism, and potential internal unrest in countries like Syria, Iraq, and Yemen. These issues could impact regional stability and disrupt India's economic and strategic interests in the region.

However, opportunities lie in the economic, political, and strategic domains. India's continued efforts to strengthen partnerships with Saudi Arabia, the UAE, Qatar, and Egypt, improve ties with Oman, Bahrain, and Kuwait, and rebuild relations with Türkiye will yield dividends. These efforts will enable India to leverage regional cooperation for mutual benefits.

India's focus will remain on deepening geoeconomic and strategic partnerships. Key objectives include successfully realigning the India-Middle East-Europe Economic Corridor (IMEC), ensuring energy and maritime security, and further bolstering strategic, defence, and security collaborations with regional partners. ■

*—The author is an Associate Professor of Middle East Studies at Jawaharlal Nehru University, New Delhi. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*

**While the Israel-Hamas and Israel-Hezbollah wars dragged on, a significant question emerged regarding Iran's role in supporting militant groups across the region and the devastating consequences of such support**



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## INDIA-US DEFENCE, STRATEGIC COOPERATION ON FIRM FOOTING UNDER TRUMP 2.0

There is considerable apprehension about how Indo-US ties may evolve under Trump 2.0, but based on the personal chemistry between President Trump and the Indian Prime Minister Narendra Modi, it is expected that the bilateral ties will bloom further, as both leaders and nations share a common vision on key issues

 **VINAY KUMAR**

**A**

As Donald J Trump began his second innings as 47th President of the US on January 20, an intense debate is brewing in diplomatic and strategic circles across the globe on major policy shifts which Trump has already announced and the possible turn of events in the months to come. The world remains tense as it is not known what path President Trump will take and what kind of impact it will make on the global ties.

Stating in his inaugural address that “Golden Age of America begins now”, President Trump pledged to rescue America from what he described as years of betrayal and decline, prioritising a crackdown on illegal immigration. In India too, there are concerns about his second term, as the bilateral ties face many challenges. Will Trump change rules of the game? While India-US relations are on a firm footing, New Delhi

is particularly concerned about two issues – tariffs and illegal immigration – which were underlined in Trump’s inaugural address.

Given assertions made by Trump after assuming charge at the White House, there is little doubt that India-US ties are entering a new phase with his return after a gap of four years. India’s relationship with the US encompasses strategic areas, particularly defence cooperation, technology transfer etc.

The new Trump administration is sure to present a new set of challenges for India’s strategic interests, notably in sectors like defence and trade as well as regional diplomacy. The US emerged last year as India’s top trading partner and the economic interdependence spans across sectors from IT services to pharmaceuticals, new technologies and manufacturing. In the area of strategic defence cooperation, the bilateral partnership has evolved

over the past years and graduated from a buyer-seller relationship to co-development and co-production of military hardware.

The cooperation between the two countries extends from maritime security in the Indo-Pacific to counter-terrorism, and intelligence sharing. The ongoing QUAD partnership which apart from US and India, also has on board Australia and Japan, and has been instrumental in strengthening bilateral ties.

Within hours of his inauguration, President Trump's administration held QUAD foreign ministers meeting in Washington DC which was attended by External Affairs Minister S Jaishankar. The meeting was used to send a clear and strong signal to China. The US Secretary of State Marco Rubio, External Affairs Minister S Jaishankar, Australian Foreign Minister Penny Wong and Japan's Foreign Minister Takeshi Iwaya "strongly opposed any unilateral actions that seek to change the status quo by force or coercion."

The meeting of QUAD foreign ministers also signalled countering China a top priority for the Trump administration. QUAD foreign ministers reaffirmed their "shared commitment to strengthening a Free and Open Indo-Pacific where the rule of law, democratic values, sovereignty, and territorial integrity are upheld and defended."

Trump's tough stand on China, swift revival of the four-nation QUAD dialogue, strong stand against Pakistan-sponsored terrorist activities and robust growth in US-India defence and security cooperation are some of the issues worth clearly watching for.

Differences over trade, tariff and investment issues remained during Trump 1.0, but failed to derail the US-India strategic partnership which was carefully and painstakingly built over the past two decades.

Though President Trump's unpredictability weighs in as a key factor in shaping future Indo-US ties, foreign policy experts anticipate a "strong momentum" in Indo-US ties, while others have cautioned that there will be "some challenges" going forward. Former diplomats opine that India's ties with the US will continue on a strong footing but sounded a note of caution, saying a "wait and watch" attitude will be the best policy for New Delhi to see what position President Trump takes on crucial issues.

As far as India-US defence trade is concerned, it has grown by leaps and bounds in the past decade, touching over 20 billion US dollars in 2020. India has also signed all four foundational defence agreements with the US. The naval exercise "Malabar" which began in 1992 as a bilateral naval drill between the navies of the two countries has evolved into an important multilateral event.

For India, the US also remains important in the area of technological advancement, particularly in



semiconductors, quantum computing and AI. Silicon Valley continues to be a major hub for Indian tech talent and startups. US has also emerged as a key energy partner for India in helping to diversify its energy sources away from traditional supplies.

In broader geopolitical terms, Trump 1.0 administration's policies towards South Asia and the Indo-Pacific region were by and large in keeping with the national interests of India. In the first few days of the new Trump administration, there have been positive signals like presence of External Affairs Minister S Jaishankar at the inaugural ceremony, meeting of QUAD foreign ministers and a tough joint statement after the meeting pointing towards continuation of positive and constructive ties between India and the US.

India can take comfort from the fact that the bilateral relationship with the US has grown to such an extent that it will not be possible to derail it. Also, President Trump and Prime Minister Narendra Modi share a close personal rapport which can easily come handy in adding warmth to the ties and ironing out any differences.

However, it cannot be denied that New Delhi should be ready with well thought out response to face challenges and tackle unexpected situations which may arise from time to time. Global climate and uncertainty may throw up challenges in the bilateral ties from time to time but strategic and defence ties are well set to grow and deepen in the years to come.

In the US too, there is bipartisan consensus on the importance of partnership with India. In broader terms, the new political and ideological climate in the US is laced with nationalism and agenda of America First, which aligns well with the ruling dispensation in India. Also, shared concerns and anxiety about China is another factor that binds the two countries. ■

*-The writer is a senior journalist based in Delhi. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*

**As Donald J Trump began his second innings as 47th President of the US on January 20, an intense debate is brewing in diplomatic and strategic circles across the globe on major policy shifts which Trump has already announced and the possible turn of events in the months to come**



AMIT COWSHISH

## AERO INDIA 2025: SPECTACLE AMIDST SHORTFALLS

Aero India 2025, Asia's largest air show, promises a dazzling display of aerospace innovation at Bengaluru's Yelahanka Air Force Station. However, the event should also deliberate on addressing India's air combat challenges. With just two squadrons of the 4.5th generation Rafale and persistent delays in the indigenous Tejas programme, India lags behind China's advancements, including operational 5th generation stealth fighters and recent test flights of 6th generation jets

**A**sia's biggest air show, Aero India 2025, is all set to take place at the Air Force Station, Yelahanka, on the outskirts of Bengaluru, Karnataka, from February 10 to 14, 2025. This marks the 15th edition of India's premier biennial airshow, which began in 1996 and has since been held consistently with increasing grandeur and prominence.

This year's event is being organised by the Ministry of Defence's (MoD) Defence Exhibition Organisation (DEO) under the tagline 'Runway to a Billion Opportunities'. The focus is on forging new partnerships and exploring avenues to accelerate the indigenisation process in the aerospace sector. Previous editions of the airshow have similarly been framed with lofty aspirations, often evaluated more in terms of statistical achievements than tangible outcomes.

If past records are anything to go by, DEO is poised to add another feather to its cap. The 2023 edition saw over 700,000 visitors from 98 countries, with 809 exhibitors, including businesses, investors, start-ups, and MSMEs, participating in various events. Representatives from 27 countries attended the Indian Ocean Region (IOR) and Defence Ministers' Conclave, while 53 aircraft showcased their capabilities.

On the commercial front, more than 250 Memorandums of Understanding (MoUs) and partnerships worth over ₹75,000 crore were finalised, with ₹200 crore pledged at the maiden iDEX Investor Hub (iIH). The iDEX (Innovation for Defence Excellence) is an MoD-sponsored initiative aimed at encouraging start-ups and innovators to tackle complex defence challenges, supported by limited funding from the MoD.

There is little reason to doubt that this year's numbers will match or even surpass previous benchmarks. While these figures are a valid measure of the event's scale and success, they reveal little about how many of the MoUs signed in earlier editions led to the commencement of

production or how much of the promised investments were realised in the subsequent years.

While it would be unfair to undermine the intent or the effort involved in organising such a colossal event, its true impact should be assessed in terms of its contribution to enhancing the Indian Air Force's (IAF) combat capabilities. This is where the situation becomes less promising.

The IAF currently operates 30 fighter squadrons, far short of the sanctioned strength of 42 squadrons. This sanctioned figure, determined decades ago, has remained unchanged despite the induction of more advanced fighter aircraft, the acquisition of drones and missiles, and ongoing efforts to promote jointness in military operations.

That said, there is no denying the mismatch between India's air combat capabilities and those of its adversaries, particularly China. The IAF's most advanced aircraft, the 4.5th generation Rafale, is represented by just two squadrons.

In contrast, China is significantly ahead. It already operates 5th generation Chengdu J-20 and Shenyang J-35 stealth fighters and, on December 26, 2024, conducted the maiden test flights of two 6th generation stealth fighter jets in Chengdu. India's 5th generation Advanced Medium Combat Aircraft (AMCA) project, meanwhile, remains at least a decade from completion. By the time it materialises, China is likely to have advanced even further.

The HAL-built Light Combat Aircraft (LCA) Tejas is expected to become the backbone of the IAF in the coming years. However, both its variants, Mk-1A and Mk-2, face persistent challenges. These range from design issues and production rates to delays in the supply of F404-IN20 engines by the US-based General Electric. This has directly impacted the production of the Tejas Mk-1A. Furthermore, the deal with General Electric for the transfer of technology to co-produce the F414 INS6 engine, which is to power the Tejas Mk-2, appears to be experiencing inexplicable delays.

Delivering the keynote address at the 21st Subroto Mukerjee Seminar in New Delhi on 7 January 2025, Air Chief Marshal A.P. Singh highlighted the security challenges India faces due to the increasing militarisation by China and Pakistan, the extremely slow pace of delivery of the indigenous Tejas aircraft, and the Defence R&D's inability to meet timelines for developing cutting-edge technologies.

While promoting local production of defence equipment and defence exports will undoubtedly contribute to the defence industry's growth, it will

provide only limited assistance in equipping the Indian Air Force (IAF) with the requisite capabilities within the desired timeframe. More importantly, unless Defence R&D is prioritised over co-production initiatives involving technology transfers from abroad, self-reliance in the true sense will remain an elusive goal.

This issue is exemplified by the case of the IAF's future workhorse, the Tejas. The aircraft remains critically dependent on foreign-origin engines, and disruptions in its supply chain have significantly impacted production timelines. Additionally, concerns persist regarding Hindustan Aeronautics Limited's (HAL) capacity to meet the IAF's requirement for 180 Tejas Mk-1A and 108 Tejas Mk-2 aircraft within the desired timeframe, even if the ongoing engine supply issues are resolved promptly.

The private sector's involvement in Defence R&D remains marginal, despite the Union Budget announcement for FY 2022-23, which earmarked 25% of the defence R&D budget for private industry and start-ups to foster innovation in defence technologies. The reasons for this limited involvement remain unclear, as no substantial effort has been made to identify and address the root causes.

Moreover, procurement policies and procedures continue to be complex and inherently resistant to swift decision-making. For instance, less than a year after the Defence Acquisition Procedure 2020 was introduced, the then recently retired Army Chief, General Manoj Naravane, criticised the "overbearing nature of our rules and regulations" and called for a "revolution in bureaucratic affairs."



## Despite ambitious slogans and record-breaking participation numbers, Aero India 2025 faces tough questions about its impact on strengthening India's defence capabilities. With production delays in the Tejas programme and dependence on foreign engines, the road to self-reliance appears fraught with turbulence

The objectives of Aero India 2025 would be better served by focusing on these systemic issues in the numerous meetings and conferences scheduled during the event. However, it remains doubtful that sessions such as the CEOs' Round Table, iDEX Start-up Event, and the Defence Ministers' Conclave, cryptically titled 'BRIDGE – Building Resilience through International Defence and Global Engagement,' will provide adequate space for discussing the real challenges facing the IAF.

That said, the agenda does include some bilateral ministerial and official meetings with participating industry representatives. These informal brainstorming sessions offer a valuable opportunity to generate out-of-the-box ideas for tackling the enduring problems of military modernisation and self-reliance. Such informal exchanges often prove more fruitful than rigid, formal information-gathering exercises. ■

*–The writer is a former Financial Advisor (Acquisition), Ministry of Defence.  
The views expressed are personal and do not necessarily reflect the views  
of Raksha Anirveda*

# IAI and India: A Partnership for Growth

**India's military is ranked fourth in the world.** As one of the world's leading defence powers, with a strategic vision extending far beyond its borders, India is advancing its defence capabilities, enhancing self-reliance, and becoming a major global exporter of military systems.

**Israel Aerospace Industries (IAI)** fully support India's vision and has been a trusted partner in this journey working alongside Indian defence organizations to develop, produce, and sustain cutting-edge military technologies. Through collaborations, IAI has partnered and invested in India's ability to design, manufacture, and support world-class defence solutions.

## Sharing Visions

**We at IAI believe,** that India's defence industry is undergoing a remarkable transformation, driven by policies such as "Make in India" and Atmanirbhar Bharat (Self-Reliant India). The country is focused on building a robust domestic defence manufacturing hub, increasing its technological edge, and positioning itself as a key player in global security. India's defence ambitions reach far beyond its borders, strengthening collaborations with global allies, securing international trade routes, and engaging in Arctic security.

**IAI fully embraces this approach,** ensuring that its cooperation with India goes beyond supplying advanced systems—it is about building local capabilities, transferring knowledge, and supporting India's long-term defence objectives.

## Building a Strong Foundation

**A relationship is the foundation of building a strong nation.** To effectively support India's self-reliance goals, IAI follows a three-pronged process that ensures



*Credit: IAI*

sustainable growth in local defence production, innovation, and long-term support:

## Wholly Owned Companies

**IAI operates through wholly owned subsidiaries** in India that provide direct support, maintenance, and system upgrades for its deployed technologies. These companies also contribute to develop local manpower and technical skills, ensuring India's armed forces to receive fast, efficient, high-quality service for their sophisticated weapon systems. This localized support improves operational readiness,

shortens turnaround times, and creates a highly skilled workforce, strengthening India's defence industry for the long term.

**Examples include** ASI, an IAI subsidiary of Systems, Missiles and Space, which supports the MRSAM program, and HELA, an IAI subsidiary of Elta Systems that provides local assistance to advanced surveillance and electronic warfare capabilities.

## Joint Ventures

**IAI has established JVs** with leading public and private sector companies in India to enable joint development, local production, technology transfer, and expertise sharing. These partnerships ensure

that Indian companies acquire knowledge of advanced defence systems efficiently and develops the capability to manufacture and sustain them independently. A key example is IAI's JV with Bharat Electronics Limited (BEL), BIA, which serves as a single point of contact for MRSAM systems, in-use by the Tri-services and streamlines procurement and support for them.

**IAI also partners with Indian firms** acting as the prime contractor while IAI contributes technology and expertise. This structure enables participation in large-scale Indian defence projects fully aligned with government policies.

## Fostering Innovation

**Beyond large-scale defence projects**, IAI is actively investing in India's startup ecosystem. To accelerate defence innovation, the company launched NUESPHERE, a startup incubator and accelerator designed to nurture local innovations into emerging defence technologies. This initiative builds on similar innovation centers established by IAI in Israel and the USA.

**In partnership with GHV (Green House Ventures)**, NUESPHERE is driving cutting-edge research and development, allowing Indian startups to collaborate with global defence experts. By mentoring and supporting Indian entrepreneurs, IAI is helping to create next-generation defence technologies, further strengthening India's self-reliance.

## A Springboard for International Growth

**India's defence self-reliance strategy** extends beyond its own military needs. The country is rapidly becoming a global exporter of advanced defence systems, supplying friendly nations with locally produced equipment.

IAI fully supports this vision and is actively helping India scale its defence industry to reach international markets. Through technology transfers, local production, and expanded supply chains, IAI contributes to India's goal of building a world-class defence manufacturing ecosystem.

## Looking Ahead

**IAI's relationship with India** is built on trust, reliability, and long-term cooperation, standing together in the hour of need. IAI is deepening its engagement to support India's evolving moderation needs. Through local manufacturing, advanced technological collaboration, and long-term sustainment programs, IAI ensures that India's defence forces benefit from state-of-the-art systems, outstanding support, and seamless technology transfers.

**During the upcoming Aero India 2025 exhibition**, IAI will showcase some of its most advanced technologies and announce new collaborations, reinforcing its commitment to India's long-term success.

**Jai Hind Jai Bharat !**

**Come and meet with our global experts at Hall B Booth B2.1 or contact us at [iai-in@iaeworld.co.il](mailto:iai-in@iaeworld.co.il)**



Credit: IAI

## IN CONVERSATION

# ‘COMMITTED TO DEVELOP MODERN WEAPON SYSTEMS, AWEIL HAS STRATEGIC FOCUS WITH INCREASED R&D EXPENDITURE’

*Advanced Weapons and Equipment India Limited (AWEIL) - The Ultimate Weapon System Provider is committed towards timely product delivery with highest standards of quality, prompt service, grievance redressal mechanism, transparency and accountability.*

**A K Maurya, Director-Operations and CMD (Addl. Charge) of AWEIL** in an engaging interaction with Editor, **Raksha Anirveda**, shares insights on the Company's commitment to Excellence, Delivery, and Future Growth in the Defence industry.



**RA:** *Since its establishment, what major steps are being undertaken by AWEIL to bring in more innovation and efficiency in its manufacturing?*

**AKM:** Since its inception, AWEIL has placed a strong emphasis on innovation and manufacturing efficiency, making significant strides in these areas. We have invested extensively in state-of-the-art facilities, advanced manufacturing technologies, and automation systems to ensure the highest standards

of precision and quality. By adopting Industry 4.0 solutions, we have successfully optimised production processes and reduced lead times, enhancing overall operational efficiency.

AWEIL is strategically enhancing its infrastructure to meet the evolving needs of the Services, Ministry of Home Affairs and also for international markets. Our focus is on Artillery Gun Systems, Tank Gun Components, Ammunition Hardware and Small Arms which includes Assault Rifles, Sniper Rifles and Carbines.

AWEIL is also committed to develop modern weapon systems and a lot of thrust is being given to Research and Development activities. AWEIL has increased its R&D expenditure to 2% of total revenue for the fiscal year 2024-25, with plans to further escalate this investment to 3-5% in subsequent years. This strategic focus highlights our dedication to developing new products and advancing our technological capabilities.

AWEIL is committed towards fostering a culture of continuous improvement. We regularly organise skill development programs specifically designed for our workforce, along with specialised training programmes at AWEIL Training Academy in Ishapore. This ensures that our team is equipped with the latest manufacturing techniques and quality assurance practices, further reinforcing our dedication to excellence in Defence manufacturing.

**RA:** *Reflecting on AWEIL's journey of three years, what are the key milestones achieved by the company in terms of year-on-year revenue growth and meeting export targets? Have you been able to grow the business at 15-20 percent per annum as targeted?*

**AKM:** In just three years, AWEIL has shown a remarkable growth. We have been consistently meeting and even exceeding our targets. We have been consistently growing and our units have given promising results. Our revenue has been growing at a rate of 15% approximately. This has been achieved by our continued focus on enhancing operational efficiencies, expanding our product portfolio and strengthening our customer base both domestically and internationally. AWEIL has achieved the highest revenue growth in the last five years, including the period of erstwhile Ordnance Factory Board (OFB). In FY 2023-24, AWEIL recorded a revenue of INR 2039 crore. AWEIL has further plans to increase its revenue in FY 2024-25. AWEIL is looking forward to grow @ 20% per annum and it is anticipated that the sales will cross INR 4000 crore by FY 2028-29.

Currently AWEIL is having a very healthy order book which is in excess of INR 10,000 crore. Further, AWEIL has also participated in a number of RFPs related to



Large Caliber Weapon Systems

Arty Guns, Naval Guns, Carbines and Sniper Rifles which are likely to be finalised in a year or two. We are hopeful that our order book will further grow. In the field of exports also, AWEIL has made significant progress. We have orders from various countries from Europe, North America, Middle East and Africa. Our export order book is in excess of INR 600 crore. The export orders include a range of products ranging from Small Arms, Medium-Caliber Weapons, Artillery Gun Sub Systems and Ammunition hardware. We are committed to establish AWEIL as a global leader in Defence manufacturing.

**RA:** *Delays in product delivery and shortcomings in quality standards have been DPSUs' hallmark, as per defence experts and analysts. How has AWEIL been tackling this unwarranted perception? Kindly elaborate with measures being taken to reverse this adverse narrative.*

**AKM:** AWEIL has implemented a robust project management framework which ensures adherence to timelines and quality standards. We also maintain proactive communication with our customers to meet their expectations and ensure timely deliveries. Regular interaction with our customers helps us identify the areas for improvement and take corrective actions.

Artillery Gun systems are being manufactured indigenously for the first time. These systems are

subjected to extreme operational conditions and the raised concerns have been thoroughly analysed. Based on this analysis, we have identified corrective and preventive actions to address the issues, ensuring that we continue to meet the highest standards of performance and reliability. Contrary to the perception of lower quality of DPSU products, AWEIL is focusing on Research & Development (R&D) to develop products of global standards. Notably, a reputed foreign OEM has praised the quality of AWEIL's supplies which they have confirmed through a written communication and which has been followed by two repeat orders. Getting export orders at competitive prices and repeat orders from reputed OEMs in itself is a testimony of our quality and delivery.

AWEIL is integrating advanced technologies including Artificial Intelligence (AI) to enhance quality assurance and manufacturing processes. We have implemented AI-based barrel bore inspection to eliminate human error and ensure precise defect detection. AI-powered predictive maintenance for CNC machines enables real-time monitoring, optimising performance. These innovations reflect our commitment to leveraging cutting-edge technologies to improve product quality and operational efficiency.

On the product delivery front, AWEIL is making consistent efforts to ensure timely deliveries to meet the customer expectations. Since inception, we have geared up our production capabilities and

**AWEIL is strategically enhancing its infrastructure to meet the evolving needs of the Services, Ministry of Home Affairs and also for international markets. Our focus is on Artillery Gun Systems, Tank Gun Components, Ammunition Hardware and Small Arms which includes Assault Rifles, Sniper Rifles and Carbines**

# IN CONVERSATION

**AWEIL is integrating advanced technologies including Artificial Intelligence (AI) to enhance quality assurance and manufacturing processes. We have implemented AI-based barrel bore inspection to eliminate human error and ensure precise defect detection**

have successfully supplied products more than INR 5000 crore till FY 2023-24. These include a diverse range of armament solutions from Small Arms to Large-Caliber Artillery Gun Systems. These products have been delivered not only to domestic customers but also to global markets through our export initiatives.

**RA:** *The Indian defence industry has changed over the past decade and now it's more competitive. Do you find competitiveness a positive development for enhancing India's standing in the global defence market? How has it benefited AWEIL?*

**AKM:** The increased competitiveness in the Indian Defence industry has positively impacted both our domestic sector and has improved India's position in global scenario. This environment has driven AWEIL to innovate and enhance its operational efficiency maintaining a strong focus on quality. As a result, we continuously refine our products, making them more appealing to the customers both in India and abroad. The competitive landscape has also enabled us to forge partnerships with Indian Defence industries. In this connection, AWEIL has signed a number of MOUs with leading Defence companies and with reputed academic institutions.

The competition in the Defence sector, combined with the Government of India's emphasis on exports, has motivated AWEIL to strengthen its presence in global markets. If we compare our performance

with the erstwhile OFB, we have made significant strides in getting export orders. Despite high level of competition, AWEIL has successfully penetrated both the domestic and international markets by offering competitive pricing and high-quality products.

As already mentioned AWEIL has an Export Order Book in excess of INR 600 crore. We are making continuous efforts to increase this order book further by promotion and marketing through direct engagement with potential customers, engaging channel partners, participation in domestic and international exhibitions, direct engagement with prospective customers and interaction with foreign OEMs.

**RA:** *As AWEIL is actively pursuing the development of new products and systems to expand its portfolio, kindly provide a brief account of the progress made so far. What new products and systems do you plan to unveil in 2025-2026?*

**AKM:** AWEIL is dedicated to expand its product portfolio with advanced technologies to enhance India's Defence capabilities. In the coming years, AWEIL plans to introduce several innovative products such as 155mm 52 Cal Mounted Gun System, 105mm Mounted Gun System, 7.61x51mm Assault Rifle, 5.56mm CQB Carbine, 8.6mm Sniper Rifle etc. These products are being developed in collaboration with leading academic institutions and industry partners.

AWEIL has entered into long-term collaboration



155X52mm Towed Gun System (TGS)



**Dhanush 155x42mm Caliber  
Artillery Gun System**

agreements with Indian Defence Industries for co-development and co-production in areas such as the Artillery Gun System. Our ongoing projects with industry and academia include the 155mm 52 Cal MGS in collaboration with L&T, among others. So far, AWEIL has filed 77 intellectual property rights (IPRs) with 20 already granted, reflecting our commitment to innovation and technological advancement in Defence manufacturing.

AWEIL is actively working to develop new products. These include Drone Mounted Gun System, Remote Firing Platform capable of autonomous target identification, tracking, and destruction. These initiatives are a part of our ongoing efforts to meet the evolving needs of the Armed Forces and also to contribute for India's standing in the Global Defence arena.

**RA:** *How is AWEIL contributing to the government's Aatmanirbharta drive and also supporting the emerging Indian defence startup ecosystem?*

**AKM:** At AWEIL, we are fully aligned with the government's Aatmanirbharta initiative and take pride in being an integral part of India's defence manufacturing ecosystem. Our emphasis on indigenisation reflects this commitment. AWEIL currently has an overall indigenous content of 94% which is one of the highest amongst Defence Public Sector Undertakings (DPSUs). Our ultimate goal is to reach 100% indigenisation and eliminate any dependency on imports.

A significant advancement in this direction is the contract signed with the Ministry of Defence in 2024. This contract is for manufacture and supply of 463 indigenously produced 12.7mm Stabilised Remote Control Guns (SRCGs) for the Indian Navy and Coast Guard, with over 85% indigenous content. These SRCGs will greatly enhance the capabilities of our naval forces in engaging small targets, aligning with the vision of Aatmanirbharta in defence. This contract will also provide significant opportunities for over 125 Indian vendors and DPSUs over the next five years, thereby strengthening the domestic defence ecosystem.

**RA:** *AWEIL is participating in Aero India 2025. What products and systems will be showcased at the airshow, and what are your expectations?*

**AKM:** Aero India 2025 is one of Asia's largest airshows, serving as a key platform for global innovation, collaboration, and knowledge exchange in the aerospace industry. While the event primarily focuses on aerospace, AWEIL is excited to participate and showcase our capabilities in defence manufacturing.

AWEIL will showcase the MMG MAG Gun, which is currently used by the Indian Air Force, along with a range of small arms, including sniper rifles, carbines, assault rifles, and more. Our senior leadership team will be present at the exhibition to engage with foreign OEMs, industry experts, and potential partners. We are excited to leverage this prestigious platform to expand our global presence and explore new collaboration opportunities.

**A significant advancement in this direction is the contract signed with the Ministry of Defence in 2024. This contract is for manufacture and supply of 463 indigenously produced 12.7mm Stabilised Remote Control Guns (SRCGs) for the Indian Navy and Coast Guard, with over 85% indigenous content**

# TWO SSNS, THREE PATHS

India has revived its long-stalled nuclear-powered attack submarine (SSN) programme with the approval of two domestically built SSNs worth Rs 40,000 crore. With strategic options ranging from adapting the Russian-assisted Arihant design to exploring France's Barracuda-class submarines or a potential invitation to the AUKUS alliance, India's choice will shape its naval power and geopolitical autonomy in the Indo-Pacific



## CMDE RANJIT B RAI

**O**n 15th September 2021, the leaders of Australia, the United Kingdom, and the United States announced a landmark trilateral security partnership known as 'AUKUS', reinforcing their shared commitment to a free, peaceful, and open Indo-Pacific. This agreement marked a significant shift in global defence alignments, underscoring the deepening strategic ties between the three nations, particularly in areas of intelligence sharing—leveraging the existing Five Eyes network—as well as defence technology, industrial base development, and supply chain security.

One of the first and most significant initiatives under AUKUS was the agreement to equip the Royal Australian Navy (RAN) with nuclear-powered attack submarines (SSNs). These advanced submarines possess the capability to track and neutralise enemy submarines and surface ships using underwater-

launched missiles and torpedoes. Furthermore, they can project power ashore through cruise missile strikes and play an offensive role by laying mines in adversarial waters. The nomenclature 'SSN' stands for 'Submersible Ship Nuclear-powered,' indicating their ability to remain submerged indefinitely, constrained only by the endurance of their crew and onboard provisions. Given their stealth and endurance, SSNs are an indispensable asset for modern naval warfare, and global maritime powers are rapidly expanding their fleets of nuclear-powered submarines both for strategic deterrence and tactical engagements. Conversely, smaller navies, constrained by financial and technological barriers, are investing in conventional submarines with Air Independent Propulsion (AIP) systems, which allow them to remain submerged for extended periods—typically a few weeks—enhancing their survivability in contested waters.

The momentum of AUKUS accelerated further on 13th March 2023, when the three partners unveiled a comprehensive roadmap for developing Australia's indigenous nuclear-powered submarine capability by 2030. Under this ambitious initiative, Australia has commenced extensive technical preparations, including infrastructure upgrades and workforce development. RAN personnel have been undergoing rigorous training at US and UK nuclear reactor schools to build the requisite expertise in nuclear propulsion systems. Additionally, the frequency of visits by US nuclear-powered submarines to HMAS Stirling, the naval base located on Garden Island near Perth, has increased significantly. These port visits are designed to provide hands-on exposure and operational training to Australian sailors. Lincoln Reifsteck, the US AUKUS Program Manager, underscored the strategic intent behind these visits, stating, "Each visit will build upon the previous one and allow the RAN team to grow its capabilities."



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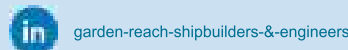


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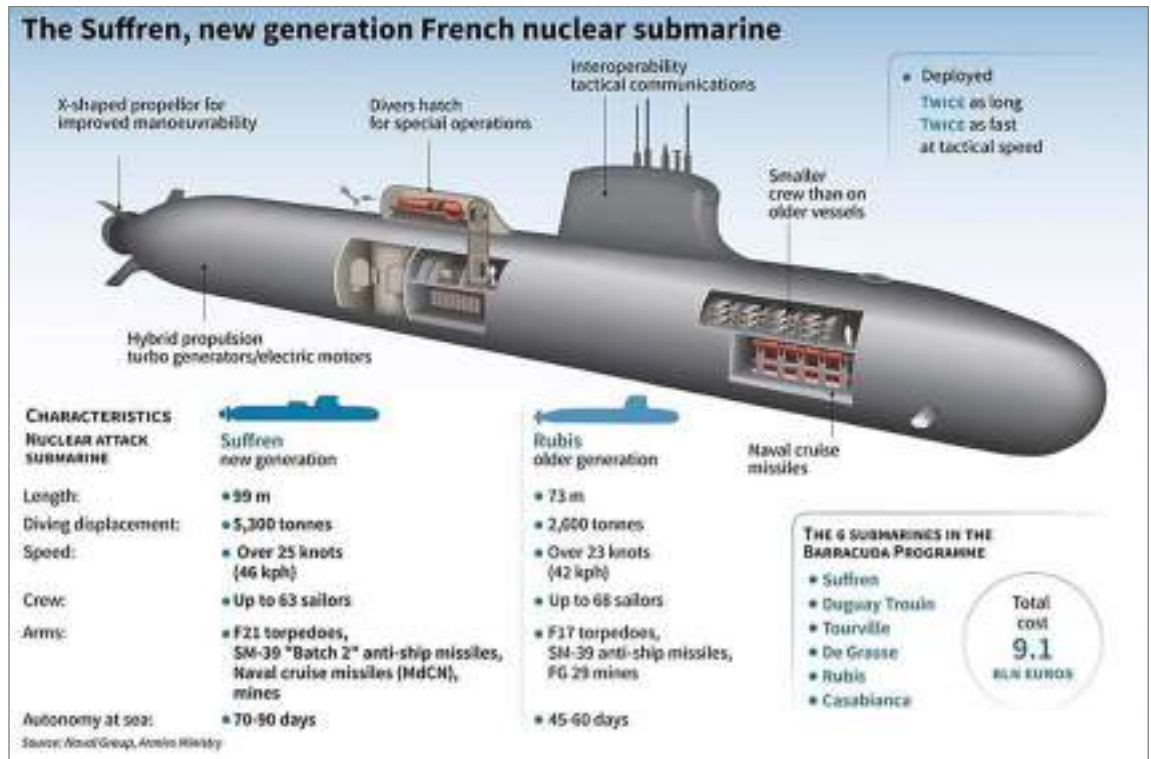
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# ANALYSIS

One of the first and most significant initiatives under AUKUS was the agreement to equip the Royal Australian Navy (RAN) with nuclear-powered attack submarines (SSNs). These advanced submarines possess the capability to track and neutralise enemy submarines and surface ships using underwater-launched missiles and torpedoes



The United States Navy currently operates a formidable fleet of forty-nine SSNs, and given the evolving Indo-Pacific security landscape, there remains a possibility that Washington may lease one of its nuclear-powered submarines to the RAN. This mirrors a precedent set by India in 1987, when the Indian Navy leased the SSN INS Chakra from the Soviet Union. The lease arrangement, which included a skeleton crew from the Soviet Navy for safety and operational guidance, provided India with its first exposure to nuclear submarine operations. Recognising the need for dedicated infrastructure to support nuclear-powered vessels, India subsequently developed a specialised nuclear submarine base at Visakhapatnam. Such bases are critical for sustaining nuclear-powered fleets, as they provide essential shore-based facilities, including electric supply, air-conditioning, chilled water systems, first-line repair capabilities, and nuclear reactor maintenance.

## INDIA HAS BECOME USA'S PREFERRED DEFENCE PARTNER

Over the past decade, India has emerged as a key strategic partner of the United States in the defence domain, cementing this relationship through substantial procurements of American military hardware. As of 2024, India has acquired

over \$22 billion worth of US-made defence equipment, reflecting a significant shift in its military dependencies and operational synergies. The Indian Navy, in particular, has enhanced its interoperability with the US Navy through the induction of twelve P-8I maritime reconnaissance aircraft armed with Harpoon missiles and torpedoes, MQ-9B drones for long-endurance surveillance, MH-60R multi-role helicopters, and continuous replenishment of Harpoon missile stocks.

On 10th January 2025, President Donald Trump assumed office as the 47th President of the United States, promptly initiating a series of executive orders and policy announcements under his signature 'Make America Great Again' (MAGA) agenda. Among his key pronouncements, President Trump signalled his intent to impose additional tariffs on BRICS nations, including India, and hinted at the possibility of expanding sanctions. Given India's considerable dependence on Russia for defence procurements, crude oil imports, and civil-military nuclear cooperation, any US-imposed restrictions could have far-reaching implications on Indo-Russian strategic ties.

In light of these developments, Indian Prime Minister Narendra Modi held a crucial telephonic conversation with President Trump on 27th January 2025. Following their discussion, PM Modi took to social media to reaffirm



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India's commitment to bilateral ties, stating, "Delighted to speak with my dear friend President @realDonaldTrump @POTUS. Congratulated him on his historic second term. We are committed to a mutually beneficial and trusted partnership. We will work together for the welfare of our people and towards global peace, prosperity, and security." This upcoming high-profile meeting

between PM Modi and President Trump in Washington is poised to play a decisive role in shaping the trajectory of India-US relations. Furthermore, the outcome of this engagement will offer crucial insights into how India intends to balance its strategic partnerships, particularly with Russia, which remains embroiled in its protracted conflict with Ukraine.

## INDIA'S SSN DEVELOPMENT

India currently has three potential pathways to develop its SSN fleet:

1. **Leveraging Russian Expertise:** India could build upon the Russian-assisted Arihant programme. Under this approach, India's Advanced Technology Vessel (ATV) project, managed by DRDO and the PMO, had earlier acquired the SSN Rubin design from Russia. This included 'normatives,' which provide design flexibility within specific parameters. The Arihant-based SSN could be enhanced with a more powerful nuclear reactor to achieve the higher speeds required for an SSN.
2. **French Barracuda-Class Collaboration:** Another option is to adopt the French Barracuda-class SSN design offered by Naval Group. In 2021,

after Australia scrapped its submarine deal with France's Naval Group, French President Emmanuel Macron reassured Indian Prime Minister Narendra Modi of France's commitment to strengthening India's strategic autonomy. There has been speculation that this could lead to cooperation on Project 78A, with France's Direction Générale de L'Armement (DGA) potentially supplying enriched uranium for India's domestically built nuclear reactors. The 4,800-ton Barracuda-class SSNs feature a hybrid propulsion system, combining electric propulsion for economic cruising and turbo-mechanical propulsion for higher speeds. They are also equipped with pump jet propulsion, which reduces noise emissions and mitigates cavitation risks.

## NAVY'S PLANS FOR TWO SSNS WORTH RS 40,000 CRORES (\$44 BILLION)

India's Defence Acquisition Council (DAC) had sanctioned six nuclear-powered attack submarines (SSNs) in 2010 under Project 78A to bolster the Indian Navy's underwater warfare capabilities. However, the project was shelved in favour of Project 75, which prioritised conventional submarine construction. This resulted in the commissioning of six Scorpene-class submarines, while the SSN plan remained dormant despite significant advancements in India's nuclear submarine infrastructure. Notably, the Defence Research and Development Organisation (DRDO), the Indian Navy, and Larsen & Toubro Ltd (L&T) had established an ecosystem for nuclear submarine construction, including nuclear reactor development at the Bhabha Atomic Research Centre (BARC). This led to the commissioning of India's first indigenous nuclear ballistic missile submarine (SSBN), INS Arihant, in 2016.

On 8th October 2024, the Cabinet Committee on Security (CCS), chaired by Prime Minister Narendra Modi, approved two major defence procurements: the construction of two SSNs and the acquisition of 31 MQ-9B Predator armed drones from US-based General Atomics. The SSNs will be built domestically at the Ship Building Centre (SBC) in Visakhapatnam, with an estimated budget of Rs 40,000 crore. This initiative will significantly enhance India's naval capabilities and reinforce the country's push for Aatmanirbharta



**The upcoming high-profile meeting between PM Modi and President Trump in Washington is poised to play a decisive role in shaping the trajectory of India-US relations. Furthermore, the outcome of this engagement will offer crucial insights into how India intends to balance its strategic partnerships, particularly with Russia, which remains embroiled in its protracted conflict with Ukraine**

(self-reliance), with substantial participation from the private sector.

### INDIA'S STRATEGIC CONSIDERATIONS

Regardless of the chosen approach, India must address critical design and technological challenges, as it currently lacks a proven indigenous SSN design. However, integrating advanced weaponry such as the underwater-launched BrahMos missile, a concept envisioned by Dr APJ Abdul Kalam, could provide India's SSNs with formidable strike capabilities.

The decision on India's SSN programme will be a litmus test for its strategic autonomy. Whether New Delhi chooses to deepen its collaboration with Russia, align more closely with France, or explore a new partnership with the AUKUS bloc, the move will significantly shape India's naval power projection and its standing in the Indo-Pacific. ■

*—The writer is a retired naval officer and maritime historian who curates a private maritime museum at C-443 Defence Colony, New Delhi. His latest book, Indian Navy@2025 – A Pictorial Journey, is set to be released in December 2024. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*

## OPTIONS

3. **Potential AUKUS Partnership:** The third possibility is aligning with the AUKUS SSN programme, led by the United States, the United Kingdom, and Australia. Given the Republican Party's strong support for the US Military-Industrial Complex (MIC), the second term of President Donald Trump could see Washington inviting India to join the AUKUS initiative. However, this raises a geopolitical dilemma—would a Trump administration tolerate India's longstanding defence and nuclear cooperation with Russia? If India were to participate in AUKUS, it could gain access to cutting-edge SSN technology, but this might come at the cost of its strategic autonomy.



Digital impression of Indian CCAs teaming with an IAF Tejas Mk2

# COLLABORATIVE COMBAT AIRCRAFT: REDEFINING AIR WARFARE

Poised to change modern air combat in the decades to come, the Collaborative Combat Aircraft represents a fundamental shift in how nations will project power in contested skies while maintaining an edge in the air warfare. By prioritising indigenous programs like the Warrior and Abhimanyu, which foster AI innovation and enhance air combat effectiveness, India can bridge its capability gap and position itself as a leader in autonomous technologies. This next evolution of air combat, will mature in the years ahead

 **AJIT K THAKUR**

**O** imagine a pair of sleek, stealthy aircraft flying high over the Himalayan horizon in the not so distant future. As you zoom in close, you astonishingly realise there's no pilot in the cockpit. This pair of robotic platforms calmly weave invisible patterns, dancing to the tune of an unknown composer. Only the trained eye can relate this as tactical manoeuvring against a beyond visual range (BVR) entity. This carries on for a while, till such time that a sleek Tejas fighter jet zooms in and joins up with the uncrewed platforms in a perfect finale to the composition.

As the two robotic platforms tuck in obediently behind the Tejas, you realise that you are witnessing a first-hand manifestation of manned unmanned teaming (MUM-T), and the two uncrewed systems are none other than the Hindustan Aeronautics Limited (HAL) CATS-Warrior and its smaller sibling, the NewSpace Research & Technologies (NRT) developed Abhimanyu. Warrior and the Abhimanyu define the emerging breed of uncrewed air combatants widely termed as 'Collaborative Combat Aircraft (CCA)' and in some geographies, as the 'Loyal Wingman'.

The CCAs are the byproducts of a rapidly developing air warfare

doctrine in the age of Industry 5.0. They're designed to fly alongside traditional 4/4.5/5th Gen fighters, taking on some of the toughest missions and making sure they stand as a barrier of contact between the home team and the opposition for a variety of operational needs. The HAL Warrior and the NRT Abhimanyu epitomise disruptive trajectories of CCA development across the world, where the United States is the global leader. While the definitive operational deployment of these futuristic platforms is still some years away, the one thing which is obvious is that CCAs are poised to change modern air combat as we know it.

### UNDERSTANDING THE CCA CONCEPT

For decades, the world has pictured fighter jets dominating the discourse on the command of the skies, and advancements in air warfare doctrine. But with the advent of Collaborative Combat Aircraft, the airpowers across the world are changing that narrative, registering the next big thing in Air Warfare. Expanding on the definition of the CCA - Collaborative Combat Aircraft are advanced, autonomous, or semi-autonomous systems engineered to work in tandem with traditional manned aircraft such as fighter jets, bombers and/or C2 assets; as well as terrestrial entities. These Uncrewed Combat Air Vehicles (UCAV) are equipped with sense and perception sensors, collaborative autonomy, edge computing, artificial intelligence (AI), and networked protected data links; enabling them to perform a wide variety of roles — from reconnaissance and electronic warfare, to strike missions and air defence suppression; and as air to air combat vectors equipped with Air-to-Air Missiles. CCAs are mostly powered by jet engines

and can be deployed solo or in a swarm.

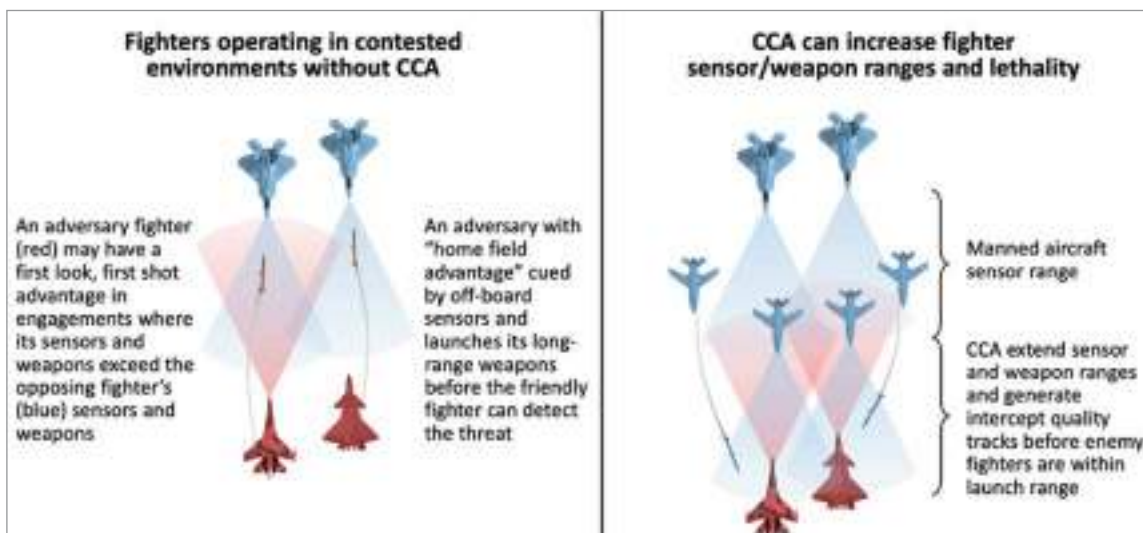
Unlike traditional drones, which often operate independently or under direct human control, CCAs are designed to collaborate with other CCA/UAVs and with human pilots in a dynamic manned teaming (MUM-T) and wider autonomy paradigm. In the days ahead, pilots would command a CCA swarm to scout ahead, jam enemy radars, or engage hostile targets, keeping the aircraft out of the harm's way while the pilot focuses on higher-level decision-making. This complex set of manoeuvres and tactical routines will be implemented through a 'system of systems' philosophy.

Today's 4/4.5/5th Gen manned platforms are 'exquisite, expensive and available in fewer numbers' to create a widespread impact. Recent conflicts reinforce the emergence of Anti-Access and Area Denial (A2AD) layered offence/ defence philosophies, which imposes caution on use of these platforms, especially the ability to generate a sizeable 'mass' and 'air launched effects' (ALEs) to penetrate the A2AD layers without suffering disproportionate attrition.

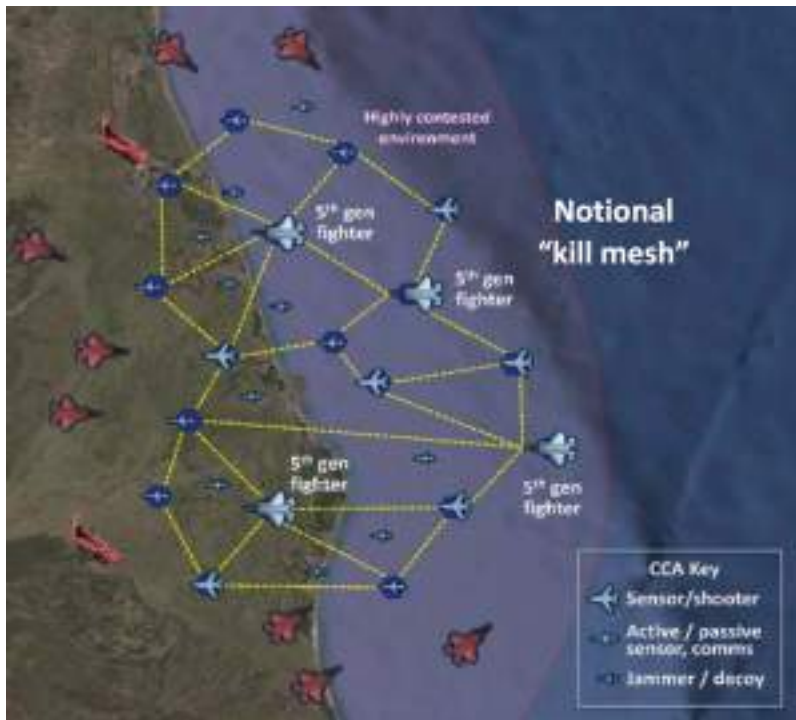
Reintroducing the philosophy of affordable and de-centralised 'combat mass', CCAs will be able to disaggregate sensors and payloads across dispersed, less 'exquisite' vehicle types within the same swarm. Thus CCAs increase the density of sensors, weapons, and other mission systems that can be projected in depth inside contested zones. CCAs can enable non-stealthy fighters and bombers to contribute to the highly contested air superiority fight as a team. They can prove their lethality by helping to close sensor - weapon range gaps and achieve first look/first shoot advantage.

The CCAs are expected to be most effective

**The CCAs are the byproducts of a rapidly developing air warfare doctrine in the age of Industry 5.0. They're designed to fly alongside traditional 4/4.5/5th Gen fighters, taking on some of the toughest missions and making sure they stand as a barrier of contact between the home team and the opposition for a variety of operational needs**



# COVER STORY



Source: Mitchell Institute for Aerospace Studies

**Reintroducing the philosophy of affordable and de-centralised ‘combat mass’, CCAs will be able to disaggregate sensors and payloads across dispersed, less ‘exquisite’ vehicle types within the same swarm. Thus CCAs increase the density of sensors, weapons, and other mission systems that can be projected in depth inside contested areas**

when utilised as part of kill meshes, to increase survivability and lethality against enemy assets. Kill meshes would increase options for manned fighters to detect, avoid, and counter enemy defences in 360-degree threat environments. Creating a more heterogeneous force mix, sharing sensing, data links, and other functions across meshes would complicate an enemy’s ability to identify nodes and other targets. Employing large numbers of lower cost CCA could help deplete enemy air defences, impose costs, and open the path to follow-on crewed and uncrewed force vectors. Imagine the advantage of an entire fighter squadron, where only one or two aircraft have human pilots, and the rest are CCAs. They seamlessly follow commands, thanks to AI-driven software, delivering the Air Force’s combat punch to achieve Air Superiority in hostile space.

### TACKLING OLD PROBLEMS WITH NEW IDEAS

It’s interesting to watch where the USAF, the current CCA development champion is headed in this vertical. The US DOD realises that Aircraft are expensive to develop, buy, and operate. Since the 1990s, the USAF fleet has decreased, in part because of those costs. Former Air Force Secretary Kendall has stated CCAs would cost roughly one-third the price of crewed fighters. Kendall added that there is a “planning assumption” of 1,000 CCAs, a number derived by projecting the use of two CCAs for each of 500 advanced fighters. CCAs are part of the Air

Force’s Next-Generation Air Dominance (NGAD) family of systems program, which also may include a future crewed fighter platform, sensors, weapons, and more.

The USAF is envisioning that training on CCAs would occur virtually, so the airframes themselves would fly less, potentially leading to lower maintenance and sustainment costs. The Air Force would purchase them in quantities large enough to augment its fleet. CCAs arrive just as China’s aerospace and defence industry is on a massive research & rearmament up drive, where its contribution to the anti-access/area-denial (A2/AD) strategies—think long-range missiles and sophisticated air defence—are challenging the US air superiority. By integrating CCAs with crewed fighters, the USAF believes it can create a larger, more flexible, and more obscure force for adversaries to deal with, helping in A2AD penetration methodologies.

Further, in line with a new approach called agile combat employment (ACE), the Air Force wants to disperse and scatter forces across multiple small bases instead of relying on large, centralised locations which are under threat from Chinese long range precision strike complexes. CCAs in dispersed locations will add sensors, weapons, and enough options to deploy, which will keep potential adversaries guessing. The Commander of Air Combat Command General Kenneth S. Wilsbach sums it well -“You can create mass, and so many targets out in the battlespace that your adversary will have to worry about ... is that something that I have to use some munitions on?”

### FOUNDATIONAL DEVELOPMENT IN THE UNITED STATES

The Defence Advanced Research Projects Agency (DARPA), the USAF, and Air Force Research Laboratory (AFRL) have undertaken numerous efforts to develop and test single agent and collaborative autonomy software and modular upgradable platforms during the past decade. What is significant to note is that the USAF has sought to develop a pipeline of technologies feeding into the CCA. These efforts helped to refine underlying technologies such as digital engineering, agile software, and open mission systems. Programs like DARPA’s ACE combat and AFRL’s Skyborg have delivered the building block for the same. The Air Force has a dedicated experimental test unit working on developing the best ways to use CCAs, including using its X-62 VISTA fleet to experiment



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# COVER STORY



The GA-ASI 'Longshot' air-air CCA concept



The USAF F-16 VISTA "Variable Stability In-flight Simulator Test Aircraft"

with the autonomy software undergirding CCAs. These projects have collected data and conducted artificial intelligence (AI) experiments to help teach pilots how autonomous software behaves and reduce risk for CCA mating.

The Kratos XQ-58 Valkyrie, in operation since 2019, was the world's first CCA concept to start autonomy & human machine teaming trials with AFRL, and has demonstrated its advanced electronic attack capabilities by autonomously

detecting, identifying, and geolocating multiple targets of interest. In one of the demos, the aircraft successfully transmitted target track coordinates to collaborative assets and executed non-kinetic electronic attack (EA) effects against multiple emitters. The XQ-58A Valkyrie offers high performance, runway-independent tactical UAV capabilities, including long-range flights at high-subsonic speeds, operational flexibility, and affordability for various US DOD applications.

In January 2024, the USAF awarded initial contracts to five companies to design and build CCAs: Anduril, Boeing, GA-ASI, Lockheed Martin, and Northrop Grumman. In April 2024, the Air Force announced that two of those companies—Anduril, and GA-ASI—won Increment 1 contracts to build production-representative test articles. Anduril made headlines when it acquired Blue Force Technologies, the developer of a large uncrewed aircraft called Fury. The Fury is now slated for a makeover, evolving into a high-performance, and multi-mission aircraft under Anduril's guidance. The company plans to pair Fury with its 'Lattice' intelligence software suite—an open system that can tie together multiple sensors and domains. Meanwhile, General Atomics has built on its XQ-67A test platform, which first flew in early 2024. It focuses on endurance, rather than raw speed or manoeuvrability. In fact, GA-ASI's leaders say they've already started production, hinting at the pace of innovation taking place behind the scenes.

The USAF anticipates ordering more than 100 CCAs as part of Increment 1 program award in the next five years. The vendors not selected would still be eligible to compete for Increment 1 production contracts and future increments. The preliminary work has started on Increment 2. The USAF intends to work with more than 20 industry partners, including those not initially selected



The Kratos XQ-58 Valkyrie releasing an Altius Air Launched drone



The Anduril FURY CCA

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# COVER STORY



**General Atomics XQ-67A CCA test platform**



**A Boeing MQ-28A flying in a formation with a USAF F-22 Raptor**

**The CCAs are expected to be most effective when utilised as part of kill meshes, to increase survivability and lethality against enemy assets**

for Increment 1, and is additionally exploring international partnerships. The Increment 2 award could be a more complicated platform that incorporates stealth technologies.

Lockheed Martin recently announced that it successfully demonstrated the capability to command drones with a MUM-T architecture resident on board an F-35 in 2024. The company conducted tests with a human controller in an L-39 Albatros jet using a touchscreen interface to command two L-29 Delfin jets, equipped with AI-enabled flight technology acting as surrogate drones, to engage simulated enemy fighters. In fact the Kratos XQ-58 CCA has on many occasions flown besides the F-22 and F-35 fighters of the USAF and the Marine Corps.

The showcasing of the XQ-58A Valkyrie’s ability to fly alongside two F-35 aircraft and deliver an integrated electronic attack capability during a live flight test event, marked the completion of the initial phase of the US Marine Corps’ Penetrating Affordable Autonomous Collaborative Killer – Portfolio (PAACK-P) program on April 2, 2024,

with a successful demonstration by its Unmanned Systems Division at Eglin Air Force Base, Florida. The F-35 can command and control up to 8 CCAs under its existing capability.

## DEVELOPMENT TRAJECTORY ACROSS REST OF THE WORLD

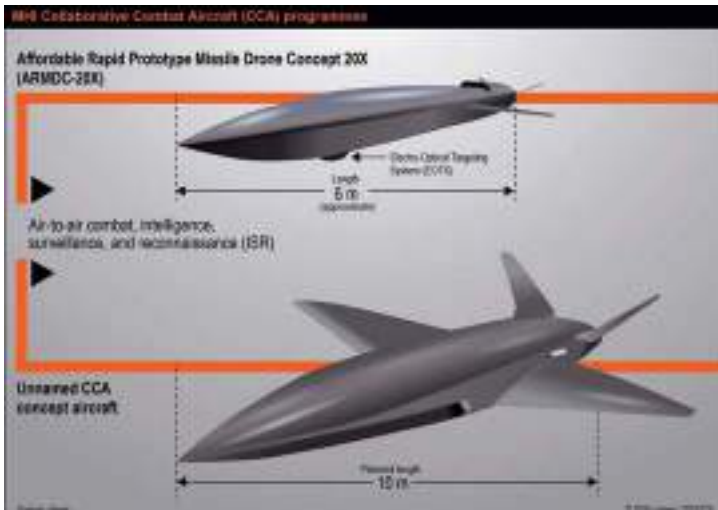
In Europe, the CCA development by several European nations is primarily focused on the “Future Combat Air System (FCAS)” program, which aims to create a network of manned and unmanned aircraft capable of seamlessly collaborating in combat operations, utilising advanced technologies like AI and big data for enhanced situational awareness and decision-making. Key players in the FCAS project include France, Germany and Spain. FCAS will be built around a core Next Generation Weapon System (NGWS). In this system of systems, piloted New Generation Fighters will work together with the newly unveiled Airbus CCA design, and with Unmanned Remote Carriers – all connected to other systems in space, in the air, on the ground, at sea and in cyberspace via a data cloud called the “Combat Cloud.”

These connected platforms will act as sensors, effectors and C2 nodes, enabling agile decision making and working together within an open, scalable, architecture that allows the inclusion of future platforms and technologies. FCAS capabilities will roll out incrementally, starting with enhanced situational awareness in the late 2020s and progressing to manned-unmanned teaming in the early 2030s. Upgraded fighters such as the Eurofighter will team with first-generation Wingman, leading to the full FCAS vision by 2040 with the NGWS.

UK, Italy and Japan are developing CCA capabilities around the multi-national Global Combat Aircraft Program. The GCAP envisions a swarm of Loyal Wingman/ CCA class aircraft being



**Airbus Loyal Wingman concept revealed in 2024**



CCA concepts by Mitsubishi Heavy Industry (MHI) as part of GCAP



The European FCAS mesh visualisation

interoperable with the Tempest 6th Gen fighter aircraft. CCA designs from BAE Systems, Leonardo and Mitsubishi Heavy Industries (MHI) have emerged centred around this requirement which focuses on creation of a crewed and uncrewed platform based connected and dynamic combat mass to saturate and penetrate enemy defences.

Australia has developed the Boeing MQ-28A ‘Ghost Bat’ Loyal Wingman, which is touted as a pathfinder for integration of autonomous systems and AI to create smart human-machine teams. It is the result of a collaboration between Australian Air Force and Boeing Australia.

In December 2024, the Swedish firm Saab presented concepts for a potential new-generation crewed fighter and a series of CCA drones intended to work alongside it. With a long history of domestic combat aircraft development, a sixth-generation fighter and complementary stealthy drones make sense for Sweden, although there are big questions about whether this is a realistic prospect without joining forces with other countries.

Turkey is prototyping a CCA based on the Baykar Kizilelma (Red Apple). It is being designed to work alongside the Turkish KAAAN 5th Gen manned fighter jet, providing additional situational awareness, carrying out specific tasks like electronic warfare, and potentially engaging enemy targets under the command of the manned aircraft. The Kizilelma is under flight testing and has a maximum take-off weight (MTOW) of 6,000 kilograms, with 1,500 kg of weight available for the payload. According to data shared by the company, the Kizilelma will have an operational altitude of 10,000 meters AMSL.

South Korea’s KAI is involved in development of the KUS-FS, a Loyal Wingman class low RCS UCAV



Baykar Kizilelma (Red Apple) jet powered uncrewed aircraft

designated to operate with the locally developed 4.5/5th Gen KF-21 Boramae fighter aircraft. It is still at a conceptual stage and will only be operational towards the end of the decade.

The Russian Sukhoi bureau is developing the S-70 Okhotnik-B, also referred to as Hunter-B, which is a Russian UCAV being transitioned into a CCA concept around the development of the 5th Gen Su-57 platform. The concept relies on MUM-T to add robotic layers tied to the Su-57 and exploit the same at a tactical level. On October 5, 2024, an S-70 was shot down by an air-to-air missile from a Russian Su-57, near Kostiantynivka, in Ukraine. The drone apparently lost contact with its ground control and flew in the direction of Ukrainian-controlled territory. By the time attempts to regain control had been abandoned, the drone had crossed the front line into Ukraine and, subsequently, the Russian Su-57 deliberately shot it down. Russia though will continue developing the S-70 in the days ahead, albeit at a reduced pace, limited by sanctions and tech gaps.

# COVER STORY

## Russia's Okhotnik stealth drone

The Sukhoi S-70 Okhotnik (Hunter) is Russia's first heavy unmanned aerial vehicle (UAV), designed to perform reconnaissance and strike missions using high speed and fully autonomous flight

### SUKHOI S-70 OKHOTNIK-B (HUNTER-B)

**Airframe:** Reportedly made of composite materials and treated with radiation-absorbent (stealth) coating

**Dorsal-mounted engine air intake**

**Powerplant:** Single turbofan, likely AL-31/41 series

**Weapons bay**

### SPECIFICATIONS (estimated)

Wingspan	19 metres
Take-off weight	20 tonnes
Maximum speed	1,000km/h
Range	4,000km
Payload	Up to two tonnes

### Armament

Air-to-surface missiles and array of bombs carried inside ventral bay or bays to reduce drone's visibility on enemy radar

"Fully robotized" vehicle capable of making independent combat decisions – only requiring human operator to deploy weapons

Flat "flying wing" design similar to U.S. Air Force's B-2 stealth bomber

Possible hypersonic weapon

**Weapons bays:** Should be able to carry most, if not all, missiles and munitions being developed for Russia's Su-57 multirole aircraft, including hypersonic missile with characteristics similar to Kh-47M2 Kinzhal

Sources: GlobalSecurity, Jane's 360, The National Interest

© GRAPHIC NEWS

China's "intelligentised warfare" doctrine emphasises AI, autonomy, and networked systems to counter US military advantages in the Indo-Pacific. Collaborative drones and CCAs are a key component of this strategy and have started appearing in Chinese whitepapers on air warfare. While China has not officially confirmed a program named "collaborative combat aircraft," its investment in stealth UAVs, AI, and swarm technology suggests active development of systems analogous to the Loyal Wingman concept. These platforms aim to enhance the lethality and survivability of China's 5th-gen fighters like the J-20 in high-threat scenarios. With the unveiling of two 5+ /6th Gen fighters in Dec 2024, it can safely be assumed that China is testing a series of CCA concepts out of the public eye to support deployment of its next generation fighters.

The GJ-11 "Sharp Sword" Stealth UAV will be one of them; which is a flying-wing stealth combat drone revealed in 2019, capable of internal weapons

carriage. It is speculated to operate alongside stealth fighters like the J-20 for penetrating enemy air defences and conducting strikes on US assets in the Indo – Pacific region. The FH-97 Loyal Wingman unveiled at the 2022 Zhuhai Air Show resembles the US Skyborg /XQ-58A Valkyrie. It features AI-driven swarm coordination, air-to-air missile capabilities, and modular payloads and is designed to act as a sensor node/ weapons carrier for manned fighters. Another concept is the 'Dark Sword' (Anjian), a rumoured high-speed, stealthy CCA under development with potential air-combat capabilities. Its status remains unclear, but it highlights China's interest in advanced AI-driven combat drones paired with manned elements.

## FROM INTERACTION TO AUTOMATION, TO CHALLENGES WITH HIGHER ECHELONS OF AUTONOMY & AI

What is yet to be seen is how the CCAs will be controlled and what levels of autonomy may truly be available in the near term to support the Concept of Operations (ConOps). There is a lot of opinion amongst the Air Forces about the right way to go about doing this. On Human Machine Interface (HMI) protocols, the universal thought is that the fastest way to begin experimentation would be a tablet or a touch based interface in the cockpit, and most of the



The FH-97 Loyal Wingman unveiled at the 2022 Zhuhai Airshow



Initial Command & Control layer interaction has been through stand-alone tablets in the cockpit



**NewSpace Research Air Combat Intelligence Development (ACID) simulation as shown in Aero India 2021**

CCA Command & Control (C2) interfaces in manned cockpits are taking this route.

However effort will needed to integrate the HMI in a most intuitive and cognition friendly manner at the aircraft mission avionics level so as to not overload the pilot from his core job of flying the aircraft. These system architectures can only come out of clinical experiments on the subject. One such initial effort is operational in the F-35 cockpit, while futuristic concepts using Augmented/ Virtual Reality (AR/VR) are being explored with programs like the UK's GCAP.

The inference on how much autonomy is enough for the CCA agent would ideally depend on what best result it is able to deliver in a teaming environment. It will also be dependent on the quality of the data crunched to train and augment the AI algorithms and associated combat autonomy development processes, some of which may not be currently available in the real world. Here besides real world testing effort, high fidelity simulation environments with training and experimentation of next generation autonomy

and ConOps implementation for CCAs will help save effort, ambiguity and costs.

What is however emerging as a feedback from early CCA experiments is that at this juncture, an efficient automation process, with a lower level of autonomy and AI support, can still deliver the desired tactical result in a most useful manner. This will especially be pertinent with most nations emphasising on a human decision for key engagement decisions, including employment of weapons. It also understates the fact that the ability to create systems which can operate autonomously with missions in all regimes of operations, is something which is still maturing.

When we evaluate the trust and ethical behaviour of the resident intelligence on the robotic entity, the explainability of AI and trusted hard coded behaviour trumps the very advanced layers of autonomy which cannot be understood on how they take decisions. With a better grasp of evolving CCA doctrine, technology mapping and other fundamentals, a single manned fighter can control a 'larger' number of drones than previously thought with proven facets of automation, using less-sophisticated autonomous technology. Not only can pilots embed with a larger numbers of CCA drones, but they also won't need drones with the most cutting-edge autonomy software to do it. Reliance on emergent behaviour using AI methods with unsupervised learning, will be limited to exclusive scenarios only, with the majority of actions like navigation, collaboration of agents, group combat tactics etc., centred around playbook routines and behaviour trees, which are explainable.

Hence, what was clearly thought as the necessary requirement for a great amount of autonomy and a

**Reliance on emergent behaviour using AI methods with unsupervised learning, will be limited to exclusive scenarios only, with the majority of actions like navigation, collaboration of agents, group combat tactics etc., centred around playbook routines and behaviour trees, which are explainable**

### TENETS OF AI FOR AIR COMBAT

- **Classical AI**
  - Logic (explainable) – Behaviour Trees
- **Advanced AI**
  - Neural Networks (potent, non-explainable)

**OUTPUT B. Program Scope – XAI Development Challenges**

# COVER STORY

**The development of the Warrior and Abhimanyu CCAs by Indian companies is a milestone event for the UAV sector in India, with a clear intent to push for integration of CCAs into India's larger Defence strategy - particularly in scenarios that demand rapid deployment and scalability of airborne uncrewed systems**

significant amount of artificial intelligence, and really, really complex algorithms, has with widespread virtual and real world workflow deployments turned out to be instead - 'automation support, simple autonomy, simple algorithms, a little bit of AI sprinkled in.' This has been verified to a great deal in the USAF autonomy experiments. The experiment teams have been able to decrease pilot workload to a degree where they can effectively utilise these capabilities. The USAF calls the development "probably the most exciting part" of the CCA program so far, because it opens up more options for how the Air Force can employ the current generation of drones. Complex behaviours can wait for 'tomorrow', mapped to the technology implementation trajectory of the future.

### THE CCA ADVANTAGE FOR INDIA

The Indian Air Force (IAF) faces a critical challenge with its dwindling fighter squadron strength (currently 30-32 squadrons against a sanctioned of 42). This shortage affects the IAF's operational readiness given threats from China and Pakistan in a two front war scenario. Especially against China, the IAF is the first line of defence and offensive action over the Tibet Autonomous Region (TAR). With the IAF not being able to afford a doctrine that seeks to match the PLA aircraft-for-aircraft, a shortfall in Indian Air Force mission capacity will massively increase the risk for all Indian inter service joint force operations. No other service can bring enough combat air capacity to fill existing gaps. Thus the IAF must develop asymmetric capabilities and operating concepts that prevent PLAAF from achieving its campaign objectives against India using operational mass.

Collaborative Combat Aircraft (CCA) and loyal wingman drones like India's indigenous Hindustan

Aeronautics Limited (HAL) CATS - Warrior, could play a transformative role in mitigating this gap while modernising the force and preserving force levels. "Mass" has long been a crucial theme behind the CCA program and pairing each manned fighter like the Rafale, Tejas MK2, or the 5th Gen AMCA with 2-3 low-cost CCAs will effectively multiply combat capacity without requiring more human pilots or expensive platforms. That provides an answer to China's growing force size, and presents the Chinese with a more complex targeting challenge against larger number of rival aircraft dispersed across the pan Indian region, thus reducing the IAF's attrition in highly contested environments.

CCAs are cheaper to produce and maintain than 4/5th Gen fighters. India's Warrior program aims for a per-unit cost of USD 5 -10 million, compared to USD 60-100 million for a Rafale class platform. At the same time, mass production of modular CCA platforms could offset the IAF's squadron shortages much faster than either procuring foreign jets from outside India or expecting HAL, India's lone aircraft manufacturer, to ramp up production capacity beyond what may be feasible.

The Indian Air Force is aware of this predicament and has supported HAL's CAT - Warrior Unmanned Wingman development since some years now. HAL unveiled the Warrior concept as part of its futuristic Combat Air Teaming System (CATS) in February 2021 and has been steadily developing capabilities to design and scale up the Technology Readiness Level (TRL) of the prototype vehicle. HAL achieved a significant milestone in the programme with the successful completion of the engine ground run of a full-scale demonstrator ahead of Aero India 2025, where the prototype is set to be unveiled.



HAL's CATS - Warrior was unveiled at Aero India 2021



The OMCA Kiran MK2 undertaking flight testing in Bengaluru



**NewSpace Research & Technologies (NRT) CCA concept**

The Warrior will have a MTOW of 1300 kg and a top speed of 850 kmph, a max range of 800 km and an endurance of 80 min. It is currently powered by 2 x PTAE-7 turbojets locally manufactured by HAL. The system envisages the Tejas Light Combat Aircraft (LCA) as the “mothership” controlling a network of autonomous platforms, including the CATS-Warrior, which is a low-observable unmanned combat aerial vehicle (UCAV). Over a period of time, the Warrior will be armed with the NG-CCM and the ASRAAM air to air missiles, the DRDO SAAW anti runway glide bomb, and the NRT ALFA-S swarm drone system.

HAL is carrying out the development of the unmanned flight stack of the Warrior on a surrogate Kiran MK2 technology testbed aircraft. The Optionally Manned Combat Aircraft (CATS-OMCA) is undertaking flights to prove the technologies and thus increase the program TRL. The OMCA in itself will be productised in an unmanned wingman role as it becomes technologically mature.

The Indian Navy recently selected NewSpace Research & Technologies Pvt Ltd (NRT), a start-up company based out of Bengaluru as its choice to develop the Naval Collaborative Combat Air Vehicle (N-CCAV) through the Indian MoD’s Innovation For Defence Excellence (iDEX) Aditi 2.0 challenge route. NRT will be pushing forward its Abhimanyu CCA under the N-CCAV mandate.

The Abhimanyu, which is a jet powered low RCS design, is expected to be a smaller and lighter drone as compared to HAL’s Warrior with a mandate to deliver human machine teaming missions with the Indian Navy’s Mig-29K and other suitable aircraft. Its modular design can be adapted to perform a variety of roles, including surveillance, EW and kinetic attacks. Abhimanyu, which is designed to be cost effective and expendable, can be rapidly produced and deployed in large numbers to augment the existing fighter fleet of both the Indian Navy and the Indian Air Force. These connected platforms can act as sensors, effectors and C2 nodes, enabling agile decision making within an open, scalable, operations oriented architecture, which will allow inclusion of future platforms, technologies and ConOps.

### **CATALYSING AATMANIRBHAR BHARAT**

Although currently a work in progress, the development of the Warrior and Abhimanyu CCAs by Indian companies is a milestone event for the UAV sector in India, with a clear intent to push for integration of CCAs into India’s larger Defence strategy - particularly in scenarios that demand rapid deployment and scalability of airborne uncrewed systems. Here the Services, DRDO and its associated labs, along with HAL and the industry partners need to put in synergised

**The Warrior and the Abhimanyu programs underscore India’s ambition to modernise its air operations with cutting-edge home grown sovereign hardware; while balancing affordability and strategic autonomy as a nation**

## KEY TECHNOLOGIES & CHALLENGES

### Autonomy & AI/ML

- **Decision-Making Algorithms:** Enable CCAs to perform tasks (e.g., target identification, route planning) autonomously.
- **Machine Learning:** Adapts to dynamic combat scenarios and improves performance through experience.
- **Swarm Intelligence:** Distributed and de-centralised AI coordinates swarm behavior for synchronised missions, such as overwhelming defences.

### Communication & Networking

- **Secure Data Links:** Resilient, low-latency networks (e.g., mesh networks) with anti-jamming encryption.
- **Interoperability Standards:** Common protocols for seamless integration with allied systems (e.g., Joint All-Domain Command and Control).

### Sensors & Fusion

- **Multi-Sensor Integration:** Radar, EO/IR, and electronic warfare systems provide comprehensive situational awareness.
- **Sensor Fusion Algorithms:** Aggregate data across platforms to create a unified battlefield picture.

### Weapon Systems & Payloads

- **Modular Payloads:** Interchangeable mission-specific modules (e.g., missiles, EW pods).
- **Human Oversight Protocols:** Ensure ethical weapon deployment with human-in-the-loop authorisation.

### Stealth & Survivability

- **Low Observable Design:** Radar-absorbing materials, reduced thermal signatures.
- **Electronic Warfare:** Jamming and deception capabilities to counter threats.

### Propulsion

- **Adaptive Engines:** High-efficiency turbofans for endurance or high-speed systems for rapid response.
- **Hybrid-Electric Options:** Quieter operation and extended loiter times.

### Manned Unmanned Teaming MUM-T

- **Intuitive Interfaces:** Voice/gesture controls and AI assistants for managing CCA fleets.
- **Trust Calibration:** Algorithms that balance autonomy with pilot oversight.

### Cyber-security

- **Resilient Architectures:** Protection against hacking, spoofing, and data breaches. Future-proofing secure communications.

### Testing & Simulation

- **Digital Twins:** Virtual models to refine AI and swarm tactics.
- **Live-Virtual-Constructive (LVC) Testing:** Validate performance in mixed-reality environments.

### Logistics & Maintenance

- **Predictive Maintenance:** AI monitors system health to pre-empt failures.
- **Scalable Deployment:** Rapid Repair/replacement protocols for large CCA fleets.

### Trust/Ethical/Legal Considerations

- **Accountability Frameworks:** Ensure human responsibility for lethal decisions.
- **Compliance with Laws of War:** Adhere to international norms for autonomous systems.

scale the development of the eco system for this genre of platforms along with development of associated sensors, payloads, subsystems and allied tech in India.

It should be well understood that unmanned wingmen and CCAs are not a replacement for manned fighters, but a strategic force multiplier that can help the IAF offset squadron shortages, modernise cost-effectively, and counter peer adversaries like China. By prioritising indigenous programs like Warrior and Abhimanyu, which foster AI innovation and enhance air combat effectiveness, India can bridge its capability gap and position itself as a leader in autonomous technologies. Hence the Indian MOD needs to assess CCA design and cost trade-offs to define high fidelity requirements, and a persistent appetite to support this initiative. The key lies in balancing urgency with technological pragmatism, supported by a dedicated budget and end user mandate.

The Warrior and the Abhimanyu programs underscore India's ambition to modernise its air operations with cutting-edge home grown sovereign hardware; while balancing affordability and strategic autonomy as a nation.

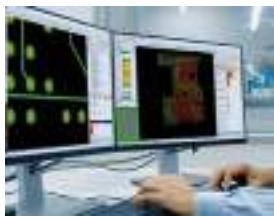
## DEFINING A NEW CHAPTER IN AIR POWER

As the airpowers across the globe gear up to field these unmanned teammates, it's clear that the Collaborative Combat Aircraft is more than just a showpiece on the drawing board. With its fangs bared, CCA represent a fundamental shift in how nations will project power in contested skies. By combining human pilots with AI-enabled agents, the early adopters will be able to project cutting edge technologies in a world where adversaries are quickly catching up.

This next era of air combat is still taking shape. Budgets will evolve, technology will push boundaries, and questions about autonomy, and related trust and ethical usage will spark debates. But one thing is certain: CCAs have the potential to redefine what an air force looks like and how it wins the fight for the command of the skies in the next decade. ■

efforts to develop and test the required combat autonomy and AI implementations, as well propose a modular spiral/ upgradable route towards procurement; much in the way the US ecosystem has supported the CCA development. This will catalyse and consolidate technologies needed to

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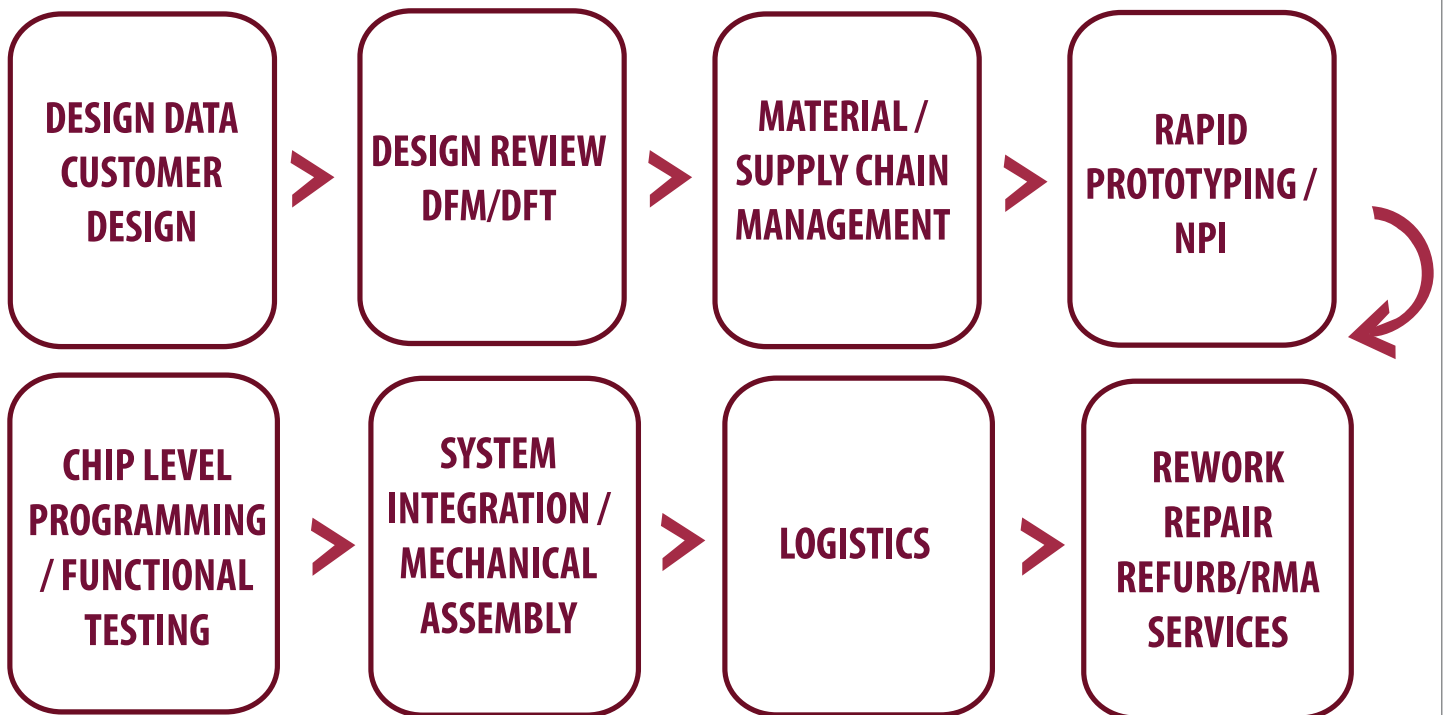
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# THE CHANGING SANDS OF GLOBAL POLITICS

With an expansion of India's diplomatic influence, 2025 is expected to be a stimulating year for India with lots of challenges and high expectations, both at the regional and global level

 **PRANAY K. SHOME**

# T

he year 2024 was one of the most interesting years for the Indian foreign policy establishment. Not only did New Delhi focus on dealing with a turbulent neighborhood but also managed to strengthen the existing partnerships with her allies, apart from that India also managed to enhance her defence preparedness even as she tried to navigate the complex maze of war, social conflict, climate change, disruptive technology etc. In that context it is necessary to highlight the nuanced nature of the expected diplomatic work that India needs to undertake in order to enhance its profile and also stabilise a rather hostile neighbourhood with a distinct anti-India flavour.

## DEALING WITH CHINA

2024 marked a landmark moment when India and China during the BRICS summit in Russia's Kazan region managed to defuse military tensions along their border by agreeing not only to work towards restoring the status quo but also promote the growth of confidence building measures along the border regions in order to ensure peace and tranquility along the nearly three thousand kilometers border.

However, it is necessary to gain an in-depth understanding of Chinese strategic psychology and history in order to identify a definite path for Indian diplomacy to navigate the China challenge.

China as one of the world's

oldest civilisations has its own distinct worldview. Being one of the undisputed world powers in Asia from the 6th- 18th centuries onwards, enabled her to develop the idea of what is known as the Middle Kingdom, a view-in which China is perceived as heaven or the centre of global civilisation. However, a lack of investment in health, arms, education, and infrastructure on one hand and the lack of strategic foresight on the part of the then Chinese rulers to gauge the threat posed by the West caused her to fall behind in the global power race which resulted in the beginning of the 'century of humiliation'. In order to change the narrative, China began, during the time of Deng Xiaoping to rebuild itself.

While the Chinese focused on developing themselves into an economic powerhouse, they eventually began embroiling themselves into conflicts with their neighbours over territories. This



gave rise to what foreign policy experts describe as 'cartographic aggression' - attempts by Beijing to revisionise the lands under dispute of her neighbors by using new and controversial maps.

Today, that cartographic aggression has manifested itself, by China engaging in Wolf warrior diplomacy to bully neighbors such as Vietnam, Philippines, India etc., In that context, even though India has managed to restore calm at the border, New Delhi should not really expect the Chinese side to honour their side of the border agreement.

As per China's previous track records on border disputes, especially concerning Arunachal Pradesh, India should use a carrot and stick approach of diplomacy.

The carrot in this framework must be allowing China access to the vast Indian market across sectors, barring the strategic ones like telecom, defence etc. The stick, therefore, must be to make it clear to the dragon to address the burgeoning trade deficit that is heavily against India. New Delhi must make it clear to China that without giving Indian companies and entities more access to the Chinese market, the foundation of this relationship becomes rather shaky.

Further, military modernisation must continue unabated in order to respond to Beijing's shenanigans along the border areas, focusing especially on infrastructure building.

## THE BANGLADESH CONUNDRUM

While the rest of the neighbourhood is more or less receptive to India's strategic concerns, the real problem however, continues to lie with Bangladesh. Ties with Bangladesh have deteriorated to a point that were hitherto unseen. Not only is our eastern neighbour not only not addressing the concerns regarding the Rights of minorities but is gradually cosyng up to our belligerent western neighbour-Pakistan.

In that context, India must adopt two-pronged approach - use offensive tactics both economically and militarily. While the idea of a humanitarian intervention may seem tempting, the cost in personnel and economic aspects is likely to be pretty high. In that context, deliberate steps must be taken in a surreptitious manner to weaken the economy



of Bangladesh such as by promoting India as the go-to destination for the textile sector. Vegetable diplomacy, especially diverting the supplies of vital commodities like onion, potatoes etc., to other countries in the world. This will stoke inflation in Bangladesh which might be quite difficult for them to bridge, given the relative decline in the economic profile of Bangladesh.

Militarily, India must engage saber rattling via large combat exercises using the three arms of her armed forces along the eastern parts of the country, in order to send a message that India means business and will not tolerate an intransigent attitude when it comes to addressing New Delhi's core security concerns.

## ISRAEL-PALESTINE ISSUE

India's stand in the longest running conflict in the Middle East has evolved over the years, for the first fifty years after Israel's formation, New Delhi looked at the region from the framework of an Islamic lens, focusing on addressing Palestinian state claims by advocating unequivocally a two-state solution with East Jerusalem as its capital. However, since the last three decades, India has taken definitive steps to strengthen ties with Israel, focusing on enhancing ties in every possible sector, most notably in the defence and IT sector.

However, with Israel embroiled in the biggest war since the end of the Second World War after 2023, New Delhi finds herself in an increasingly uncomfortable position, particularly because

**As per China's previous track records on border disputes, especially concerning Arunachal Pradesh, India should use a carrot and stick approach of diplomacy. The carrot in this framework must be allowing China access to the vast Indian market across sectors, barring the strategic ones like telecom, defence etc**



**In 2025, New Delhi in a nuanced manner, must also emphasise to her Islamic neighbours and allies the complexity of the situation in the Middle East. Given the intractable nature of this legacy, the future of a Palestinian state looks increasingly bleak**

Israel's targets in the region such as Islamic Jihad, Hezbollah, Houthi movement etc., are proxies of Iran and India is a key ally to both these countries.

To complicate matters further, the Arab world has united more or less in its condemnation of Israel's military actions. New Delhi, however, cannot afford to play the odd one out game. In that context, India must still advocate a two-state solution in order to assuage Palestinian-cum-Muslim concerns about India's commitment to the Palestinian right of self-determination; further, India should send more humanitarian aid to the Gaza strip in order to help stabilise the heart wrenching living conditions of ordinary Gazans.

In 2025, New Delhi in a nuanced manner, must also emphasise to her Islamic neighbours and allies the complexity of the situation in the Middle East. Given the intractable nature of this legacy, the future of a Palestinian state looks increasingly bleak. In that context, while they must demand accountability from Israel, New Delhi should also push the idea to prioritise their national interest which lies in normalising ties with Israel as soon as possible. In that context, instead of USA, India can become the architect of Abraham Accords 2.0.

## STRENGTHENING DEFENCE

2025 must be a year of defence diplomacy. With New Delhi strengthening her military arsenal, she must focus strongly on becoming the next big player in the arena of the military-industrial complex. This year promises to be an important one from the point of view of addressing India's strategic concerns such

as the increasing shortage of advanced fighter jets, lack of properly integrating AI into the operational matrix of the armed forces etc., In that vein, India must enhance the production of vital defence equipment by focusing on both Aatmanirbharta and the technology transfer from her allied countries in order to mass produce cutting edge equipment in India. Further, India must make an outreach to her allies about the competitiveness of her indigenous defence products as an item for export. The success of the BrahMos deal with Philippines is a case in point.

## TRUMP'S AMERICA

With the inauguration of Donald Trump's second presidency on 20 January of this year, it is imperative that India learn to adapt to the disruptions, which his presidency is clearly expected to bring to the world of commerce, diplomacy, and technology. Trumpism's objective is on the transactionalism with a focus on making 'deals' in the form of a public spectacle. In that context, India must pitch herself as a deal maker of sorts, emphasising on enhancing her cooperation with the US in key areas such as semiconductors, AI and technology.

In toto, 2025 is expected to be a year of hard bargaining and landmark deals, New Delhi must be ready for unexpected changes and surprises which shall demand some unconventional thinking to deal with crises as they emerge.

*- The writer is currently working as a Research Associate at Defence Research and Studies (dras.in) and is a columnist. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*

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**AERO INDIA 2025 SPECIAL COVERAGE**

# AERO INDIA 2025: TIME TO DELIBERATE

The 15th edition of Aero India 2025 provides an opportunity to country's defence planners and strategists on how to leverage the opportunities offered by the show to India's advantage, both in terms of buying new hardware and evolving as an essential part of the global aircraft manufacturing ecosystem

 **ASAD MIRZA**

**T**he 15th edition of Asia's biggest aero show aimed at forging new partnerships and explore avenues to fast-track indigenisation process, Aero India 2025 - will be held at the Air Force Station, Yelahanka in Bengaluru, Karnataka from February 10 to 14, 2025. With the broader theme *The Runway to a Billion Opportunities*, the event will provide a platform for forging partnerships between foreign and Indian firms and identifying newer avenues in the global value chain to accelerate the indigenisation process of Indian aero-defence companies.

The highlights of the Aero India will be the Defence Ministers' Conclave, CEOs' Round-Table, *Manthan* start-up event, breath-taking air shows and a display of indigenous manufacturing capabilities.

However, the past achievements of the event also compel one to act as the devil's advocate and ask country's defence planners and strategists that what holds them back to shape-up Aero India as a *numero*

*uno* regional air show, or at least endeavour to be in the top five global air shows.

Concurrently, they should also ponder over how to leverage the huge pool of India's skilled and technologically savvy workforce to become a part of the global aircraft manufacturing ecosystem.

Evolving as a future partner of the global aircraft manufacturing system will not only boost the country's aero-defence manufacturing industry, but also provide access to the Indian Air Force (IAF) to the best available air machines, in addition to helping it to fulfil its numerical shortfall. Further, becoming a part of the global aircraft manufacturing system will generate ample job opportunities for the large pool of skilled manpower in the country.

On how to become a part of the global aircraft manufacturing ecosystem, India can take lessons from three global cases, where different nations have pooled together their technical prowess and economic resources to develop new global aircrafts, by shortening the plan to delivery time gap and pitching-in with their area of expertise.





### GLOBAL COMBAT AIR PROGRAMME (GCAP)

The first example is that of the Global Combat Air Programme (GCAP), which is a multinational initiative, led by the United Kingdom with Japan and Italy to jointly develop a 6th generation stealth fighter. The programme aims to replace the Eurofighter Typhoon in service with the Royal Air Force (RAF) and Italian Air Force, and the Mitsubishi F-2 in service with the Japan Air Self-Defence Force.

The strategically important multilateral partnership of GCAP, brings together the governments of the UK, Italy and Japan, and their respective industries, led by BAE Systems (UK), Leonardo (Italy) and Mitsubishi Heavy Industries (Japan) to collaborate on shared military and industrial objectives in the delivery of a next generation combat air capability.

The combat aircraft, called Tempest in the UK earlier, is set to be in service by 2035 and will be one of the world's most advanced, interoperable, and adaptable fighter jets in service.

This unique partnership not only drives innovation and technological advancement but also promotes significant economic growth in each nation, securing the future of their respective combat air industries for decades.

Reportedly, the Swedes, the Germans and the Saudis may also join this multilateral programme, soon.

### FUTURE COMBAT AIR SYSTEM (FCAS)

Secondly, Germany, France, and Spain are mutually developing the European weapon

system of the future, the Future Combat Air System (FCAS).

The FCAS project itself has now reached the demonstration phase. Germany and France began planning a combat aircraft in 2017. In 2019, Spain joined the project and the defence ministries of three nations signed a framework agreement on the mutual development of the FCAS. In June 2023, Belgium became an Observer to the FCAS programme, and is set to join the programme by June 2025

### EURODRONE PROGRAMME

Third, comes the example of Eurodrone, which is a 4-nation development programme comprising Germany, France, Italy, and Spain, led by the Organisation for Joint Armament Cooperation (OCCAR). Airbus Defence and Space (GER) is the industrial prime contractor for the project, together with Leonardo (ITA), Dassault Aviation (FRA) and Airbus Defence and Space (SPA) acting as major subcontractors. Germany is the lead nation for the programme.

Moreover, OCCAR has accepted India's application as an Observer for the Eurodrone programme. This will provide New Delhi with an opportunity to closely monitor the four-nation drone project. It would keep India better informed for future procurement of the platform or allow it to incorporate the lessons into its own domestic projects. As an Observer, India could gain access to briefings on the drone's technical specifications and operational capabilities.

**The past achievements of Aero India, compel one to act as the devil's advocate and ask country's defence planners and strategists that what holds them back to shape-up Aero India as the leading regional air show, or at least endeavour to be in the top five global air shows**



**India can also initiate a novel joint manufacturing project for its AMCA programme on its own with like-minded countries like Taiwan, Saudi Arabia and UAE to achieve its Aatmanirbharta targets and develop a machine which could be touted as an example of indigenous and self-reliant pursuit**

### INDIA'S TECH PROWESS AND GROWING CONFIDENCE

Indian Navy's MiG-29K is set to make its debut at Aero India. The backbone of the Indian Naval Air Arm, will be on static display at Aero India 2025. The aircraft has been upgraded with new mission computer developed by HAL and cutting-edge armament with ASTRA missiles and enhanced avionics suite in the recent years. It was inducted in the Indian Navy in 2010 and has proved to be the backbone of Indian Navy's air arm, till date.

Also, India's advanced indigenous Intermediate Jet Trainer - IJT (HJT 36) also known as Sitara is to be exhibited at Aero India and will also be a part of the aerial display at the aero show. This programme is a testament to HAL's commitment to developing indigenous defence technologies and overcome technical challenges. Its anticipated full-scale production by 2028 will be a significant milestone for India's *Aatmanirbharta* in aero-defence manufacturing and will provide the IAF with a much-needed modern trainer aircraft.

The above two examples demonstrate the tenacity of the Indian engineers and technicians to maintain aircrafts which have ceased production in their host country, yet they continue to operate by the Indian defence forces. IJT is an example of perseverance by Indian engineers developing their expertise in developing the IJT, albeit with delays. Such technical prowess and experience can be used in any future aircraft manufacturing process also.

### THE WAY AHEAD

The above examples show clearly that multilateral cooperation is the way ahead for the future, when nations aspire to gain a tactical and technological upper hand over their adversaries but either a lack of technical prowess or financial strength prohibits them from doing so alone.

India can learn valuable lessons from the Eurodrone programme and our defence honchos can leverage this to get India inducted into any foreseeable multilateral aircraft manufacturing programme or also try to get involved in the current programmes like the GCAP and FCAS. This may not only help them to fulfil the IAF's requirements but also generate jobs for the huge skilled manpower

pool available in India.

As regards to what India would bring to the table, a point raised by Japan for including Saudi Arabia in the GCAP programme, then India could counter it by offering the vast technologically sound and skilled workforce for the programme, besides the lower cost of manufacturing through its already booming aero manufacturing sector.

Additionally, India can also initiate a novel joint manufacturing project for its AMCA programme with like-minded countries like Taiwan - sensitive considering geostrategic implications but a worthwhile option, besides the UAE and Saudi Arabia - both of which want to be part of an international platform to develop viable options particularly in the aerial domain, to achieve its *Aatmanirbharta* targets and develop a machine which could be touted as an example of indigenous and self-reliant pursuit.

Adopting such an innovative approach will surely help the defence ministry to achieve its armaments export targets by 2029 and also helping in achieve the complete *Aatmanirbharta* and *Viksit Bharat* initiatives by 2047.

Being ambitious is not the only goal, to achieve that goal one is also required to think out of the box and apply some innovative measures to achieve success and fly proudly. ■

*-The writer is a political commentator and media consultant, based in New Delhi. He can be contacted on [www.asadmirza.in](http://www.asadmirza.in). The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*



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AWEIL's diverse product portfolio is backed by State-of-the-Art manufacturing units spread across the country, equipped with facilities for the high-quality, cost-effective manufacturing of Small, Medium, and Large Caliber Weapon Systems. Leveraging its extensive expertise and capabilities, AWEIL is engaged in development of new weapons as per the needs of the Indian Armed Forces, Defence Public Sector Undertakings (DPSUs), Civilian Markets, and International customers.

AWEIL is dedicated for development of Advanced Weapon Systems and has plans to increase its R&D expenditure to about 3%- 5% of its total revenue in next 2-3 years.

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AWEIL is at the forefront of developing cutting-edge weapon systems that will revolutionize India's Defence Landscape. AWEIL plans to introduce several innovative products, with the following key developments:-

**155mm 52 Cal Mounted Gun System (MGS):** MGS is a next-generation Artillery Gun System mounted on a 6x6 vehicle, designed to operate in diverse terrains, including deserts and high-altitude areas. It has features including rapid deployment, high maneuverability, automated ammunition handling, Shoot & Scoot Capability, precise orientation and fixation by GPS aided INS, making it essential tool for modern Artillery operations. With a firing rate of 3 rounds in 30 seconds in Burst mode & 12



155x52mm Towed Gun System (TGS)



5.56x45mm CQB Carbine

rounds in 3 minutes in intense mode and a range of more than 38 km, the MGS will be a game-changer for India's Artillery Forces.

**155mm 52 Cal Towed Gun System (TGS):** Designed for excellent maneuverability and long-range fire, the 155mm Towed Gun is a robust all-terrain Weapon System. The gun features advanced targeting systems, auto-laying and fire control computers, and shoot-and-scoot capabilities, ensuring operational flexibility in various combat situations. TGS is compatible with all NATO 155 Ammunition systems.

**105mm Mounted Gun System:** 105mm MGS is mounted on a Truck. It includes electric drives for remote laying, a ballistic computer for accurate targeting, and an impressive range of features designed for enhanced operational efficiency. The 105mm Mounted Gun System combines mobility with firepower, making it a critical asset for rapid-response operations.

**5.56x45mm CQB Carbine:** Developed in collaboration with ARDE, the 5.56x45mm Close Quarter Battle (CQB) Carbine is designed for close-quarter battle scenario. Compact, lightweight, and highly maneuverable, this carbine is perfect for counter-insurgency operations and personnel Defence in confined spaces. Its ease of maintenance and versatility makes it a reliable weapon for modern infantry forces.

AWEIL is expanding its footprint beyond India, with a growing customer base across Asia, Africa, North America, and Europe. The company is also actively forging alliances with OEMs and leading Defence Industry players to integrate next-generation technologies. This aligns with India's ambitious 'Make in India' initiative, which aims to position India as a global leader in defence manufacturing.



### AWEIL's Vision:

**To strengthen India's defence capabilities under 'Aatmanirbhar Bharat' and ensure a larger global presence for ourselves as well as our Nation**

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From the Arctic to deserts and turbulent oceans, across the globe Schiebel's unmatched CAMCOPTER® S-100 has proven its capability with repeat orders and inclusion in European project for unmanned anti-submarine and seabed warfare solutions



**R**

etaining its leadership position, Vienna-based Schiebel Group has kick-started the year 2025 impressively. The Group was awarded another multi-year service contract for the CAMCOPTER® S-100 Unmanned Air System (UAS) with the European Maritime Safety Agency (EMSA). The contract is for service provision with Remotely

Piloted Aircraft Services (RPAS) for supporting EU member states in emission monitoring and maritime surveillance operations.

In addition, Schiebel, as part of the SEACURE consortium led by Thales, has been awarded a grant agreement under the European Defence Fund's call for unmanned anti-submarine and seabed warfare solutions. The SEACURE (Seabed and anti-submarine warfare capability through unmanned feature for Europe) consortium consists of 35 companies from 13 European countries and aims to progress joint Anti-Submarine Warfare (ASW) and Seabed Warfare (SBW) with unmanned air, surface and underwater systems protecting critical maritime infrastructure. The focus is on detection, classification, identification and tracking of underwater threats in demanding conditions. Schiebel's latest product, the CAMCOPTER® S-300, will serve as the dedicated Unmanned Air System (UAS) for this project. With a maximum take-off weight of 700 kg, the S-300 offers an impressive endurance in excess of 24 hours with a camera and Inverse Synthetic Aperture Radar (ISAR) or typically 6 hours with a 250 kg payload. It is the first operational VTOL in its class to achieve these capabilities. The SEACURE project is scheduled



to culminate in a large-scale sea trial by 2028.

Schiebel Group's revolutionary CAMCOPTER® S-100 Unmanned Air System (UAS) has built an international reputation. Schiebel Group's first CAMCOPTER® S-100 was supplied to the UAE Armed Forces in 2006 and within three years Schiebel sold its 100th aircraft. During its ongoing production since then and in line with the company's philosophy of permanent performance enhancement, the CAMCOPTER® S-100 UAS has undergone continuous improvement to meet the ever-growing demand for new capabilities from its worldwide customers.

Backed by Schiebel's customers and industrial partners, the CAMCOPTER® S-100 now stands out as the unchallenged market leader in its class. After missions on five continents and oceans and in every environment, from the tropics to the Arctic, the CAMCOPTER® S-100 has undeniably proved to be the most mature system of its kind in the world today.

Schiebel India is paving the way for advanced defence solutions with the flagship CAMCOPTER® S-100 Unmanned Aerial System and upcoming innovations like the CAMCOPTER® S-300. Reflecting on the company's resilient journey in the Indian defence market from initial demonstrations in 2007 to overcoming challenges posed by dynamic geopolitical landscapes, Schiebel India CEO Jajati Mohanty sounded optimistic on the business prospects in the competitive Indian defence market.

"Having opened our operations in India, we look forward to providing solutions for various military and civilian market requirements here. We are currently



**"We execute capabilities when others are just thinking about them, for example, the manned-unmanned teaming of a rotary UAS from an Airbus helicopter was demonstrated to the world years ago. Therefore, Schiebel will always improve its capabilities and introduce new versions and capabilities to provide multiple options to new and existing customers in India and around the world."**

JAJATI MOHANTY, CEO, SCHIEBEL INDIA

working with the Indian Navy to use our S-100 Unmanned Aerial System (UAS) in a tactical role in the Indian Ocean Region (IOR) and anticipate an increase in numbers as the Navy experiences the capability of our mature solution and steadily creates new concepts of operations based on this quantum jump in technology for use at high seas," stated Jajati Mohanty.

He added that CAMCOPTER® S-100 is a platform capable of handling Intelligence, Surveillance, and Reconnaissance (ISR), mine detection, manned-unmanned teaming, unmanned-unmanned teaming, anti-submarine warfare (ASW) operations, and operational logistics, to name a few. The Navy itself is studying the capability further to enhance its options with the help of the S-100 platform by providing necessary inputs.

"The CAMCOPTER® S-100 has provided the Indian Navy with a fantastic platform for undertaking a plethora of activities that previously required

# AERO INDIA SPECIAL



**The CAMCOPTER® S-100 now stands out as the unchallenged market leader in its class. After missions on five continents and oceans and in every environment, from the tropics to the Arctic, the CAMCOPTER® S-100 has undeniably proved to be the most mature system of its kind in the world today**

a manned helicopter and obviously came with limitations and regulations. With the CAMCOPTER® S-100, the Navy has found its reach and enhanced its multi-role, multi-domain capability by leaps and bounds. The smoothness and zeal with which the Indian Navy has adopted the CAMCOPTER® S-100 into their concept of operations onboard frontline warships have been an eye-opener,” noted Mohanty.

According to Schiebel India CEO, Jajati Mohanty, the platform CAMCOPTER® S-100 has been found to be very versatile at sea, and our customers have commenced its exploitation in earnest to further optimise its usage. “Schiebel has been the market leader for the last two decades, and the reason for this is our capability and our thought process to innovate and stay ahead of the global curve.”

With several world firsts to its credit, Schiebel’s CAMCOPTER® S-100 excelled during its security support of both the G20 Summit in Seoul, South Korea, and the Winter Olympics and Paralympics in Sochi, Russia. More recently, the CAMCOPTER® S-100 was also the first UAS to be operated in the Canadian Arctic. In addition, Schiebel assisted the OSCE Special Monitoring Mission to Ukraine and the NGO Migrant Offshore Aid Station (MOAS), whose operations have saved the lives of thousands of migrants in the Mediterranean Sea.

Elaborating further, Mohanty remarked, “We execute capabilities when others are just thinking about them, for example, the manned-unmanned teaming of a rotary UAS from an Airbus helicopter

was demonstrated to the world years ago. Therefore, Schiebel will always improve its capabilities and introduce new versions and capabilities to provide multiple options to new and existing customers in India and around the world.”

In October 2024, Schiebel participated in the large-scale NATO supported exercise REPMUS 2024 (Robotic Experimentation and Prototyping using Maritime Uncrewed Systems) hosted by the Portuguese Navy. Sponsored by the UK Royal Navy and in partnership with Thales, the CAMCOPTER® S-100 flew multiple missions over the three weeks of the exercise and impressed with its Intelligence, Surveillance and Reconnaissance (ISR) capabilities as well as its Anti-Submarine Warfare (ASW), Mine Counter Measures (MCM) and Rapid Environmental Assessment (REA) solutions.

“The CAMCOPTER® S-300 provides capabilities to the user that currently do not exist in the global defence market, and we expect to disrupt the market for rotary unmanned aerial systems. In addition to offering the same capability to the Indian military in terms of payload capability and enhanced endurance, the CAMCOPTER® S-300 would position itself as the only rotary unmanned system capable of handling high-altitude operations, both in terms of ISR and operational logistics. This would clearly be a game-changer for high-altitude operations, which need systems like these to drastically reduce dependence on manned aviation and slow-moving logistics,” said Jajati Mohanty.

Mohanty informed that Schiebel India will soon complete all activities towards a functional Maintenance, Repair, and Overhaul (MRO) facility for the CAMCOPTER® S-100 in India for domestic customers, both military and civilian. “Schiebel India is set to establish a regional hub for MRO activities and cater to Asian and African markets, taking into account the government’s mandate and a suitable environment being provided to the Make in India initiative and exports,” he added.

Known for producing quality defence and humanitarian products, which are backed by exceptional after-sales service and support, Schiebel’s new composite division has started to supply high-tech customers with products of supreme carbon fibre technology - all quality-controlled to meet ISO 9001 standards.

With this impressive pedigree Schiebel looks forward to meeting future customer needs for further increased capability and payload and to continue, supported by its partners, to deliver the most flexible, operationally effective unmanned helicopter systems in the world. ■



# Pioneering Aerospace and Defense Excellence with Indigenous Mil Grade Solutions from Sunlux

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# THE FUTURE OF AIR POWER

As the argument for adopting a 6th-generation strategy gets stronger, leapfrogging strategy is the only option for India to close the gap with China. A more reliable and optimal strategy would be to join one of the European consortiums and leverage the consortium better in terms of technology access, development work, and indigenous manufacture. The AMCA programme could be modified to be integrated into the 6th generation strategy. India must make the right strategic decision

## AIR MARSHAL M MATHESWARAN



The 15th Aero India gets underway at Bengaluru, India from February 10-14, 2025 with exhibitors from 15+ countries displaying their products including significant aerial displays of advanced 5th generation platforms such as Lockheed Martin's F-35 from the USA and Sukhoi's Su-57 from Russia. This would mark the first display of Russia's 5th generation Sukhoi fighter Su-57. India's own Tejas Mk1 light combat aircraft will be on aerial display as it had done in the past few airshows, though the Tejas Mk 1A is the one keenly expected. HAL and ADA would go on to display the mock-ups of further derivatives; Tejas Mk 2 for the IAF, TEDBF for the Indian Navy, and India's 5th generation fighter AMCA (Advanced Medium Combat Aircraft); all slated to materialise in the next decade. There would be considerable interest in Drones, UAVs, communication systems, sensors, and weapon systems from the perspective of businesses, joint ventures, and collaborations. While cutting edge technologies will be displayed and debated, it is time to recognise the rapidly evolving developments in the aerospace domain that have enormous potential to transform the nature of air combat and warfare.

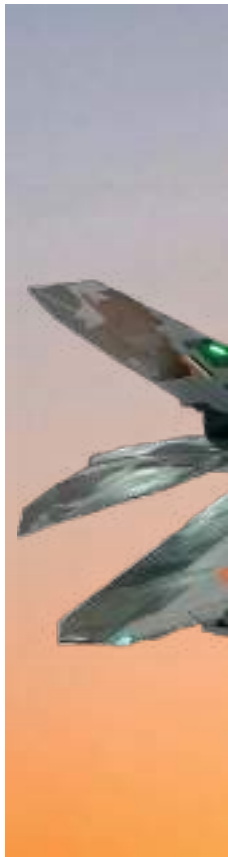
### IMPACT OF CHINA'S AEROSPACE DEVELOPMENTS

Two milestone events in China during the last month and a half, have had 'Black Swan' impact on the world, the West in particular. The first event was in the last week of December 2024, when China quietly flew

two prototypes of 6th generation fighter and fighter-bomber aircraft. The news, spread through social media, took the world by surprise. The second event was even more earth-shaking, when in the middle of January 2025, a Chinese private company released its Open-Source AI tool, Deepseek. Not only was it developed rapidly and cost a fraction of the costs of AI tools of Silicon Valley, but its performance was also rated far better than those of the Western majors. The arrival of Deepseek in the market led to a slaughter of Silicon Valley companies in the stock market, with \$ 500 billion of market value of NVIDIA shaved off in a single day. Both events have highlighted the significance of China's innovation and rapid progress in hi-tech domains.

China demonstrated its second 5th generation fighter aircraft, J-35A at the Zuhai air show last year. This is the second 5th generation aircraft after J-20 (there are reportedly 250 J-20s in operational service), the only country other than the USA to have two 5th generation fighters. In December 2024, it was reported that China will supply 40 x J-35A aircraft to Pakistan within the next two years. This is a concern for India, as our own AMCA is yet to complete the prototype. If all things are on track, the AMCA will enter service not earlier than 2035. 5th generation fighter aircraft are characterised by stealth design, high-thrust engine, high performance and super-cruise capabilities, long-range and endurance, advanced radar and EW systems, integrated sensor and communication system, Datalink, and significant weapons package including in internal bay. China's demonstration of rapid advancements in its aerospace capability is bound to accelerate the developments in America and Europe.

India's current modern fighters are of 4.5 and 4th generation and include Rafale, Su-30 MKI, Tejas, and upgraded Mirage 2000. Given the significant shortfall in IAF's squadron strength, the focus is on the accelerated manufacture and deliveries of Tejas Mk 1As, and Mk 2s. This, however, is a challenge due to supply chain issues hampering the production of these aircraft. IAF's proposed RFP for 114 MRFAs will be of considerable interest during the Aero India, particularly from American, Russian, and French OEMs.





## WARS, NEW TECHNOLOGIES AND THE JUMP-START OF THE 6TH GENERATION AIRCRAFT

Much of the war-fighting concepts since the 1990s have been influenced by the 1991 Gulf War. Airpower dominance, precision weapons, sensors and EW, and that wars will be short and swift have characterised much of the debates, war plans and doctrines in the last three decades. Despite the awareness that all these wars were fought by the US and its allies, with preponderance of fire power, against extremely weak and small countries and militaries, the belief in short and swift wars prevailed. The wars in Ukraine and Gaza have exposed the hollowness of this doctrine and brought into focus the reality of long, grinding, and attritional warfare even in an environment of advanced technologies. Ukraine has demonstrated that a weaker country can hold at bay for years, a stronger adversary if it has access to space-based communications, ISR, and weapons. Traditional concepts of air defence have been demolished with the use of drones and mobile air defence weapons, aided by accurate space-based information in an asymmetric strategy. On the other hand, Russia's hypersonic missiles and stand-off weapons have demolished the strongest of air

defences. Similarly, Ukraine has proved to be the death knell for helicopters in the battlefield, while artillery and unmanned aerial vehicles continue to be the major offensive weapons. Use of AI for targeting and autonomous drones are game changers in both Ukraine and in Gaza.

Use of AI in targeting and decision making has been significant if not enormous. Both wars have indicated the rapidity with which AI-enabled automation will influence all aspects of warfighting. These raise a few important questions:

- What is the future of airpower in terms of platforms, systems, and weapons?
- What should be India's airpower development strategy in terms of building its self-reliance and advanced technology capabilities?
- Is the 5th generation fighter concept already giving way to the 6th generation systems concept?

Answers to the above questions can be deduced if we carefully analyse the recent developments and the trajectory of technology.

**Technology Factors:** Rapid developments in drone technologies and those related to communications, datalink, and network centric capabilities are changing the character of war, including in terms of costs and numbers. Drones are enabling a low-

**India's current modern fighters are of 4.5 and 4th generation and include Rafale, Su-30 MKI, Tejas, and upgraded Mirage 2000. Given the significant shortfall in IAF's squadron strength, the focus is on the accelerated manufacture and deliveries of Tejas Mk 1As, and Mk 2s**

# STRAIGHT DRIVE

cost option that is effective, accurate, and in huge numbers.

**AI and Robotics:** Digital technologies, AI and robotics are having a transformational impact through autonomous systems. Increasing use of AI in targeting and decision-making has paved the way for rapid developments towards cognitive AI.

**Advanced Materials, Stealth, and Integration:** Digital engineering for design, additive manufacturing, advanced materials etc are shortening the development timeframes. Platform designs use advanced tailless designs using composites and advanced materials for stealth.

**Sensors, Weapons, and NCW:** 6th generation concepts involve the integrated suite of communications, sensors, EW, and Network Centric Warfare capabilities. NCW format integrates drones and manned platforms to develop a force system in a 'System of Systems' concept. Weapons include hypersonic and energy weapons.

**Return to Classical Principles of War:** The 1991 war exemplified the effectiveness of precision, ISR, and later, datalink driven NCW. The influence of these

factors was to modify the principle of concentration of force in terms of precision and effectiveness at the cost of numbers and mass. The current ongoing wars, and technology developments like the drones, have brought back the importance of mass and numbers. Hence, force structures will need to be revisited in the context of the importance of high numbers and mass.

**Short span of the 5th Generation Fighter:** Currently the US and China operate two 5th generation fighters each (F-22 and F-35 of USA, and J-20 and J-35 of China), while Russia operates its lone 5th generation fighter, Su-57. The other countries who have 5th generation fighter programmes in various stages of development are India, Turkey, South Korea, Japan, and Taiwan. These would take anywhere between 5 years to 15 years to materialise to the stage of series production. However, given the rapid technology developments discussed earlier, the advanced countries are already into their 6th generation fighter programs. Unlike previous generations, the tenure of the 5th generation aircraft, as it becomes evident, is becoming a short one of less



than two decades. It is instructive to examine these developments particularly for India whose AMCA is still to get off the prototype stage.

## 6TH GENERATION FIGHTER PROGRAMS – DRIVERS AND STRATEGIES

USAF's F-22 is the longest serving 5th generation fighter aircraft, in operation since 2005, while China's J-20 entered service in 2017, and Russia's Su-57 in 2020. USAF's Air Superiority AS 2030 concept evolved as NGAD (New Generation Air Dominance) or the 6th generation fighter program in 2018.

In September 2020, the US announced that the industry designed, built, and flown a full-scale demonstrator of its NGAD in a little more than a year since the start of the program. This was an incredible achievement. To design, develop, build and fly an aircraft in such a short timeframe is impossible with conventional design methods. This was possible through digital engineering, using high computational power and simulations resulting in considerable reduction in time and cost. Digital engineering is thus the most important driver for 6th generation fighter development.

The US set the 6th generation fighter concept as a "System of Systems" approach characterised by low-observable design, super cruise, adaptive engine, a native level of compatibility with Directed Energy Weapons (DEW) such as high energy lasers (HEL), high-powered microwave (HPM) weapons, or the use of AI and capacity to lead or manage manned-unmanned teaming (MUM-T) formations involving drones.

China's equally rapid development and the test flight of its two 6th generation fighter prototypes in December 2024 is interesting. The first one is Chengdu Aircraft Corporation's CAC J-36, leveraging a tailless diamond-wing fuselage and is powered by two engines under the fuselage and a third engine in the spine. This is a large platform, possibly conceived for long-range, high-payload, and super cruise capabilities. It is designed for low-observability and improved stealth, use of AI, omnidirectional sensors, accelerating processing power of sensors, and iterating very rapidly

using open mission systems. The three-engine configuration may also be intended to generate significant electrical power, a key need for supporting its advanced avionics, different sensors, high-output EW system, and potentially DEWs, such as HELs (High Energy Lasers) and/or HPMs (High Pulse Microwave). The second aircraft is Shanghai Aircraft Corporation's SAC J-50/J-XX is a smaller tailless "Lambda-wing" platform with equally similar capabilities.

Russia has also embarked on its 6th generation fighter program, called PAK-DP/MiG-41 by the Mikoyan Design Bureau. The aircraft reportedly will incorporate 6th generation features including stealth. The aircraft is designed to have a max speed of M 4.3 (about 5270 kmph or 3270 mph), cruise at M 3.0 and fly at near space (between altitudes of 45000 metres and 12000 metres). Planned weapons include antimissile laser to intercept hypersonic missiles. It is also planned to carry anti-satellite missiles. The first flight is planned in this year mid-2025.

## EUROPE'S LEAPFROGGING STRATEGY

It is interesting to observe that Europe has not ventured into a 5th generation fighter aircraft program. Europe's current aircraft: France's Rafale, Eurofighter of the four-nation consortium, and Sweden's Gripen, are all in the 4.5 generation category. Considering the rapidly evolving technologies, European powers are leapfrogging to the 6th generation platform. There are two programs driven by two consortiums.

**France-led Consortium:** France, Germany, and Spain are collaborating on the development of a new fighter jet project known as the Future Combat Air System (FCAS), which they consider Europe's most important tool to preserve its sovereignty and security amid "fast growing threats." The technology demonstrator is to fly in 2027 and is planned to enter operational service in 2040. The Next Generation Weapon System (NGWS) is the innovative core of the FCAS. The FCAS will be composed of the new generation fighter jet (NGF), remote carriers, unmanned aerial platforms, and a communication network called "combat cloud" designed to achieve information dominance. In the NGF concept, the new generation fighter will be accompanied by remotely piloted aircraft, or wingman drones, called 'Remote Carriers' that will connect to each other digitally using a combat "cloud". Interoperability is very critical and AI will be aboard the platforms. The design of the FCAS rests on seven pillars: "aircraft, engine, remote carriers, combat cloud, simulation, sensors, and stealth."

**UK-led Consortium:** Similarly, UK, Italy, and

**It is interesting to observe that Europe has not ventured into a 5th generation fighter aircraft program. Europe's current aircraft: France's Rafale, Eurofighter of the four-nation consortium, and Sweden's Gripen, are all in the 4.5 generation category. Considering the rapidly evolving technologies, European powers are leapfrogging to the 6th generation platform**



# STRAIGHT DRIVE

**India's position now is one of considerably difficult choices with respect to developing its aerospace capabilities. The most critical issue is the dwindling squadron strength of the IAF, which needs to be addressed on a war-footing**

Japan are collaborating since 2022 to develop a next generation fighter aircraft under a new Global Combat Air Programme (GCAP). The future aircraft's integrated sensing, non-kinetic effects and integrated communications (ISANKE & ICS) will be at the heart of the system's capability. The aircraft is called 'Tempest' and is being developed as a "System of Systems" networked with various assets (including loyal wingman drones). While the jet is planned to be manned, it will also be powered by advanced AI-driven software. Using AI and Machine Learning, the system exploits information from the aircraft to maximise the effect that the weapons can deliver.

Effectively, these aircraft are also flying super computers. More than manoeuvring and speed, what is important is computing power, sensor fusion, and power generation. Tempest will feature integrated sensing that will provide advanced highly integrated sensors and communications systems that will work seamlessly together to provide vital information to the pilot. The new 'System of Systems' will operate across five domains – air, land, sea, space, and cyber – and will have the next-generation fighter as its "core platform" connected to other crewed and uncrewed peripheral systems. Tempest is also being developed with option of being unmanned platform as well.

These sixth-generation fighters are being armed with internal lasers, a game changing technology that is valuable in layered defence. The fighter can engage with a range of non-kinetic effects such as EW and DEW. As a result, power generation is critical to lasers and the aircraft's many other systems. The Tempest will use two advanced, adaptive engines with

increased electrical power generation capability coupled with intelligent power management system that will meet the growing demand for air vehicle electrical power. Tempest's radar and sensors will gather 10000X more data than today, and this will require equally powerful computers to process the data. The fighter jet will be characterised by artificial intelligence, supercomputing, combat cloud architecture, cyber-resilient and adaptive ultra-fast datalinks, for high-volume data transmission.

Tempest's first flight is planned for 2027 and is scheduled to enter service by 2035. It is prioritised for large combat range and payload missions. Sixth-generation fighters are more about computing, data-processing and NCW capabilities, and less about flight performance.

## INDIA'S STRATEGIC OPTIONS

India's position now is one of considerably difficult choices with respect to developing its aerospace capabilities. The most critical issue is the dwindling squadron strength of the IAF, which needs to be addressed on a war-footing. The blunder of scrapping the MMRCA project more than a decade ago has had a detrimental effect on India's aerospace industry. The IAF, now down to 30 fighter squadrons as against its authorised requirement of 45 squadrons, continues to face challenges to its rebuilding and modernisation strategies. IAF's force structure rebuilding now depends on the faster acquisition of the 180 x Tejas Mk 1As (83+97), possibly 200+ Tejas Mk 2s, and the impending procurement of 114 MRFA (Multi Role Fighter Aircraft) through a combination of direct acquisition and local manufacture under license. The MRFA (RFP issue is likely by mid 2025) is the most important target for foreign OEMs in the Aero India 2025.

As the CAS mentioned more than once in the last few months, the urgency for accelerating the production of Tejas variants is





extremely important. Despite the best efforts, these aircraft, including the MRFA will take the better part of next decade to materialise. India must devote all efforts to get the supply chain and development issues under control and accelerate the production of Tejas Mk 1As, Mk 2s, and the TEDBF through a combination of public private partnership strategies. The decision on MRFA needs to be urgent so that the industrial process becomes faster. Setting in place a competitive environment in India's aerospace manufacturing is now a vital requirement.

### 5TH GENERATION OR 6TH GENERATION?

AMCA is India's 5th generation fighter aircraft project. By the end of 2030s the IAF and the IN will be operating largely 4.5 generation aircraft that include Tejas variants, Su-30 MKI and Rafale aircraft. If all plans go well, the AMCA may enter series production by 2035 at the earliest. This is the timeframe when the environment around India and world will begin to see the domination by 6th generation fighter systems. With AMCA, India will be a generation behind. Since AMCA is still in the prototype development stage, India needs to make a choice. Europe provides the model to emulate, which is to leapfrog to the 6th generation fighter program.

The argument for adopting a 6th-generation strategy gets stronger, when we realise that much

**With AMCA, India will be a generation behind. Since AMCA is still in the prototype development stage, India needs to make a choice. Europe provides the model to emulate, which is to leapfrog to the 6th generation fighter program**

of the Tejas variants, Rafale, and Su-30 MKI can be upgraded with 5th generation capabilities in due course. Leapfrogging strategy is the only option for India to close the gap with China. Going alone may become prohibitively expensive and take much longer due to technological challenges. A more reliable and optimal strategy would be to join one of the European consortiums just as Japan has done. The number of aircraft requirement will certainly be higher for India, and this should enable us to leverage the consortium better in terms of technology access, development work, and indigenous manufacture. The AMCA programme could be modified to be integrated into the 6th generation strategy.

India must make the right strategic decision. The time is now.

*- The writer, a AUSM VM PhD (U) is a former Deputy Chief of Integrated Defence Staff for Policy, Plans, & Force Development (DCIDS - PP & FD). He is currently the President of The Peninsula Foundation, a Chennai-based public policy research think tank. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*

## SHOW STOPPER

# ENDUREAIR: STRENGTHENING INDIA'S DEFENCE SECTOR AND CONTRIBUTING TO AATMANIRBHAR BHARAT

Committed to strengthening India's UAV ecosystem, EndureAir has established itself as an integrated defence partner within India's defence framework. The company plays a pivotal role in driving the next wave of innovation and growth within India's defence and aerospace sectors



The company's UAVs support a wide array of applications, such as aerial cargo delivery, surveillance, border security, maritime patrolling, disaster management, intelligence gathering, counterinsurgency, counterterrorism, synthetic aperture radar (SAR) operations, and utility monitoring.

By prioritising indigenous manufacturing, EndureAir actively reduces reliance on foreign manufacturers and contributes significantly to India's mission of self-reliance (Aatmanirbharta).

One of EndureAir's flagship innovations is the Sabal, a logistics drone inspired by Chinook helicopters, renowned for their

operational efficiency. Sabal, currently deployed at the Indian Army's Eastern Theatre, is designed to address logistical and surveillance challenges in defence operations. With its advanced autopilot system and intuitive controls, Sabal excels during intense missions, showcasing engineering excellence and reliability in critical situations.

Sabal features a tandem rotor configuration that ensures precise functionality even in the most challenging terrains. Its advanced variable pitch technology, coupled with massive rotors, allows it to operate seamlessly in remote areas and efficiently navigate mountainous regions. Designed to address the limitations of traditional transport systems reliant on porters and ponies, Sabal has transformed logistics operations.

Alakh is a state-of-the-art nano-category drone designed for stealth and surveillance operations. Engineered to function in hostile and GPS-denied

India's defence reliance on the West is steadily declining, with startups and MSMEs playing a crucial role in developing new technologies that strengthen the nation's defence capabilities. Among these innovators, EndureAir Systems stands out as a major player in the UAV industry. Founded at IIT Kanpur by Dr Abhishek, Rama Krishna, and Chirag Jain, the company specialises in manufacturing indigenous unmanned aerial vehicles (UAVs) and providing advanced UAV solutions tailored to the diverse needs of the military, navy, and public and private sectors.

EndureAir Systems' core strength lies in its expertise in helicopter-based UAV technology, which combines the design advantages of manned helicopters with the operational efficiency of unmanned systems. This unique capability gives EndureAir an edge in challenging environments, including high-altitude regions and rugged terrains.

environments, it excels in tasks such as munitions drop, counter-insurgency, counter-terrorism, and real-time intelligence gathering. Its exceptional versatility makes it ideal for swarm applications, tracking insurgents, and conducting wide-area strategic surveillance. With its ability to endure extreme conditions, Alakh is highly effective in high-risk missions.

Alakh has been effectively deployed by the National Disaster Response Force (NDRF) during critical missions, including the Chamoli cloudburst disaster, Silkyara Tunnel rescue operation in Uttarakhand, and several other high-stakes emergency scenarios. Its compact form factor, combined with shrouded design elements, enhances portability and operational stealth, making it particularly effective in constrained environments. These features, coupled with its adaptability to diverse terrains and conditions, render it highly suitable for tactical military missions and disaster response operations where precision and reliability are paramount.

The Vibhram Series comprises two variants: G-Vibhram, powered by gasoline, and E-Vibhram, powered by electricity. Both models are meticulously engineered for long-range surveillance missions and are recognised for their impressive range, making them highly effective for extended operations.

Equipped with advanced autopilot systems, the Vibhram Series can be operated in both autonomous and semi-autonomous modes, providing operators with flexibility and precision during missions. These UAVs are versatile, supporting a wide range of applications, including military reconnaissance, border surveillance, disaster response, and environmental monitoring.

EndureAir has established itself as an integrated defence partner within India's defence framework, not only by supplying state-of-the-art drones but also by advancing indigenous defence technologies through strategic collaborations with defence public sector units under the Defence Testing Infrastructure Scheme (DTIS). EndureAir's contributions are instrumental in ensuring that



**Image Footage Captured by Alakh deployed for a rescue operation in Uttarakhand Silkyara Tunnel with the National Disaster Response Force (NDRF).**



**Image Footage Captured by Vibhram deployed for the Chamoli cloudburst disaster relief operation which was successfully executed by EndureAir for the National Defence Response Force (NDRF).**

the technological self-sufficiency objectives of India's defence industry are consistently achieved by developing and rigorously testing advanced UAV technologies in alignment with the nation's sovereignty goals.

Committed to strengthening India's UAV ecosystem, EndureAir emphasises collaboration with local manufacturers to ensure that its UAV advancements foster domestic production. The company's strategic capabilities and focus on indigenous manufacturing are opening new verticals and enhancing existing ones, significantly bolstering India's national security infrastructure. As the nation moves closer to Aatmanirbharta (self-reliance), companies like EndureAir play a pivotal role in driving the next wave of innovation and growth within India's defence and aerospace sectors. ■

# CROWN'S MARINE DIVISION MARCHING TOWARDS NEW FRONTIERS

Crown Group Defence is one of India's largest independent defence MRO companies. The marine vertical of the group has over 40 years of experience in providing comprehensive repair and refit support to the Indian Navy and Coast Guard platforms. The Marine vertical has recently started catering to the civilian ship's repairs sector, too.



## RA EDITORIAL DESK

**C**rown Group Defence's Dynatron Services Private Limited (DSPL) is one of India's only organised and fully equipped company having a presence across all coastal cities in India and catering to MRO and service and repairs of IN ships and submarines. They have state of the art ship repair facilities at Karwar, Mumbai, Goa, Kochi, Chennai, Visakhapatnam, and Kolkata.

The repair facilities are providing credible support for repair and refit of warships and submarines at all DPSU and private shipyards. DSPL is amply equipped to provide service support to INS Vikramaditya and has carried out major system repairs of its main propulsion system and auxiliaries.

The Company is also adept in maintenance of diesel engines, gear transmissions and electronic control and monitoring systems used by the Indian Navy. Crown Group can also undertake major PGD system repairs and routines maintenance of submarines and has demonstrated capability for the same. The company is in the process of joining hands with a diesel OEM for providing service support of submarine diesels.

By virtue of an agreement with the OEM, the

Crown Group Defence is geared to provide repair and routines support for Gas Turbine Generator 1250-E and installation and commissioning of main propulsion Gas Turbines. The group is also adept at providing controls and instrumentation of the main and auxiliary Gas Turbines and associated systems.

As part of 'Make in India' initiative, DSPL is now forging ahead to make a mark in the shipbuilding arena, proving its capabilities in full-ship repair and refit.

DSPL's facility at Karwar is the largest outside





NSRY and has recently commissioned a state-of-the-art Pump Test House equipped with data logging system to carry out pumps parameters checks, post repairs. This is being undertaken to provide enhanced quality and reliability in Pump repairs.

The Company also has a dedicated team of engineers specialising in undertaking installation, commissioning, warranty support and repairs and maintenance in India in respect of ZF Gear Boxes and Thrusters manufactured by Kobota Diesel of Japan, and Coffin Pumps of USA. The Karwar unit of DSPL has also created a 'Centre of Excellence' in Thruster Design and repairs. The DSPL Chennai unit has a test bed for ZF Gear Box trials post repairs.

OSK India Private Limited (OIPL), is the weapons vertical of the Marine Division which is focused towards installation, repair and MRO of various weapon systems, Nav-aids and communication system of naval ships and submarines and Coast Guard platforms. Being the youngest in the Marine Vertical, its defining moment came when it cleared successful repair of over 500 system modules belonging to frontline naval platforms. This has cemented the status of Crown Group Defence as a major holistic service provider in Naval MRO sphere.

OIPL has MRO facilities at Mumbai, Goa and Karwar. The facility at Goa undertakes repair of

all kinds of modules, including those which have an RF content. The laboratory is certified as AS 9100 Standard and is also an NABL accredited calibration laboratory. The facilities are equipped with state-of-the-art test equipment essential to undertake complex module repair and testing.

To be a part of the Government's thrust towards 'Make in India', the company has tied up with global OEMs for indigenously manufacturing shipborne fire sensing and firefighting systems (for machinery compartments). The company also has tie-ups with MNCs for marketing weapon systems and Navaid components or modules, particularly for the Ice Class extreme weather platforms.

Having accomplished laurels in General Engineering and Weapon Systems MRO, the Crown Group is now moving forward towards the niche technological arena of manufacturing Night Vision Devices to meet the requirement of the armed and para military forces. Efforts are also in hand for design and manufacture of aerial drones and 'Autonomous Underwater Vehicles' (AUVs).

The Marine Division of Crown Defence is a 'One stop shop' to provide entire gamut of facilities from general ship to weapon system repairs and is now focused towards making a mark in niche technological areas. ■

**Having accomplished laurels in General Engineering and Weapon Systems MRO, the Crown Group is now moving forward towards the niche technological arena of manufacturing Night Vision Devices to meet the requirement of the armed and para military forces**

## IN CONVERSATION

# “BOEING IS COMMITTED TO INNOVATION AND SUPPORT FOR INDIA’S VISION OF BECOMING A GLOBAL AVIATION LEADER”

*As India’s trusted partner to support the country’s growing aviation sector, Boeing has invested extensively in supply chain partnerships, engineering, R&D, training, co-production, and co-development. Boeing’s Sukanya Program aimed at further fostering women’s participation in the aviation sector and cutting-edge R&D initiative BIETC, highlight its commitment to innovation and support for India’s vision of becoming a global aviation leader.*

*In an immersive interaction with Raksha Anirveda’s Editor, Ryan Weir, Vice President of Commercial Sales and Marketing for India & South Asia, Boeing Commercial Airplanes explained in detail Boeing’s vibrant presence in the third-largest aviation market, its market position amidst growing demand for commercial aircraft and involvement in India’s regional connectivity scheme while catering to domestic airlines’ unique needs. He also shares Boeing’s plan to leverage digital tools and innovations in India to enhance passenger experience and other initiatives to meet rising cargo demands amidst challenges and advancing Sustainable Aviation Fuels in the industry. Edited excerpts from the interview:*

**RA:** *India is the third-largest aviation market globally. How is Boeing positioning itself to meet the growing demand for commercial aircraft in the region?*

**RW:** India’s aviation market has grown rapidly over the past decade, establishing itself as the world’s third-largest civil aviation market. By 2041, India’s commercial fleet is projected to nearly quadruple from its size in 2019, accounting for over 90% of South Asia’s airplane deliveries and adding more than 2,500 new aircraft to the country’s fleet. Additionally, India’s cargo fleet is projected to expand from 15 to 80 airplanes by 2042. Boeing’s 2024 Pilot and Technician Outlook also highlights the region’s need for 40,000 pilots, 40,000 maintenance technicians, and 49,000 cabin crew over the next two decades, driven by India’s growing aviation sector.

With a legacy of over eight decades in India,



Boeing’s extensive investments in supply chain partnerships, engineering, R&D, training, co-production, and co-development, uniquely position us as a trusted partner to support the country’s growing aviation sector. Boeing has committed \$100 million



**Ryan Weir, VP of Commercial Sales and Marketing for India and South Asia, Boeing Commercial Airplanes**



to developing infrastructure and programs aimed at training pilots in India to meet the country's demand for new pilots over the next 20 years. This investment includes advanced full-flight simulators, competency-based training programs, and partnerships with local institutions to prepare the next generation of aviation professionals. In 2023, Boeing supported the setup of India's first Boeing Converted Freighter (BCF) line, while establishing a Global Support Centre in Gurgaon to provide customised operational efficiency and safety improvement projects for airline customers, regulatory bodies, and other stakeholders. Boeing's India Distribution Centre in Khurja, Uttar Pradesh, a first in the country, provides efficient and cost-effective service solutions to regional customers, ensuring higher fleet utilisation and mission readiness rates.

Additionally, in alignment with Prime Minister's vision, Boeing has launched the Boeing Sukanya Program aimed at further fostering women's participation in the aviation sector. This initiative spans the multiple stages of a woman's professional career, nurturing future leaders, and fostering a more inclusive industry.

Our team of over 6,500 engineers and technologists at the Boeing India Engineering and Technology Centre (BIETC) in Bengaluru and Chennai are also playing a pivotal role in enabling cutting-edge R&D, not only for Boeing platforms in India but also globally. These initiatives highlight Boeing's commitment to innovation and support for India's vision of becoming a global aviation leader. We remain focused on further enhancing capabilities and strengthening local partnerships to drive the sector's growth.

**RA:** *With the rise of low-cost carriers and regional connectivity schemes in India, how does Boeing plan to cater to these airlines' unique needs?*

**RW:** As low-cost carriers (LCCs) and regional connectivity schemes continue to expand in India, Boeing is focused on meeting their unique needs with strategically designed solutions that prioritise operational efficiency, fuel economy, and reliability. The 737 MAX family, known for its

**By 2041, India's commercial fleet is projected to nearly quadruple from its size in 2019, accounting for over 90% of South Asia's airplane deliveries and adding more than 2,500 new aircraft to the country's fleet. Additionally, India's cargo fleet is projected to expand from 15 to 80 airplanes by 2042**

# IN CONVERSATION



**India's domestic air cargo trade is forecasted to continue rapid growth at 6.9% per year over the next two decades. The growth is driven by various factors, including the overall growth of the Indian economy and increased demand for air cargo transportation**

fuel efficiency and operational versatility, is especially suited for India's price-sensitive market. The 737 MAX 8 and the higher-capacity MAX 8-200 models offer reduced operating costs per seat, aligning with the business models of LCCs aiming to maintain low fares while ensuring profitability. Additionally, the 737 MAX 10 variant, with its increased seating capacity, caters to high-density routes commonly operated by Indian LCCs. For instance, Akasa Air has placed orders for the 737 MAX 10.

India's Regional Connectivity Scheme, UDAN ("Ude Desh ka Aam Nagrik"), aims to enhance air travel accessibility by connecting underserved airports. Boeing's aircraft portfolio, including the 737 series, is well-suited for these regional operations, offering the range and performance necessary for efficient service on shorter routes. Our strong partnerships with Indian carriers, such as Akasa Air, Air India, and SpiceJet, highlight our commitment to supporting the growth of India's LCC market. Air India's historic order for up to 290 Boeing jets, including 190 737 MAXs, and Akasa Air's order of 226 737 MAX airplanes reflect our role in supporting India's growing aviation sector. Boeing also provides comprehensive lifecycle support services, including pilot and technician training and digital solutions, to optimise airline operations.

Through our tailored solutions and strategic engagements, we are well-positioned to support the evolving needs of India's low-cost carriers and regional connectivity programs, contributing to the development of the nation's aviation infrastructure. Boeing's support extends beyond aircraft delivery, offering maintenance, training, and in-country services to ensure sustained operations and growth. This approach enables airlines to remain competitive and thrive in the dynamic Indian aviation market while maintaining operational excellence.

**RA:** *Emerging technologies are reshaping aviation. How does Boeing plan to leverage digital tools and innovations in India to enhance the passenger experience and airline operations?*

**RW:** The Boeing India Engineering & Technology Centre (BIETC) in India is leveraging a talented pool of 6,500+ engineers and innovators across Bengaluru and Chennai to drive growth and innovation in the aerospace industry. With a strong engineering presence in India since 2009, BIETC was formally established in 2016. Boeing had further invested \$200 million in a state-of-the-art 43-acre campus in Bengaluru, inaugurated by Prime Minister Modi in January 2024. This is Boeing's largest such facility outside the US, housing teams across engineering, testing, research, technology, IT, and digital analytics. These teams provide high-quality aerospace engineering expertise to Boeing's defence, space, and commercial businesses, supporting everything from design and manufacturing to testing and digital solutions for airline customers. The centre focuses on cutting-edge R&D in both traditional and emerging areas, including next-generation airplane health management, eco-friendly coatings, advanced networks, and secure communications. Leveraging technologies like Artificial Intelligence, Machine Learning, IoT, Cloud computing, Model-Based Engineering, and Additive Manufacturing, the centre enhances quality, safety, and productivity, contributing to the advancement of airline operations and the passenger experience.

**RA:** *What is the outlook for air cargo and freighters in India, and how does your company collaborate with Indian airlines and cargo operators to address demand, tackle challenges, and provide tailored solutions?*

**RW:** Approximately half of the global demand for conversions is expected to come from the regions Asia and Africa, including India. This is driven by the rapid expansion of e-commerce and the electronics manufacturing industry, which has revolutionised customer expectations and supply chain needs. Global e-commerce revenues are projected to reach more than double pre-pandemic levels by 2026, relying heavily on air cargo in emerging markets without well-established ground and postal networks. The rise of high-end electronics manufacturing in India, such as smartphones and wearables, along with other high value added manufacturing, like semiconductors, is creating opportunities for air cargo growth in the future.

India's domestic air cargo trade is forecasted to continue rapid growth at 6.9% per year over the next

two decades. The growth is driven by various factors, including the overall growth of the Indian economy and increased demand for air cargo transportation. Furthermore, the expansion of India's e-commerce sector is contributing to the demand for efficient and reliable logistics and transportation solutions. This has led to the entry of cargo carriers into the Indian market that are operating a range of freighters, including the Boeing 737-800 Boeing Converted Freighter, to cater to the growing air cargo services demand.

The Boeing family of freighters provides operators with flexible solutions to meet the needs of their specific markets. Boeing's teams work closely with all customers in India and air cargo operators to understand their unique requirements, their market imperatives and help provide them with our freighter products and services solutions that facilitate a gain in their competitive advantage.

**RA:** *What progress have your initiatives made in advancing SAF in the industry?*

**RW:** Boeing is actively working toward making its commercial airplanes capable of flying on 100%

Sustainable Aviation Fuels (SAF) by 2030. In India, we have collaborated with SpiceJet and the Council of Scientific and Industrial Research – Indian Institute of Petroleum (CSIR-IIP) aimed at leveraging SAF supply from CSIR-IIP and its production partners and licensees to help SpiceJet decarbonise its fleet. This initiative builds on Boeing's long-term industry leadership and investment to develop SAF around the world in partnership with airlines, fuel companies, governments and research institutions, to expand SAF supply and reduce its cost. Boeing is presently helping review and support the certification process for SAF samples being developed by CSIR-IIP. Boeing also contributed to the World Economic Forum's Clean Skies for Tomorrow initiative, which determined that 10% of India's SAF needs by 2030 can be met through domestic production. Through this initiative, WEF has convened an Indian SAF community of private and public institutions with the shared vision of transporting 100 million domestic passengers in India on SAF by 2030 on a 10% blend (360,000 metric tons). India's total expected domestic need for jet fuel is estimated to be approximately 8 million tons by 2030, flying an estimated 190 million domestic passengers a year. ■



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# LOCKHEED MARTIN BRINGS VAST™ EXPERIENCE SYSTEM TO AERO INDIA 2025

The company will be presenting latest advanced technology solutions to address India's most challenging 21st Century needs



Lockheed Martin is unveiling its immersive Vast™ experience system in India for the first time at the 15th biennial edition of Aero India taking place in Bengaluru from February 10–14, 2025. The company is highlighting its vision for 21st Century Security® solutions with a focus on integrated capabilities on offer to the Indian Armed Forces.

The immersive Vast™ experience is the prime attraction at the Lockheed Martin booth, providing visitors with access to a system that brings multi-domain missions to life through interactive 3D visualisations.

The company's exhibit also showcases its most innovative capabilities, including the C-130J Super Hercules tactical airlifter, F-21 fighter aircraft, MH-60R "Romeo" multi-mission helicopter, Javelin® weapon system and S-92 multi-role helicopter among others.

"Aero India has been a leading platform for Lockheed Martin and the aerospace and defence

sector for many years, and we look forward to our participation this year with the Vast™ Experience System," said William L. Blair, vice president and regional chief executive, Asia and India, Lockheed Martin. "Building on our deep partnerships with the Indian industry, we look forward to showcasing some of our advanced capabilities that address our customers' biggest challenges for the 21st Century and grow our presence and partnerships that support greater self-reliance in the defence sector."

Boosting Lockheed Martin's presence at the show will be the C-130J Super Hercules aircraft model which represents a strong legacy of partnership with the Indian defence industry. The Indian Air Force operates 12 C-130Js to support a variety of tactical airlift missions. India also is connected to the C-130J through Tata Lockheed Martin Aerostructures Limited, a joint venture, that has the distinction of being the single-global source of C-130J empennage assemblies included on all new Super Hercules aircraft.

In 2024, the company expanded its commitment to India through a teaming agreement with Tata Advanced Systems Limited to expand upon the companies' business relationship through the C-130J Super Hercules tactical airlifter on future potential business opportunities to include:

- Establishing a Maintenance, Repair and Overhaul (MRO) facility in India to support the IAF's existing fleet of 12 C-130Js as well as other global Super Hercules fleets;
- Expanding C-130J manufacturing and assembly in India to produce aircraft for the IAF's MTA program, subject to U.S. and Indian government approvals.

An **F-21 fighter aircraft model**, which is on offer to the Indian Air Force (IAF) for the Multi-Role



Fighter Aircraft competition, is configured with the latest sensors and mission avionic systems that couple on-board and off-board data information into an effective, easy to manage combat situation display. F-21 is the ideal solution to meet India's fighter force structure, affordability, and 'Make in India' and "Skill India" requirements.

The **MH-60R "Romeo" SEAHAWK® helicopter** occupies a prominent place at Lockheed Martin's Aero India display. The MH-60R is the most capable and mature Anti-Submarine (ASW)/Anti-Surface Warfare (ASuW) multi-mission helicopter available in the world today. Ten MH-60R helicopters are presently available to the Indian Navy for operations. A total of 24 MH-60Rs will be delivered to India over the next year.

**Javelin**, the world's most versatile, one-man-portable and multi-purpose weapon system, also will be part of Lockheed Martin's exhibit at Aero India. The anti-tank weapon system can be deployed by its traditional man-portable manner as well as from multiple platforms and used during the day, at night and in any kind

of weather. Using fire-and-forget technology, Javelin provides operational flexibility so that operators can rapidly engage and then move on to a new firing position, affording the highest level of survivability to the user.

**S-92®** multi-role helicopter is connected to India through the Tata Sikorsky Aerospace Limited, a joint venture, that has the distinction of being fully integrated into Lockheed Martin's global supply chain for manufacturing aerostructure components for the S-92 helicopter.

Lockheed Martin continues to build upon more than three decades of partnerships and seven decades of association with India by nurturing and expanding collaborations with local industry to support the foundation of indigenous defence manufacturing ecosystem. Today, the company's presence has moved beyond defence systems to provide technical support, apprenticeships, fostering positive change and inspiring the next generation from under-represented communities to build sovereign capabilities through industrial partnerships and human capital development.

**"Aero India has been a leading platform for Lockheed Martin and the aerospace and defence sector for many years, and we look forward to our participation this year with the Vast™ Experience System. Building on our deep partnerships with the Indian industry, we look forward to showcasing some of our advanced capabilities that address our customers' biggest challenges for the 21st Century and grow our presence and partnerships that support greater self-reliance in the defence sector"**

-William L. Blair, Vice President and Regional Chief Executive, Asia and India, Lockheed Martin

# ‘HAL WILL INVEST HEAVILY IN R&D AND INNOVATION, FOCUSING ON FUTURE TECHNOLOGIES’

At the forefront of India's indigenisation journey under the Make in India initiative, HAL has been playing a crucial role in strengthening the nation's aerospace and defence capabilities. By focusing on innovation, self-reliance, and cutting-edge technology, HAL has significantly contributed to India's Aatmanirbharta drive.

**Dr D K Sunil, Chairman and Managing Director, Hindustan Aeronautics Limited (HAL)** in a freewheeling and candid conversation with **Raksha Anirveda's** Editor, while highlighting HAL's key achievements and its crucial role in strengthening the nation's aerospace and defence capabilities, also touched upon the contribution HAL has been making in India's Aatmanirbharta drive. The chairman also provided a detailed account of HAL's future plans, enhanced R&D focus and participation in Aero India 2025.



**RA:** HAL has been at the forefront of developing indigenous aircraft like the LCA Tejas, Light Combat Helicopter (LCH), and Light Utility Helicopter (LUH). Could you discuss the ongoing innovations at HAL, particularly in areas like unmanned aerial systems and new aircraft platforms?

**DKS:** HAL is working on various design and development projects related to UAVs towards meeting the current and future UAV requirements of Indian Armed Forces, through collaborative as well as in-house R&D efforts. Major programs include rotary UAVs, MALE, HALE UAVs, etc., one such program is CATS (Combat Aircraft Teaming System) which is a teaming up of manned/ unmanned assets for futuristic war scenarios, for which design and development activities are initiated.

**RA:** Kindly provide insights into HAL's key achievements under the Make in India initiative. What future plans do you have to play a pivotal role

and increase your contribution in India's Aatmanirbharta drive?

**DKS:** HAL has been at the forefront of India's indigenisation journey under the Make in India initiative, playing a crucial role in strengthening the nation's aerospace and defence capabilities. By focusing on innovation, self-reliance, and cutting-edge technology, HAL has significantly contributed to India's Aatmanirbharta (self-reliance) drive. **Key Achievements Under the Make in India Initiative:**

**LCA Tejas:** The Light Combat Aircraft (LCA) Tejas, India's first indigenous multi-role fighter aircraft, developed by HAL in partnership with DRDO, is a testament to India's capability to

design, develop, and produce advanced fighter aircraft indigenously.

**Advanced Light Utility Helicopter (ALH):** ALH is an indigenously designed multi-role helicopter in the weight class of 5.5 tons. More than 350 helicopters have been produced in several variants namely MkI, MkII, MkIII & MkIV.

**Light Combat Helicopter (LCH):** The LCH, which is fully designed and developed by HAL, is a significant contribution to India's combat helicopter capabilities. It is the first indigenously developed attack helicopter and will serve in critical roles in the Indian Army and Air Force.

**Light Utility Helicopter (LUH):** HAL's LUH is designed to replace the aging fleet of Cheetah and Chetak helicopters, focusing on high-altitude operations and versatility.

**HTFE-25 and HTSE-1200 engines:** HAL is focusing on developing indigenous engines, such as the HTFE-25 turbofan engine for fixed wing aircraft and the HTSE-1200 turboshaft engine for helicopters, ensuring

long-term sustainability and reducing dependency on foreign suppliers.

HAL has taken significant strides in the field of Unmanned Aerial Systems (UAS) with projects like the Combat Air Teaming System (CATS) and advanced UAVs, ensuring India remains at the forefront of modern, unmanned warfare capabilities.

#### **Future Plans for Aatmanirbharta and HAL's Role in the Initiative:**

HAL will continue to expand its capacity for developing and manufacturing next-generation aircraft and systems. The focus will be on AMCA, TEDBF (Twin-Engine Deck-Based Fighter), and future helicopter variants like the Indian Multi-Role Helicopter (IMRH), indigenous propulsion systems, including engines and next-gen avionics for aircraft to meet both defence and commercial aviation needs, which are essential for India's strategic autonomy. SAFHAL Helicopter Engines, a JV with Safran Helicopter Engines has been for to jointly design, develop, and manufacture high power helicopter engines in India. Further, HAL has collaborated with GE to manufacture GE-414 INS6 engine with 80% ToT in India.

HAL will invest heavily in R&D and innovation, focusing on future technologies such as artificial intelligence, hypersonic flight, and autonomous systems. These technologies will not only enhance HAL's product offerings but also support India's technological self-sufficiency. Developing green aerospace technologies will be a key priority to align with global environmental sustainability goals. HAL will continue to embrace Industry 4.0 practices and integrate advanced technologies like smart manufacturing to enhance operational efficiency and ensure high-quality production standards.

**RA:** *Could you elaborate on HAL's plans for the upcoming fifth-generation fighter jet? What are the key milestones and timelines we can expect?*

**DKS:** HAL is a major design partner with ADA in AMCA program. Critical Design Review of aircraft has been completed and detailed design activities are progressing.

**RA:** *What is your vision for the company's future? How do you plan to achieve it? Could you provide details with regards to HAL's market diversification and expansion, technological innovation drive, and strategic partnerships initiatives to strengthen HAL's industry presence?*

**DKS:** I envision a future where HAL continues to be the backbone of India's aerospace and defence sectors while emerging as a global leader in innovation, market

diversification, and strategic collaborations. Our efforts are aligned with the Aatmanirbhar Bharat initiative and the evolving needs of modern warfare and civil aviation.

HAL aims to expand its footprint in international markets, leveraging its proven platforms like the ALH Dhruv, LCA Tejas, Do-228, and the upcoming HTT-40 & Light Utility Helicopter (LUH) platforms. We are actively engaging with friendly countries to address their defence and civil aviation needs. HAL will tailor our offerings to meet specific operational, climatic, and logistical challenges of other countries. Further, HAL is also committed to supporting India's regional connectivity goals by promoting indigenous platforms like the Hindustan-228 and exploring new markets for civil aviation products.

For driving innovation, we have set up a separate R&D fund for advanced technologies, such as artificial intelligence, autonomous systems, and advanced materials. Our focus is to remain at the cutting edge of aerospace and defence innovation. Programmes like the Advanced Medium Combat Aircraft (AMCA), Twin-Engine Deck-Based Fighter (TEDBF), Indian Multi Role Helicopter (IMRH) and indigenous engine development projects (HTFE-25 and HTSE-1200) are testaments to HAL's ability to deliver next-generation solutions. Initiatives like the Combat Air Teaming System (CATS) and swarm UAVs represent our commitment to modern warfare solutions.

As regards to building strategic partnership, we will continue to partner with global aerospace leaders to co-develop and co-produce advanced systems while leveraging their expertise to enhance our capabilities. In addition, we are strengthening ties with the private sector, MSMEs, and start-ups to build a robust supply chain and foster innovation. Collaborations with academia, and research institutions, will be critical to developing cutting-edge technologies and staying competitive.

HAL's vision is to become a globally recognised aerospace and defence powerhouse, driving innovation, fostering partnerships, and expanding markets while staying true to its core mission of contributing to India's self-reliance and national security. With a strong foundation and clear strategic priorities, HAL is poised to scale new heights in the years to come.

**RA:** *HAL has been associated with ISRO's space programs and is setting up a dedicated facility for cryogenic engine manufacturing. Kindly provide a detailed account of HAL's contributions to India's space endeavours?*

**DKS:** As strategic partner, HAL has been associating with ISRO for prestigious Space Programs since last five decades. HAL's expertise in precision engineering,

**HAL will continue to expand its capacity for developing and manufacturing next-generation aircraft and systems. The focus will be on AMCA, TEDBF (Twin-Engine Deck-Based Fighter), and future helicopter variants like the Indian Multi-Role Helicopter (IMRH), indigenous propulsion systems, including engines and next-gen avionics for aircraft**

# IN AUDIENCE



**At Aero India 2025, HAL will actively engage with international delegations to promote its platforms like the ALH Dhruv, LCA Tejas, and Do-228 for export markets and will explore collaboration with MSMEs, start-ups, and academia, and showcase how its ecosystem supports 'Make in India' and innovation**

manufacturing, and systems integration has contributed immensely to India's space exploration efforts, making HAL a key partner in ISRO's achievements.

HAL has been actively involved in the manufacturing of critical components for ISRO's launch vehicles, including the Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV). HAL has contributed to the manufacturing of various sub-systems, including rocket propellant tanks, airframe structures, welded propellant tankages and Satellite Bus structures. HAL has also provided crucial support in integrating complex payloads for space missions and has been involved in the assembly of satellite components that are vital for communication, earth observation, and navigation systems.

The dedicated facility for cryogenic engine set up at HAL, is one of its kind, with state-of-the-art equipment which will cater to the entire Rocket Engine Manufacture and Assembly under one roof and will boost self-reliance in rocket engine manufacturing for Indian space programs.

HAL provides advanced manufacturing capabilities to support ISRO's spacecraft assembly, integration, and testing. This includes the use of state-of-the-art facilities for precision assembly and environmental testing, ensuring that all components meet the high standards required for successful space missions. HAL will continue to participate and support the ambitious Indian Space Programs and is on track to become a one stop destination for Space Launch Vehicles.

**RA:** *What new products or technologies will HAL present at Aero India 2025?*

**DKS:** HAL will display Dhruv NG, an indigenously developed helicopter. It is the civil variant of the

Advanced Light Helicopter (ALH Mk III) used by the Indian defence forces. The civilian version of this military helicopter is powered by the 'Shakti' engines and features a civil-certified glass cockpit. Even though the civil ALH version has been in service since 2003, Dhruv NG will be an achievement for Indian aviation in terms of updated technology.

HAL's Light Utility Helicopter (LUH) will be the part of centre theme. LUH is a new generation helicopter in the three-ton class incorporating state-of-the-art technology features like Glass cockpit with Multi-Function Displays (MFD) and powered by single Turbo Shaft engine with sufficient power margin

to cater to demanding high altitude missions. The helicopter will be capable of flying at 220 Km/h with a service ceiling of 6.5 Km and a range of 350 Km with 500 kg payload.

The upgraded Tejas Mark 1A will be displayed featuring a new avionic suite centred on AESA Radar, Electronic Warfare Suite (EWS) and an externally mounted self-protection jammer (SPJ) for enhanced survivability, in-flight refuelling capability, and Onboard Oxygen Generation System (OBOGS). The variant is planned to be equipped with dual-rack pylons with weapon systems integration.

HAL will also display upgraded Intermediate Jet Trainer (IJT) with Glass Cockpit which has completed its flying trials. HAL will be displaying CATS Warrior, AMCA, Tejas MK II for Fixed wing Combat Aircraft Theme in India Pavilion.

At Aero India 2025, HAL will actively engage with international delegations to promote its platforms like the ALH Dhruv, LCA Tejas, and Do-228 for export markets and will explore collaboration with MSMEs, start-ups, and academia, and showcase how its ecosystem supports 'Make in India' and innovation. HAL will be signing MoUs with perspective partners to further explore business opportunities for co-development, and technology-sharing. HAL also looks forward to engage with key stakeholders, including the Indian Armed Forces, international clients, and industry partners, to secure new opportunities and collaborations.

Aero India 2025, will serve as a platform to showcase HAL's ability to deliver world-class products and solutions, reaffirming India's position as a global aerospace hub. HAL expects to strengthen its presence in emerging markets through targeted interactions. ■

# MBDA: MISSILE SYSTEMS THAT SUPPORT INDIAN SOVEREIGNTY

At Aero India 2025, MBDA will be showcasing the advanced missiles that support the Indian Armed Forces in their mission to protect Indian sovereignty



**A**t the centrepiece of the company's presence this year in Bangalore, are the weapon systems that arm the Indian Air Force's latest Dassault Rafale combat aircraft. These highly potent set of weapons from MBDA give the IAF an air combat capability that is unrivalled by any of India's neighbours. The most famous of these weapons is the Meteor beyond visual range air-to-air missile, which is widely recognised as a game changer for air combat.

The Meteor is powered by a unique rocket-ramjet motor that gives Meteor far more engine power, for much longer than any other missile. This means it can fly faster, fly longer, and manoeuvre more than any other missile – giving Meteor the ability to chase down and destroy agile hostile fighters at even the furthers of ranges. As a result, Meteor has a no-escape zone many times greater than any other air-to-air missile.

India's Rafales are also be equipped with the SCALP deep-strike cruise missile from MBDA to strike hardened and protected targets deep inside hostile territory. The IAF's Rafales are also be equipped with MICA, a potent air combat missile the Indian Air Force knows very well as it is also part of the upgrade package for the IAF's Mirage 2000 aircraft. MBDA is also proposing all these potent weapons, as well as the famous Exocet AM39 air launched anti-ship missile for the Rafale M for the new Indian aircraft carrier.

MBDA has been delivering battle-winning capabilities to the Indian Air Force and collaborating with Indian industry for over 50 years. L&T MBDA Missile Systems Ltd,

MBDA's joint venture with Larsen & Toubro, will also be exhibiting at Aero India 2025 and showcasing the work it performs in Coimbatore delivering Make in India projects in support of Aatmanirbhar Bharat for the Indian Air Force. LTMMSL is working to propose new Make in India projects to support the needs of both the Indian Navy, with short range surface to air missile systems, and the Indian Army with latest generation anti-tank missiles (ATGM5).

Throughout MBDA's history of partnership with India, there have been two guiding principles: to provide the very best technologies to the Indian Armed Forces, and to work in true partnership in support of the Indian Defence Industry. The company then is fully committed to the 'Make in India' programme, which aligns with MBDA's long-term strategy.

Other examples of technological edge equipping the Indian Air Force include the ASRAAM within visual range air combat missiles. ASRAAM is providing the IAF's Jaguar fleet with a step-change in air combat performance – a capability that will soon also enhance the IAF's new Tejas LCA Mk1A. Meanwhile the MBDA Mistral ATAM system has been successfully integrated on the Advanced Light Helicopter (ALH) and Light Combat Helicopter (LCH).

MBDA has an excellent track record providing both operational and industrial capabilities in partnership with the Indian Air Force and Indian Defence Industry. The strength of these two pillars make it a long-term true partnership, and one that should only continue to get stronger. ■

# EATON TO SHOWCASE ADVANCED TECHNOLOGY SOLUTIONS, COMPONENTS AT AERO INDIA 2025

The exhibit of an array of innovative, high-performance solutions by Eaton at the mega airshow reinforces its commitment to support India’s Make in India initiative



**HOSE ASSEMBLIES:** Eaton’s Aerospace business offers a variety of hose assemblies for aircraft applications, accommodating pressures from 1,500 psi to 5,000 psi, covering low, medium, and high-pressure needs. These hoses are available in extruded or convoluted PTFE, with options for metallic or non-metallic braiding, and can operate in temperatures ranging from -67°F to 450°F. They also come with protective sleeves for abrasion and fire resistance, tailored to specific applications.

For demanding applications requiring high-temperature endurance and routing flexibility, Eaton provides complex hose

Intelligent power management company Eaton will participate in the 15th edition of Aero India 2025— Asia’s premier aerospace and defence exhibition, from February 10–14, 2025, at Bengaluru’s Yelahanka Air Force Station. At the event, Eaton showcases its advanced technology solutions and components designed for military and aerospace applications, reinforcing its commitment to supporting India’s defence and aerospace industries through ‘Make in India’ initiative.

Eaton’s exhibit showcases an array of innovative, high-performance solutions designed to meet the rigorous demands of military and aerospace operations including:

**AAR PROBE:** Eaton designs and manufactures a comprehensive range of fixed, retractable and semi-retractable refueling probes for fast jets and rotorcraft. Customised air-to-air refueling probe solutions are available to meet specific customer requirements including full design, qualification and certification services

**ENGINE DRIVEN PUMP:** Engine Driven Pump (PN - 3031863-001) - a substantial product improvement to Eaton’s Vickers® P/N 887673 hydraulic pump (PV3-240-10C), this modification will significantly reduce external leakage associated with the face seal at the parting line interface between the adapter block and housing.

assemblies. These feature flexible hoses integrated with fabricated tubes, crimped onto the hose, ensuring both durability and adaptability.

**QUICK DISCONNECTS:** Eaton provides a comprehensive range of quick disconnect couplings for aircraft, which are available in both thread connect and push-pull types [SureMate, Ultramate and 3900 QDC] to suit various needs. These couplings are meticulously designed and qualified to industry standards such as AS1709 and AS7413, capable of handling pressures up to 5,000 psi and temperatures up to 300°F. Featuring unique lock and latch mechanisms, they ensure quick, reliable connections while maintaining structural integrity, leak-proof performance, and minimal pressure drop.

**JET PUMP:** Eaton Aerospace leverages additive manufacturing to create advanced jet pumps, designed for optimal performance in fuel transfer applications. These jet pumps utilise the action of motive flow to draw fuel through the induced inlet, mix it, and discharge it efficiently. The additive manufacturing process allows for innovative design features, such as integrated orifices and optimised flow paths, ensuring superior performance, reduced weight, and enhanced durability

**Eaton booth is in Hall A, Booth A7.4B.**



## Every Component Counts

In aerospace, precision matters. At BEML, we engineer high-quality spares and critical components that keep missions on track and performance at its peak.

# Aero India 2025



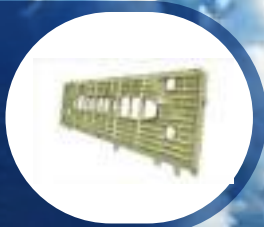
10<sup>th</sup> - 14<sup>th</sup>  
Feb 2025



Airforce Station,  
Yelahanka, Bengaluru



Indoor Hall E, Stall 3.1 (a)  
Chalet No-30



# BUSINESS INITIATIVE



**Ignited minds... for you**

## IGNITED MINDS IN AEROSPACE & DEFENCE

**W**ithin a span of 37 years since being set up in 1988, Hyderabad based Aerospace and Defence and Homeland Security company in the private sector, VEM Technologies, has grown in diversified technological fields to manufacture the state of the art, highly reliable systems for aerospace and defence applications.

The core strength of VEM is assembly, integration and testing. It is also into Design and engineering, manufacturing engineering, quality engineering coupled with systems engineering which are its core strengths. The company employees more than 1200 professionals with focus on Research, Design, Development, Manufacture, Assembly, Integrating and testing of Systems, Products and Solutions.

VEM Technologies has to its credit of being the first private sector unit to make a Centre Fuselage System for Light Combat Aircraft (LCA) Tejas. Scaling up its defence manufacturing capabilities, VEM is coming up with an integrated defence facility at Yelgoi, Zaheerabad in Sanga Reddy near Hyderabad with Rs 1,000 crore investment. This exclusive defence facility, spread over 511 acres will be operational in next two years (2027) and will be involved in making next generation weapon systems end to end, including missiles, radars, seekers, engines, avionics, fighter planes, helicopter and more. Recently, it signed a memorandum of understanding (MoU) with the Telangana government.

According to the Chairman and Managing Director, V. Venkata Raju, this facility will also serve as a defence export processing zone to cater to the overseas market.



Inauguration of Advanced Systems Division by Dr G. Sateesh Reddy, Secretary DD (R&D) and Chairman (DRDO)

VEM has a long history of successfully supporting customers in meeting their requirements. It also continues to expand the product line to meet the customers' needs. The company believes in partnership with its customers and also with its suppliers. By virtue of their support, VEM has emerged as a system integrator for various leading customers both in domestic and international market segment.

The Founder Chairman of the company, V. Venkata Raju, coming from an agricultural background did his graduation in mechanical engineering and post-graduation in tool design and engineering. He started the company by producing the connectors for the strategic Defence industries, BDL, ECIL.

He was very successful in the indigenisation of hi-precision connectors which were very critical for the productionisation of Konkur and Milan



Hindustan Aeronautics Ltd (HAL) and VEM Technologies Pvt Ltd signed the MoU for production of 20 Units of Centre Fuselage Assy to Tejas Light Combat Aircraft (LCA) in the presence of K Ravi, Director (Operations), HAL and Sajal Prakash, CEO, HAL

missiles and got the National award for Excellent Performance in Indigenisation in the category of electrical and electronic engineering for 1996-97.

The company got through the required Licenses for Missiles, Bombs and Rockets and the license for the explosive facility is at the final stage. VEM is coming out with an Aerocity that houses the Missiles, Bombs productionisation including the explosive facility and an airstrip for the flight trails of

UAVs, UAS and Business jets.

VEM has proven track record to build to specifications and build to print of various systems from the nose to the tail for all major categories of Missiles. The in-house infrastructure caters to the systems integration and medium to large section level integration activities.

The company was the development partner for the country's Laser Guided Bomb (LGB) programme and got recognised with a national award from DRDO "Best Technology Award for the Servo System". VEM is also the single largest production partner exporting major assemblies of LGBs over the years meeting the customer requirements both in terms of quality and quantities.

It has been working on the LGB systems with the current day technology and is in the process of establishing an indigenised weapon fitting into "Make in India". The company is also working on its own anti-tank guided missile system – ASIBAL and has made a good foray into the UAV/UAS and pacing ahead for the systems integration with the related test facilities. It has partnered with Austrian company Schiebel that manufactures design-awarded UAS.

#### **Systems for Helicopters and Aircrafts:**

VEM Technologies has developed a good customer base for the systems for this segment and is working closely for many a systems to make the vertical as another important contributor.

**Surveillance Systems:** An upcoming division of the company is mainly aimed at Land, Naval and Airborne applications covering the areas of Radars, Electro-Optical Systems and Sensors with the networking software. VEM has techno-commercial collaboration with the world leader who has a proven track record, worldwide to support and build the country's homeland security systems.

With an excellent team of experts, the company is working on various technologies, verticals like Instrumentation, Robotics, Thermo Dynamics, Aerodynamics, Metallurgical, Power electronics and power systems, controls, Photonics, Embedded Systems, Signal processing and image processing, Pyro techniques and propulsion systems, warheads, Power, Avionics,



**ADB Award for Excellence - Certificate of Merit for VEM ATGM being handed over by Chief of Defence Staff Gen Bipin Rawat**



**Inauguration of Advanced Composites Facility by Dr Samir V Kamat, Secretary DD (R&D) and Chairman (DRDO)**

Communications, Motor tubes and its lining, Aerostructures, Hi-energetics (Pyro technology) and combination of systems as part of advanced defence systems.

VEM is already associated with many of the strategic and tactical missile programmes and to its credit, all the missiles in the country fly with one or more of VEM's On Board Systems. The company has been recognized as a production centre under Category 'A' by the Defence Ministry and thus authorized to productionise classified products.

It has received the Defence Industrial licenses based on the capabilities, infrastructure and business verticals. The company is planning to build modern composite structure facility to cater to Advanced Fighter Aircraft (AFA) Project, HAL's Helicopter Structure and UAV structure. In addition, the company is building a large NADCAP approved Electro-plating and

Painting Facility to meet the requirement of BRAHMOS missile, large aero-structures for aircraft, UAV and other weapon projects.

VEM has a strong product development group for both hardware and software with advanced development tool to work on system on chip application using current day Field Programmable Gate Arrays (FPGAs). FPGAs are semiconductor devices that are based around a matrix of configurable logic blocks (CLBs) connected via programmable interconnects. FPGAs can be reprogrammed to desired application or functionality requirements after manufacturing.

In its endeavour to build Helicopters and UAVs, VEM is in the process of establishing facilities for filament and tape winding, Autoclave and Curing oven, Pre-Preg Plant for tapes, machining facilities for composite tubes taking into consideration the complexities. ■

# THE SIXTH-GEN SHIFT

China's recent unveiling of prototype sixth-generation fighter jets – integrating artificial intelligence, hypersonic missiles, and swarm drone capabilities – threatens to outpace India's current aerial prowess. The nation needs to explore a multi-pronged approach to maintain air dominance in the face of growing Chinese military might



## NEERAJ SINGH MANHAS

**T**he global defence landscape is undergoing a transformative shift with the advent of sixth-generation fighter jets. China's recent advancements, including the testing of two prototypes of these state-of-the-art aircraft, have raised alarms in defence circles worldwide. These developments come as China already boasts a formidable aerial fleet, including the "J-20" stealth fighters. Meanwhile, India, a regional power and strategic counterweight to China, continues to rely on the fourth-and-a-half-generation "Rafale" jets while pushing

forward its indigenous fifth-generation "Advanced Medium Combat Aircraft" (AMCA) project. The growing technological disparity in aerial capabilities necessitates a thorough examination of how India can effectively balance the power equation.

### THE SIXTH-GENERATION LEAP

Sixth-generation fighter jets represent a quantum leap in air combat capabilities. They are designed to incorporate advanced stealth features, artificial intelligence (AI) for decision-making, manned-unmanned teaming (MUM-T), directed energy weapons, and hypersonic missiles. According to reports, China's prototypes emphasize integration

with swarm drone technology and hypersonic speed, enabling them to dominate the modern battlefield. The unveiling of these jets not only underscores Beijing's technological prowess but also highlights its intent to establish air dominance, particularly in the Indo-Pacific region. India's current frontline aircraft, the Rafale, offers cutting-edge avionics, long-range missile capabilities, and superior radar systems, positioning it as a formidable platform in South Asia. However, when juxtaposed against China's sixth-generation advancements, the Rafale's limitations become evident. The question arises: How can India bridge this gap and ensure its aerial supremacy remains intact?

### INDIA'S RESPONSE: THE AMCA

India's ambitious AMCA project is its answer to next-generation aerial warfare. The AMCA, a fifth-generation fighter jet, is envisioned to possess advanced stealth, super cruise capability, and AI-powered systems. It aims to serve as a platform capable of holding its own against global competitors. However, the timeline for AMCA's operational deployment—its first flight is expected in 2028, with production slated for the mid-2030s—poses significant challenges. The long gestation period leaves a critical gap during which China's sixth-generation fighters could reshape regional dynamics.

### SHORT-TERM STRATEGIES TO BRIDGE THE GAP

While the AMCA holds promise for the future, India must adopt a multi-pronged strategy to address immediate and mid-term challenges. India's current fleet of Rafales and Sukhoi Su-30 MKIs can be upgraded with advanced avionics, radars, and weaponry to bolster their effectiveness. Incorporating new technologies, such as AESA (Active Electronically Scanned Array) radars and long-range precision missiles, can significantly enhance the combat readiness of these platforms. The recent integration of the "Hammer" missile and "Meteor" beyond-visual-range missiles on the Rafale is a step in this direction. Given the time constraints associated with the AMCA, India should consider acquiring additional Rafales or exploring partnerships to procure other advanced fighter jets. The F-35, a fifth-generation fighter jet from the United States, could be an option, provided geopolitical and logistical hurdles are addressed. Such acquisitions would provide India with a technological edge in the interim.

However, China's advancements in swarm drone technology highlight the growing importance

of unmanned aerial systems. India must accelerate its indigenous UAV programs, such as the "Ghatak" combat drone, while exploring partnerships for advanced drone technologies. A well-integrated UAS fleet can serve as a force multiplier, providing reconnaissance, electronic warfare, and strike capabilities. Investments in force multipliers like Airborne Early Warning and Control (AEW&C) systems, aerial refuelling tankers, and electronic warfare platforms are critical. These assets enhance the operational range and survivability of fighter jets, ensuring that India's air force remains effective in high-threat environments. Modern aerial warfare is as much about platforms as it is about infrastructure. India must continue to develop and modernize its airbases, particularly in forward locations along the northern and eastern borders. Hardened shelters, advanced maintenance facilities, and integrated air defence systems are essential to sustaining long-term operational readiness.

### LONG-TERM VISION: AMCA AND BEYOND

India's success in balancing power with China hinges on the timely execution of the AMCA program. To ensure this, the government must:

- Streamline Procurement Processes: Delays in defence procurement have historically plagued India's defence projects. Streamlining decision-making and reducing bureaucratic red tape are critical to meeting project timelines.
- Focus on Indigenous R&D: Collaborating with global defence companies for critical technologies, such as engines and stealth materials, can fast-

**China's leap in fighter jet technology presents a formidable challenge for India. With its current fleet facing obsolescence against Beijing's cutting-edge capabilities, India must urgently modernise its air force**





**The timeline for AMCA's operational deployment - its first flight is expected in 2028, with production slated for the mid-2030s poses significant challenges. The long gestation period leaves a critical gap during which China's sixth-generation fighters could reshape regional dynamics**

track the AMCA's development. However, the ultimate goal should be self-reliance, aligning with the "Make in India" initiative.

- Leverage International Partnerships: India should actively participate in global defence collaborations. Programs like the "Global Combat Air Programme" (GCAP), led by the UK, Japan, and Italy, offer opportunities for technology sharing and co-development.
- Develop a Sixth-Generation Roadmap: While the AMCA addresses fifth-generation needs, India must simultaneously lay the groundwork for sixth-generation fighter development. Establishing a clear roadmap, supported by sustained investment in advanced research areas like AI, hypersonics, and quantum technologies, is imperative.

**CHALLENGES ON THE HORIZON**

India's path to balancing power is fraught with challenges. Financial constraints, delays in project execution, and dependency on foreign suppliers for critical components remain significant hurdles. Additionally, geopolitical pressures, such as balancing relationships with the US and Russia while addressing China's aggressive posture, add layers of complexity to defence planning. Furthermore, China's economic and industrial

advantages allow it to sustain large-scale defence projects with relative ease. India, on the other hand, must prioritize its limited resources across a range of competing demands, including maritime security and counter-terrorism operations.

**TAKEAWAYS**

The rapid evolution of aerial warfare underscores the need for India to adopt a holistic and proactive approach to modernising its air force. While the Rafale provides a robust interim capability, and the AMCA holds promise for the future, bridging the technological gap with China's sixth-generation fighters requires sustained investment, strategic foresight, and international collaboration. India's ability to balance power in the region will not only determine its defence readiness but also shape its role as a stabilising force in the Indo-Pacific. By leveraging a combination of immediate enhancements, mid-term acquisitions, and long-term developmental programs, India can ensure that it remains prepared to counter any challenge in the skies.

*-The writer is a Special Advisor for South Asia at the Parley Policy Initiative, Republic of Korea. He regularly provides commentary on India-China border issues, water security, and transboundary river challenges in South Asia. You can follow his updates on X at @The\_China\_Chap. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*

# ‘BEL IS MAKING ALL-OUT EFFORTS TO TAP NEW EXPORT MARKETS, EXPAND GLOBAL PRESENCE’

Ahead of Aero India 2025, **Suresh Kumar K V, Director (Marketing), Bharat Electronics Limited (BEL)** in an interview with Editor, **Raksha Anirveda** talked at length about Bharat Electronics Limited's financial performance, expanding global presence, diversification and expansion plans and more. **Edited excerpts:**

**RA:** How do you look at the current international market for defence products, and what strategies is BEL employing to strengthen its global presence?

**SK:** The Ministry of Defence has set an ambitious target of Rs 50,000 crore exports by 2028-29. BEL is, therefore, fast expanding its global presence by making all-out efforts to tap new export markets across the globe. In the last few years, we have made substantial progress, both in terms of export orders acquisition and dispatches. We have identified multiple products and systems for targeted marketing in focussed export markets. In a bid to develop new markets in the Indian Ocean Region and friendly foreign countries (FFCs), we have also operationalised new overseas marketing offices.

All these efforts have paid rich dividends. Our Exports business saw a robust uptick in FY 2023-24 with sales growing by 92% to a record US \$ 92.98 million. BEL's products continued to find increased acceptance in countries such as France, USA, Spain, Israel, Germany, Armenia, Sri Lanka, Mauritius, UK, etc, a clear indication of the company's growing capabilities. BEL also has a healthy Export order book of US \$ 387 million. BEL is enhancing its geostrategic reach and strategically opening overseas marketing offices in the Indian Ocean Region, South East Asia, Middle East Region and Americas.

**RA:** Can you elaborate on your diversification plans?

**SK:** Defence has traditionally been contributing to around 80% of the Company's annual sales revenue. BEL, however, has been continuously exploring opportunities in allied Defence and Non-Defence areas. The Company aims to increase its Non-Defence share in the overall



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business in the coming years. The total opportunity in the Non-Defence business segment being pursued by BEL in the next 10-15 years is more than Rs 2 lakh crores. Some of the areas BEL is focussing as part of diversification efforts include solutions for Civil Aviation, Unmanned systems, Railway & Metro systems, Network & Cyber Security, Smart City solutions, Space Electronics, Arms & Ammunition and Seekers, Medical Electronics and Artificial Intelligence.

**RA:** Tell us about your expansion plans.

**SK:** From time to time, depending upon the growth needs and opportunities, BEL has been taking major initiatives to modernise and expand its infrastructure. Some of the new infrastructure initiatives taken up recently include setting up of a Defence System Integration Complex for Missiles and Weapon Systems at Palasamudram, Andhra Pradesh; state-of-the-art manufacturing facility for Electro Optics and IIR Seekers at Nimmaluru; Fuze manufacturing facility at Nagpur; manufacturing facility for Land-based EW systems at Ibrahimpatnam, Telangana; modernisation of storage magazine and hot integration facility for arms & ammunition at Vellore; and integration facility for QRSAM at Agra.

**RA:** Please tell us about your company's financial performance, turnover, order book position, etc.

**SK:** BEL has always been a profit-making PSU despite various challenges including stiff competition. FY 2023-24 saw the company achieve a record turnover of Rs 19,819.93 crore as against Rs 17,333.37 crore in FY 2022-23, thereby registering a growth of 14.35%. The growth was driven by strong performances across all segments. Defence contributed to 81% of revenue in FY 2023-24 with the balance 19% coming from the non-defence segment. Profit after Tax grew by 33.7% to Rs 4,020 crore in FY 2023-24 as against Rs 3,007 crore in FY 2022-23.

BEL also continued the momentum in order acquisition by booking highest ever annual order inflow of Rs 35,046 crore during FY 2023-24. The company's order book position as on January 1, 2025, stands at around Rs 71,000 crore, giving it stable revenue visibility. ■

## STARTUP ZONE

# THE PARADIGM SHIFT IN DEFENCE: UNLOCKING THE POTENTIAL OF AUTONOMOUS DRONE SWARMS

The next frontier in drone technology lies in swarm systems — autonomous, coordinated networks of drones functioning as a unified force. Swarm technology, while revolutionary, presents several inherent challenges. Arkin Labs' swarm-in-a-box platform is designed to meet India's unique operational challenges. It amplifies strategic capabilities and operational efficiency for saturation attacks, perimeter defence, or intelligence gathering

## ABISHEK V

**T**he paradigm of modern warfare has been irreversibly transformed by technological advancements that enable operational asymmetry. Drones have redefined defence strategies by providing unparalleled capabilities in surveillance, precision strikes, and operational coordination. These unmanned systems have become indispensable assets, enabling armed forces to navigate complex challenges and maintain a decisive edge over adversaries.

Despite their transformative impact, the potential of drones is far from fully realised. The next frontier in drone technology lies in swarm systems — autonomous, coordinated networks of drones that function as a unified force. These systems promise to revolutionise modern warfare by enhancing scalability, resilience, and tactical superiority.

### ENVISIONING THE FUTURE: THE POWER OF DRONE SWARMS

Imagine a swarm of drones operating seamlessly across a battlefield, each executing a specific role

in harmony with the others. These autonomous units, communicating through advanced peer-to-peer protocols, can conduct reconnaissance, execute precision strikes, and disrupt enemy communications. Their collective intelligence and adaptability allow them to function as a cohesive unit, capable of responding dynamically to evolving battlefield conditions.

Swarms enable precision through their ability to operate in saturation attack modes, overwhelming enemy defences with successive waves of coordinated offensives. Initial waves may focus on reconnaissance or diversionary tactics, exposing vulnerabilities, while subsequent waves exploit those gaps with precision strikes. This phased approach ensures that strategic targets are neutralised, forcing adversaries to spread their defences thin and increasing the operational effectiveness of each mission.

Drone swarms also act as deterrents by ensuring round-the-clock surveillance in high-risk areas. Their distributed nature enhances resilience, as the loss of one unit does not compromise the integrity of the operation. This intrinsic redundancy ensures mission continuity even in contested environments, making them invaluable assets in modern defence scenarios.

### CHALLENGES WITH SWARM TECHNOLOGY

Swarm technology, while revolutionary, presents several inherent challenges. The decentralised nature of swarm systems requires highly sophisticated communication protocols that are resistant to interference and capable of real-time decision-making. Ensuring reliability in GPS-denied environments and developing robust AI algorithms for dynamic task allocation add more layers of complexity. Additionally, managing power efficiency for prolonged missions and maintaining operational readiness across diverse and extreme terrains remain critical hurdles.



These challenges are amplified in India due to its vast and diverse terrain, ranging from high-altitude Himalayan borders to dense forests and expansive coastlines. The need for tailored solutions, which account for local conditions such as extreme weather and high altitudes, is paramount. Swarm technology must also address India's operational demands for persistent surveillance, seamless multi-domain integration, and rapid adaptability to emerging threats.

## ARKIN LABS: COMMITTED TO ADDRESSING INDIA'S DEFENCE NEEDS

Arkin Labs is deeply committed to advancing indigenous capabilities in defence technology. The swarm-in-a-box platform is designed to meet India's unique operational challenges, emphasising reliability, adaptability, and scalability. Each component of the system is meticulously developed in-house, ensuring that the platform aligns with the nation's strategic priorities and reduces dependence on foreign suppliers.

A critical aspect of any swarm system is the central management framework that oversees and coordinates the operations of autonomous drones. By integrating real-time data analysis and decision-making capabilities, the central management system ensures seamless synchronisation among drones, optimises resource allocation, and adapts mission objectives dynamically. This overarching control mechanism enhances operational efficiency and provides commanders with a comprehensive view of the battlefield, enabling informed and timely decisions.

The platform supports multi-role and multi-domain operations, enabling a wide range of applications across reconnaissance, electronic warfare, and precision strikes. It incorporates AI-enabled decision-making, empowering commanders with actionable intelligence in real-time. The ability to function in GPS-denied environments enhances its resilience and operational viability in contested territories. By operating autonomously, the platform minimises the need for human intervention, allowing for rapid and precise responses to dynamic threats.

A defining feature of the platform is its modular and scalable architecture. This allows for mission-specific customisation, ensuring the system remains versatile and effective in diverse scenarios. Whether deployed for saturation attacks, perimeter defence, or intelligence gathering, the swarm-in-a-box platform amplifies strategic capabilities and operational efficiency.



By integrating autonomous deployment stations, Arkin Labs ensures sustained operational readiness. These stations provide secure storage, automated battery recharging, and rapid re-launch capabilities, enabling continuous mission cycles without manual intervention. Their ruggedised design makes them suitable for deployment in harsh environments, extending the platform's reach and reliability.

## A NEW ERA IN DEFENCE PREPAREDNESS

Arkin Labs' vision for its indigenous swarm-in-a-box platform extends beyond immediate tactical applications. By fostering collaborations with defence research institutions, private industry, and key stakeholders, the company is building a robust innovation ecosystem to drive continuous advancements in swarm technology. Investments in AI, secure communication protocols, and predictive analytics are laying the groundwork for future capabilities, including distributed decision-making and autonomous resupply micro-units.

The indigenous development and adoption of this platform will represent a transformative step for India's defence forces, exemplifying the nation's commitment to technological self-reliance. As modern warfare continues to evolve, Arkin Labs remains dedicated to ensuring that India's strategic needs are met through innovation, resilience, and operational superiority. By focusing on indigenisation, adaptability, and scalability, Arkin Labs is not just developing technology, but contributing to creating a self-reliant future-ready force. ■

*—The writer, Director, Arkin Labs Pvt Ltd. is a defence technology enthusiast and a key contributor to Arkin Labs' efforts in advancing indigenous drone systems. With a background in engineering, he is passionate about self-reliance in technology and is dedicated to creating robust, scalable, and adaptive platforms that redefine modern warfare*

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# STRENGTHENING THE SKIES

The strategic partnership between India and Israel in aerospace and defence sectors is rooted in trust and collaboration - a testament to the power of mutual respect and a vision for progress that transcends borders. Together, this partnership is achieving a standard of international excellence that exemplifies the best of bilateral cooperation



**Yehuda (Hudi) Lahav, Executive VP of Marketing, IAI**

## **YEHUDA (HUDI) LAHAV**



he enduring partnership between Israel Aerospace Industries (IAI) and India stands out as a model of resilience and collaboration in the aerospace and defence sectors. For nearly 40 years, IAI and India's aerospace and defence ecosystem have cultivated a strategic partnership rooted in trust and collaboration - a testament to the power of mutual respect and a vision for progress that transcends borders. Together, we have addressed complex challenges and driven innovation in defence and aerospace technologies.

This partnership is more than transactional. It is a strategic alliance grounded in balancing strengths and a shared vision of technological advancement, security, and self-reliance. For IAI, India is a durable partner, not just a market. The milestones achieved in this

collaboration - from cutting-edge missile systems to localised defence solutions - underscore its significance and potential for even greater achievements.

With my background as an Air Force navigator and squadron commander, I have experienced firsthand the critical necessity of rapid response, repair and maintenance, and local training. Therefore, my team and I ensure that our partners in India have the best service possible in these areas. We have also taken our collaboration with the Indian defence ecosystem further via numerous projects, which include different levels of 'Make in India' - Aatmanirbhar Bharat. We hope and believe that this provides a fundamental peace of mind to our counterparts who rest assured witnessing the immense efforts and investment IAI makes in India.

One of the most notable accomplishments of this partnership is the Medium Range Surface-to-Air Missile (MRSAM) system, jointly developed with the DRDO, exemplifying what can be achieved when two nations

pool their expertise. This advanced system has become a part of India's defence infrastructure, serving its Navy, Air Force, and Army with capabilities tailored to address modern threats.

However, developing systems is only part of the equation. Superior operational readiness is equally critical, and IAI has invested in local subsidiaries like Aerospace Services India (ASI) and HELA Systems. These entities provide maintenance, repair, and overhaul (MRO) services within India, reducing turnaround times and ensuring the continuous availability of critical defence systems. This localised approach demonstrates IAI's commitment to addressing India's unique needs with concrete, on-the-ground support.

India's vision of self-reliance aligns closely with IAI's strategy of supporting local capabilities and fostering impactful innovation. Programs like NeuSPHERE exemplify this alignment. Through NeuSPHERE, IAI partners with Indian startups to co-develop advanced technologies such as artificial intelligence, quantum computing, and autonomous systems. By providing access to resources and expertise, these collaborations enable startups to refine their innovations and scale globally, benefiting both local and international ecosystems.

The aerospace sector is indispensable to modern defence. It underpins national security, maintaining strategic advantages and responding effectively to evolving threats. From UAVs to radar systems, aerospace technologies form the backbone of robust defence frameworks. IAI's contributions, such as the work conducted at HELA Systems in Hyderabad, underscore the importance of localised solutions that enhance operational readiness while delivering cost efficiencies. These efforts support agility and preparedness for any scenario.

Beyond defence, dual-use technologies are shaping the future of this collaboration. Innovations such as edge computing, green energy solutions, and autonomous systems are revolutionising defence and unlocking new opportunities in civilian applications. For example, green energy solutions developed for defence purposes are now finding broader industrial applications, illustrating the transformative potential of this collaboration.

An example of this multidimensional approach is our CSR collaboration with IIT Delhi. This initiative combines the academic rigor of one of India's premier institutions with IAI's industrial expertise to tackle critical applied research challenges. The research



developed through this partnership can extend benefits across defence and civilian sectors, addressing critical societal needs while advancing technological progress.

As we look toward Aero India 2025, IAI is proud to showcase the outcomes and possibilities of this enduring partnership. From advanced UAVs to next-generation radar systems, the technologies developed through this collaboration reflect a shared commitment to addressing modern challenges while anticipating future needs. Aero India will also serve as a platform to explore new avenues for collaboration, ensuring that our partnership continues to thrive in an ever-changing global landscape.

The relationship between IAI and India is grounded in shared strategic goals and mutual respect. Aerospace and defence technologies are not merely tools of security; they are catalysts for progress and innovation. Together, we are achieving a standard of international excellence that exemplifies the best of bilateral cooperation. ■

*-The writer is Executive Vice President of Sales and Marketing at Israel Aerospace Industries (IAI), leading the company's business growth worldwide. IAI is a world-leading aerospace and defence company innovating and delivering state-of-the-art technologies in space, air, land, naval, cyber and homeland security for defence and commercial markets*

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## MUSINGS FROM RUSSIA

# KREMLIN WANTS TRUMP TO TAKE HIS TIME FOR UKRAINE SOLUTION

While President Trump is in a hurry to fulfil promises made during his election campaign to get the three-year old Russia-Ukraine war ended, Kremlin wants the US President to take cognisance of ground realities



 **VINAY SHUKLA**

**F**rom the very beginning the Kremlin has been skeptical of US President Donald Trump's declaration of ending Ukraine war within 24 hours of his taking the charge of the White House and dismissed it as campaign promises. Because with the Western arms and logistic support, Zelinsky's forces have escalated the hostilities through massive strikes on Russia's critical military and energy infrastructure drawing devastating retaliatory strikes by the advancing Russian troops deeper into Ukrainian territory.

President Vladimir Putin has declared his readiness to meet with the US President Trump if he takes "cognisance of ground reality", (traditionally Russian speaking occupied territories of Eastern Ukraine, should be recognised as part of Russia).

Other conditions set by the Kremlin for lasting

peace include: downsizing the armed forces of Ukraine (AFU) to 50,000, withdrawal of long-range weapons supplied by NATO countries, denazification of Ukraine, no NATO membership and guarantee of neutrality.

However, these conditions are unacceptable for Volodymyr Zelensky, who demands Russian rollback to the line when it launched its special military operation on February 24, 2022. Moscow, which has categorically refused to agree for a ceasefire sans comprehensive solution of the Ukraine, has little interest in holding talks with Zelensky as it considers him as an illegitimate head of Ukraine, whose term expired last year in May, according to the constitution of former Soviet

state he was to hand over power to the Speaker of 'Verkhovna Rada' (Parliament). Russia says any deal with Zelensky could be declared 'null and void' by Ukraine's constitution court.

### OBAMA'S TRAP FOR TRUMP

Speaking off the record, sources in the Kremlin and Russian Duma note that the unpredictability of Donald Trump is well known. Just in seven days in the Oval Office Trump 2.0 has equally scared friends and foes by his various executive decisions.

On Ukraine also, his position is not very confident as he has fallen-in the trap set by Nobel Peace Prize winner Barack Obama who in 2014 engineered notorious Maidan coup in Kiev, overseen by State Department's Under Secretary Victoria Nuland, who in her leaked telephonic conversation with US Ambassador in Kiev is reported to have said 'fu\*\*k EU' which was trying

to reconcile anti-government protestors with pro-Russian president Viktor Yanukovich.

With the ouster of Yanukovich, ethnic Russian majority regions of Ukraine - Crimea, Donetsk and Luhansk declared independence. Fearing imminent admission of Ukraine into NATO, President Putin ordered the military to take action to get Crimea back into Russia's fold.

However, until February 24, 2022, Russia continued to recognise Donetsk People's Republic (DNR) and Luhansk People's Republic (LNR) as integral parts of Ukraine, with more cultural autonomy and say in accession to NATO.

The negotiations to resolve the situation were conducted in the so-called 'Normandy Format' by France, Germany, Ukraine, and Russia. Donald Trump during his first term avoided arming Ukraine with lethal weapons capable of harming Russia.

"Trump 2.0 now is being forced to play on the chessboard left by Obama's successor Joseph Biden. God only knows what his plans are, he may continue war or simply upset the chess board," a member of Russian parliament said in a private conversation. Russian lawmaker said under President Putin's leadership Russia is ready for both scenarios.

In his first TV interview, President Trump said if he was president this war would never have happened. Mr Putin putting his response in an interview to the Russian state TV, agreed with POTUS and added "unfortunately 2020 polls were rigged" (in favour of Joe Biden).

Trump also says that Zelensky is "no angel and shouldn't have allowed this war to happen". The Kremlin shrugged off Trump's warning to Russia that if Moscow does move to settle this war soon the US would put "massive tariffs and big sanctions" on Russia.

Trump has requested Saudi Arabia and OPEC to lower the price of crude. Last such move led to



the collapse of the USSR and end of the Cold War, probably this is why Trump said war in Ukraine will stop next day, if the oil prices come down.

In response President Putin, who has been preparing the Russian economy to face the challenge of oil price drop from the first day in Kremlin, responded "ready to discuss oil prices, but they have no relevance for the Ukraine war." He also said that Trump will hardly impose massive tariffs and sanctions detrimental to the US economy.

Most civilians though, backing President Putin's leadership and war efforts, are eagerly waiting for the start of talks with Trump to end the crisis as soon as possible so that they could visit relatives living in the two countries. ■

*-The writer is a Moscow-based independent defence analyst. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*



# BITING THE SILVER BULLET: KNOWING THE GUNS BETTER

Inherently dangerous, guns must be handled with extreme caution and care. Thus, familiarisation with the firearms - how they function and best practices for safe usage is imperative

 **SANJAY SONI**

**F**

For many, gun ownership is a part of their life. Guns are woven into their history, from the time matchlock muskets armed the earliest colonies to Colt Revolvers and Winchester rifles of the Old West, to the Glock handguns of today. In order to better understand firearms, here's a guide on guns, and how different types of guns work.

## TYPES OF GUNS

There are many kinds of guns in circulation today, mainly in two categories:

- a. **Long guns** - including rifles and shotguns. As a general rule, long guns fire large-caliber rounds from long barrels and are meant to be fired from

the shoulder.

- b. **Handguns** - including pistols and revolvers, are smaller-caliber weapons with shorter barrels and are meant to be fired using one or both hands.

Let's talk about some of the most common gun types:

## BOLT-ACTION RIFLES

The simplest form of firearm today, a bolt-action rifle is fired by manually pushing forward a bolt, pulling the trigger, pulling back the bolt to release the empty cartridge, and pushing the bolt forward again to load a fresh cartridge.

Because of their manual nature, bolt-action guns are accurate but slow to fire. Bolt-action rifles hold between four and 10 bullets in an internal or detachable magazine. Examples of a bolt-action rifle include the Remington 700 and Howa 1500.



Lee Enfield .303 bolt-action rifle



Winchester Lever Action Rifle

## LEVER-ACTION RIFLES

These rifles date back to the 19th century and are often seen in Western films. A pull of a lever attached to the rifle loads a fresh bullet, the user pulls the trigger, and another pull of the lever ejects the empty cartridge and loads a fresh one.

These rifles date back to the 19th century and are often seen in Western films. A pull of a lever attached to the rifle loads a fresh bullet, the user pulls the trigger, and another pull of the lever ejects the empty cartridge and loads a fresh one.

The position of the lever makes it much faster to fire than a bolt-action rifle. Modern examples include the Winchester 94 and Marlin 336.

## SEMI-AUTOMATIC RIFLES

These weapons can vary greatly, but the common feature is that every pull of the trigger releases one bullet, and loading a new round is automatic. These guns are sometimes called “automatic” weapons, but in this case that term refers to the loading, not the firing.



AR-15 Semi-automatic Rifle

The automatic loading process usually involves recycling some of the gun’s gunpowder gases or momentum and using it to eject the empty cartridge and load a new one. Many semi-automatic rifles have external magazines holding five to 30 rounds, which can be changed quickly to reload the weapon. Examples of semi-automatics include the AR-15 and Browning BAR rifles.

## SHOTGUNS

Shotguns are large-barrel long guns that fire a large amount of small steel or lead pellets—known as “shot”—with each pull of the trigger rather than a single bullet. The shot flies from the barrel in a narrow cone-shaped pattern. This dispersal aids the shooter in hitting small game animals, especially those in flight, such as ducks.



Double-barreled, break-open shotgun

**Semi-automatic guns fire one bullet per pull of the trigger until the magazine is empty. Fully automatic guns continue to fire multiple bullets as long as the trigger is held down, until the magazine is empty**

## REVOLVERS

Often seen in the hands of cinematic cowboys, revolvers were the first multi-shot handguns, storing up to seven bullets in a revolving cylinder that mates with the gun barrel and firing mechanism, including the firing pin.

In modern revolvers, a single pull of the trigger advances the cylinder to a fresh cartridge, pulls back



Revolver

# INSIGHT

Pistol



**Lever-action rifles were used during the Civil War and in the American Indian Wars of the 19th century. Bolt-action rifles were used in World War I, and semi-automatic rifles were used during World War II. Revolvers and pistols were used, and are still in use, with armies around the world**

the hammer, and releases the hammer to strike the primer with the firing pin, firing the handgun.

Modern revolvers are considered semi-automatic weapons. Examples include the Smith & Wesson Model 686 and the Ruger GP100.

## PISTOLS

Pistols are handguns that do not use revolving cylinders. Although some single-shot pistols exist, most pistols these days are semi-automatic handguns that load cartridges from a detachable magazine located in the grip.

Unlike revolvers, which are typically limited to up to six or seven rounds, modern pistols can carry up to

17 rounds in a magazine. Examples include the Glock 17 and the Army's M17 Modular Handgun System, also known as the Sig P320.

## SEMI-AUTOMATICS VS. AUTOMATICS

Semi-automatic guns fire one bullet per pull of the trigger until the magazine is empty. Fully automatic guns will fire multiple bullets as long as the trigger is depressed, until the magazine is empty. Semi-automatic guns are completely legal in all 50 states in the USA. Fully automatic guns in the hands of private citizens are very rare and heavily regulated.

## BUMP STOCKS

"Bump stocks" are aftermarket products that replace the normal pistol grip and shoulder stock of AR-15 and AK-47-type rifles. The replacement bump stock mechanisms can fire much faster than a normal gun user can pull the trigger, dramatically increasing the gun's rate of fire.

Why are bump stocks not automatic weapons? The distinction lies in the fact that the mechanism still fires one shot for every pull of the trigger. Bump stock-equipped guns are not semi-automatic weapons in the traditional way, but the mechanism was still approved by the ATF as a semi-automatic weapon.

"Military-style" firearms generally mean weapons such as the AR-15 that are descendants from the kind of gun a soldier would carry, that can kill many people in a short time.



**Black America "doughboys" of World War I with M1903 Springfield rifles, similar to today's hunting rifles**

Bullets also have different shapes or other features to handle different tasks



However, the simple, unpleasant fact is that all types of firearms currently in use by American sportsmen have been used in wars and conflicts, making all firearms “military-style firearms.”

Lever-action rifles were used during the Civil War and in the American Indian Wars of the 19th century. Bolt-action rifles were used in World War I, and semi-automatic rifles were used during World War II. Revolvers and pistols were used, and are still in use, with armies around the world.

Firearms such as the AR-15 are the latest in a long line of weapons that have evolved from military to civilian use. Guns are just much deadlier than they used to be.

## CALIBERS AND BULLET TYPES

You’ll hear “caliber” tossed around in any discussion of guns. This term is merely a way to identify the type of cartridge that the weapons fires.

Bullet calibers are identified in two ways: by fractions of an inch or in millimeters. The .45 ACP round used in many handguns is 0.45 inches in diameter—just under half-an-inch wide. The .22 round, .38 Special, and .500 Action Express rounds are all named for their sizes as a fraction of an inch. The 5.56-millimeter round used in an AR-15 is also expressed in inches as .223 is 5.56 millimeters in diameter. The nine-millimeter round is nine millimeters in diameter. And so on.

That said, a bullet’s diameter does not mean it will fit in every gun of that size, and there are many sub-varieties of ammunition. A .357 Magnum revolver bullet will not fit in a Glock pistol chambered in .357 SIG. The .22 Short round is primarily meant for pistols,

while the .22 Long round is meant for rifles. This is starting to sound complicated, but what you really need to know is that generally, a single gun can only shoot a single kind of bullet.

Different types of bullet calibers are meant to accomplish different tasks, and there are literally hundreds of bullet calibers. Some are for smaller shooters more sensitive to recoil, others are for long-range shooting, while still others are for close-range self-defence.

For example, a .22 Long round is meant for small game hunting and light target practice. A .223 round, just a tiny bit wider in diameter than .22 Long has a longer range, travels at a higher velocity, and is much more lethal because of the shape of the bullet and the use of more gunpowder.

Hollow-point bullets have a cavity in the nose of the bullet that allows the lead to spread outward on impact, morphing the aerodynamic bullet into a deadly, high-velocity metallic flower, creating gaping wounds.

Tracer bullets are designed to allow the shooter to see where their bullets are striking at night, and armour-piercing bullets can penetrate body armor and light steel armour.

Both are generally restricted to military use.

Snake rounds, pistol rounds that fire a spread of small metal pellets, are useful for killing—you guessed it—dangerous snakes at a distance.

## HOW GUNS WORK

The US Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) defines a firearm as “any weapon (including a starter gun) which will or is designed to or may readily be converted to expel a projectile by

**A bullet’s diameter does not mean it will fit in every gun of that size, and there are many sub-varieties of ammunition. A .357 Magnum revolver bullet will not fit in a Glock pistol chambered in .357 SIG. The .22 Short round is primarily meant for pistols, while the .22 Long round is meant for rifles**

All modern firearms have internal mechanisms to prevent accidental firing. The most common is the safety. At its most basic level, it is a lever that once flipped, blocks the firing pin from dropping on a cartridge primer

## FOUR SAFETY RULES

And while we're talking about responsible gun ownership, let's talk about the four simple rules everyone who handles guns knows—or should know. Each rule is simple, and taken together, they're pretty good at averting tragedy.

### **Rule 1: Always treat every firearm as though it is loaded**

Sometimes people forget a gun is loaded. Sometimes the weapon was loaded without their knowledge. If someone hands you a firearm, it is always a good idea to assume it is loaded. It is also a good idea to visually inspect the gun for a round in the chamber, even if you just saw someone else do it.

### **Rule 2: Always keep the muzzle pointed in a safe direction**

Guns should always be pointed in a safe direction when handled. This goes for whether the gun is unloaded or loaded. Modern engineering virtually ensures today's guns won't go off due to a design flaw, but rule No. 2 is designed to minimise the possibility of tragedy in the event of negligence. If the gun does go off unintentionally, this ensures the bullet won't accidentally hit people or pets.

### **Rule 3: Keep your finger off the trigger until ready to shoot**

This sounds blindingly obvious. The fact is, a shocking number of people new to firearms immediately find their trigger fingers gravitating to the trigger. To people new to guns, it just seems like the place where the index finger is supposed to go. Nope. It's an easy bad habit to get into, but don't put your finger here until you're ready to fire. If the person holding the gun is surprised, jolted, pushed, or shoved, his or her finger could reflexively squeeze the trigger, discharging the weapon before it is properly aimed.

### **Rule 4: Know your surroundings**

Aiming a gun with eyes focused on the target, a shooter develops tunnel vision. This makes potential safety hazards between you and your target hard to spot until the very last moment. Furthermore, bullets can travel for miles beyond your target before gravity brings them down. Only shoot in areas where you know with certainty that the entire potential path of the bullet is safe. I like to go to the shooting range, for example, and these places prohibit people from moving past the firing line until safety officers give the "all clear." Typically, they also have a built-in sand berm or other backstop to stop bullets.

Guns are inherently dangerous and must therefore be handled with extreme caution and care. The more you familiarise yourself with firearms, how they function, and best practices for safe usage, the more responsible gun owner you'll become.

the action of an explosive." In other words: if you have a tube and a projectile, and the projectile is designed to fly out of the tube as the result of an explosion, you have a firearm. This is a broad definition that covers everything from potato guns to fully automatic machine guns, but it provides the basic definition of what a gun is and how it works.

In the most basic sense, guns work like this: a bullet is loaded into the rear of the barrel, which is a tube connected to the firing pin. Mechanically speaking, the trigger is the catalyst that sets off a chain of events, starting with the release of the firing pin, which flies forward, striking a tiny explosive charge located in the base of the bullet. That explosion ignites the gunpowder, which is tucked inside the shell casing surrounding the bullet. The pressure change forces the bullet out of the casing and down the barrel toward the target.

Admittedly, the rapid evolution of guns makes it hard to look at them and see their basic components—a trigger, firing pin, and tubes. Today's firearms have magazines capable of holding up to 30 or more bullets, or more than one barrel, or can fire more than one bullet per pull of the trigger. Some guns have lights, lasers, rifle scopes, bipods, and other accessories to

identify a target or aid in marksmanship. It's true that many guns operate quite simply, but as technology progresses, newer models are continually becoming more sophisticated.

## GUN SAFETY TIPS AND TECH

All modern firearms have internal mechanisms to prevent accidental firing. The most common is the safety. At its most basic level, it is a lever that once flipped, blocks the firing pin from dropping on a cartridge primer.

Other mechanisms are less intrusive and are meant to prevent accidental discharge in the event the gun is dropped or mishandled. The Colt M1911A1 and the Springfield XD both have grip safeties - levers that must be pressed when the gun is held properly for the gun to fire. The Glock pistol has a safety on the tip of the trigger itself, ensuring that a finger must be on the trigger for the gun to fire. ■

*—The writer is the Managing Director of Hughes Precision Manufacturing Pvt Ltd, India's first small calibre manufacturer in the private sector. An MBA from the Indian Institute of Management - Bangalore, he has been involved with the ammunition industry in India and abroad for the last eight years*

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## ISRAEL-INDIA: STRATEGIC SYNERGY

Israel and India's defence partnership continues to flourish as both countries face hostile neighbours and the threat of terrorism. The growing bilateral trade is also a reflection of Israel's recognition of the strategic importance of the Indian market within the global defence industry

 **ARIE EGOZI**

India has long been one of the primary markets for the Israeli defence industry. The cooperation spans a wide range of systems and, in line with the "Make in India" policy, involves joint ventures and various forms of collaboration between Israeli and Indian defence companies.

A prime example of this collaboration is the Drishti-10 Starliner. According to a report published in *The Tablet* by Sameer Patil, Senior Fellow at the Centre for Security, Strategy, and Technology at the Observer Research Foundation (ORF), India, and Deputy Director of ORF's Mumbai Centre, the Drishti-10 is an Indian-manufactured version of Israel's Elbit Systems' advanced Hermes-900 UAV. It is reported to include over 70% local components.



Produced by Adani Defence and Aerospace, an Indian defence manufacturer, the drone is scheduled to be inducted into the Indian Navy later this year, significantly enhancing the country's intelligence, surveillance, and reconnaissance capabilities across the Indian Ocean region. Additionally, the Indian Army has placed orders for these drones, likely for deployment along the Himalayan border with China, where tensions have been ongoing for over three years.

"The production of the Drishti-10 Starliner is symbolic of the thriving India-Israel defence cooperation, which in recent years has become one of the most significant relationships for New Delhi as it deftly manoeuvres the turbulent Middle East and also tackles the China threat on its borders. Driven by the shared threat perception of being surrounded by hostile neighbours and the challenge of terrorism, both

countries have emerged as strong partners, particularly in the defence trade," the report states.

This collaboration received a notable boost in 1999 when India launched an offensive to expel Pakistani troops who had occupied parts of the Kargil region in Jammu and Kashmir. Faced with the difficult task of dislodging the Pakistani forces, the Indian defence forces found themselves in a demanding situation. Israel stepped in by supplying mortars, ammunition, and laser-guided missiles, which added precision and lethality to the Indian military campaign. The Israeli assistance remained steadfast despite significant pressure from Western countries to delay shipments of defence supplies.

"Much of the defence equipment in the Indian inventory remains of Soviet and Russian origin. Over the last decade and a half, however, New Delhi has been consciously diversifying its defence supplies and Israel is among the top arms exporters to India, along with the United States and France. In 2000, India and Israel signed their first defence deal for the purchase of the Barak-1 surface-to-air missile system. As per the available figures from the SIPRI Arms Transfers database, India's purchases from Israel totalled \$4.2 billion between 2001 and 21. Others estimate that India buys \$2 billion worth of weapons from Israel annually."

India has purchased several significant Israeli defence systems over the years, including the Phalcon airborne early warning and control system, which is installed on Russian Il-76 aircraft. This system is crucial for enhancing surveillance and operational coordination. India has also acquired various unmanned aerial vehicles (UAVs) from Israel, including the Heron, Searcher II, and Harop. These UAVs contribute to intelligence, surveillance, and reconnaissance capabilities in both military and strategic operations.

Additionally, Israel has supplied surface-to-air missile systems like Spyder and Barak, both of which offer advanced air defence capabilities. India's arsenal is further bolstered by Israeli air-to-surface missiles such as the Popeye I and II, as well as the Spike anti-tank guided missiles. To complement these systems, Israel has also provided a range of sensor systems that enhance the effectiveness of the country's defence operations, integrating cutting-edge technology into India's military arsenal.

According to Indian researcher Sameer Patil, the defence trade between India and Israel is mutually beneficial, as Israeli equipment has significantly enhanced India's intelligence, surveillance, and reconnaissance capabilities. This has been especially crucial in areas where India faces heightened security concerns, such as along its disputed borders with Pakistan and China.

For instance, the Indian army operates Medium Altitude Long Endurance (MALE) Heron drones, a product of Israel's

**Israel Aerospace Industries (IAI) is at the forefront of supplying advanced defence systems to India, from aerospace to land and maritime sectors. With collaborations such as joint ventures with Bharat Electronics Ltd and subsidiaries like ASI, IAI supports India's goal of self-reliance under the "Make in India" initiative**

# ISRAEL DIARY



**Rafael, a leader in advanced defence solutions, focuses on technology transfer to India, aligning with the nation’s “Aatmanirbhar Bharat” vision. Through local partnerships, Rafael contributes to India’s growing defence ecosystem with cutting-edge air-defence and missile systems**

cutting-edge UAV technology, for real-time surveillance along the “Line of Actual Control” (LAC) — the de facto border between India and China. This region has witnessed a protracted stand-off between the two militaries since 2020. These drones provide vital intelligence that supports military operations and helps maintain a strategic edge in the region. The use of Israeli surveillance systems has thus bolstered India’s defence posture, making the bilateral trade increasingly important in addressing security challenges along these sensitive borders.

According to a report in The Tablet, Indian Special Forces are equipped with a diverse array of Israeli-made assault rifles, including the Tavor, Galil, and Negev machine guns, as well as the B-300 man-portable anti-tank weapon system. This sophisticated arsenal enables the Indian Special Forces to perform high-precision operations with remarkable tactical flexibility. Notably, during the 2016 cross-border strike targeting terrorist facilities in Pakistan-occupied Kashmir, Indian army commandos employed the Tavor and Galil rifles. These rifles were integral to the success of the mission, underscoring the effectiveness of Israeli weapons in critical operations.

Israel’s collaboration with India extends beyond weaponry. Through active participation in India’s Make in India initiative, Israel is contributing to the growth of the Indian defence sector. Launched in 2014, the Make in India initiative aims to enhance India’s defence manufacturing capabilities by encouraging greater involvement from the private sector. Israel’s support of this initiative signals its commitment to strengthening ties with India and meeting the growing demand for advanced military systems in the region. The partnership is also a reflection of Israel’s

recognition of the strategic importance of the Indian market within the global defence industry.

“Following a similar model of major American aerospace companies, Israel’s defence industry is currently establishing fruitful partnerships with India’s private sector to boost domestic production. Israeli defence giants IAI, Elbit Systems, and Rafael Advanced Defense Systems have partnered with Indian companies Bharat Forge, Tech Mahindra, Adani Defence and Aerospace, and Tata Advanced Systems to manufacture advanced sub-systems and homeland security systems. As mentioned at the beginning, Adani Defence and Aerospace (a subsidiary of the Adani Group with revenues of \$32 billion) and Elbit Systems have joined hands to produce UAVs such as the Drishti-10 Starliner, a variant of the Hermes-900 drone. Reportedly, this is the only facility outside Israel to manufacture this drone system. Reports suggest that more than 20 of the Hermes-900 drones, produced by this Adani-Elbit joint venture, have been exported to Israel for military use.”

The report says that Israeli companies have demonstrated a keen ability to identify and leverage the niche technological expertise offered by their Indian counterparts. For instance, Tonbo Imaging, an Indian company specialising in electro-optics systems, has for many years supplied this advanced technology for IAI and Rafael’s precision-guided bombs.

The report highlights the remarkable collaboration between Israeli companies and their Indian counterparts, specifically focusing on niche technological expertise. For instance, Tonbo Imaging, an Indian company specialising in electro-optics systems, has long been a supplier of advanced technology for Israeli companies

such as IAI and Rafael, contributing to the development of precision-guided bombs. This collaboration underscores the effective leveraging of local expertise to enhance the technological edge of both countries in the defence sector.

Brig Gen (Res.) Yair Kulas, the head of SIBAT (the International Defence Cooperation Directorate of the Israeli Ministry of Defence), emphasised the enduring and robust defence partnership between Israel and India. In a conversation with Raksha Anirveda, Kulas stated that the relationship is based on shared values, mutual respect, and a joint commitment to security and innovation. His remarks underline the strategic nature of this partnership, built on trust and collaboration, with a focus on technological advancements in defence.

SIBAT head, Brig Gen Yair Kulas said, "India continues to be a key partner for Israeli defence industries, and we see great opportunities in working together, including through joint ventures and local collaborations that align with India's strategic initiatives. The close cooperation between our Defence Ministries has been instrumental in advancing numerous joint projects, strengthening our bilateral defence ties."

He added, while the global defence landscape is competitive, Israel's proven technologies and close ties with India ensure that our partnership remains resilient and forward-looking. We are confident that this collaboration will continue to grow, addressing evolving challenges and fostering mutual benefits for both nations.

Israel Aerospace Industries (IAI) is a dominant force in Israel's defence industry, actively engaging in India's defence sector. As Boaz Levy, IAI's President and CEO, notes, IAI has consistently been a cornerstone supplier of strategic and advanced systems to India, spanning sectors such as land, maritime, aerospace, and homeland security. In the last decade, IAI has expanded its collaborations with both public sector undertakings (PSUs) and private Indian firms. This includes integrating advanced systems for India's Ministry of Defence, in alignment with India's "Make in India" policy. These collaborations not only focus on providing cutting-edge technologies but also aim to address future defence needs.

In support of local innovation, IAI has established subsidiaries such as ASI and HELA Systems and formed joint ventures with Bharat Electronics Limited (BEL) - BIA, which ensure in-country support for critical defence systems. Through IAI's local innovation programme, NueSPHERE, the company has partnered with Indian startups, academic institutions, and industry players to develop advanced technologies tailored to India's requirements. This collaborative approach aligns with India's self-reliance goals while fortifying the long-term strategic partnership between IAI and India.

At the upcoming Aero India 2025, IAI will present its latest advancements in military aviation, air-defence,

missile systems, unmanned systems, special-mission aircraft, radars, and cyber technology. This event will also serve as a platform to explore new opportunities for collaboration and ensure that existing partnerships continue to thrive in the evolving global defence landscape.

Parallel to IAI's efforts, Rafael is also committed to India's defence ecosystem. Yoav Tourgeman, Rafael's CEO, affirms the company's support for India's defence sector through strong local partnerships and state-of-the-art technological solutions. Rafael aligns with India's "Aatmanirbhar Bharat" vision by prioritising technology transfer, fostering indigenous manufacturing, and enhancing local industry capabilities to meet the nation's security needs.

Elbit Systems, another key Israeli defence company, views India as a strategically important partner. Ran Krill, EVP for international marketing and business development at Elbit, underlines India's significance both as a market and a collaborator in advancing defence technology. Elbit has built a strong presence in India through strategic collaborations and joint ventures, all aligned with India's "Make in India" initiative. This initiative, aimed at reducing reliance on imports, is one Elbit fully supports. Krill further emphasises that Elbit's involvement in India extends beyond mere market opportunity, contributing to the country's defence self-reliance and economic growth through the export of domestically produced parts.

Orbit Communication Systems Ltd, a leader in airborne and maritime SATCOM systems, has been integral to India's defence sector for over three decades. Dany Eshchar, President and CEO of Orbit, highlights the company's field-proven solutions across air, land, and maritime platforms. Orbit's SATCOM solutions have been instrumental in supporting the Indian Ministry of Defence (MoD), the Indian Navy, the Indian Air Force, and DRDO labs. The company's systems are deployed on a wide array of platforms, including mission aircraft, rotary-wing aircraft, transport vessels, and unmanned systems. In addition, Orbit's SATCOM solutions are used for providing communication on the move for armoured vehicles, proving essential for modern warfare scenarios. Orbit's contributions also extend to ISRO/ISTRAC and other Indian space initiatives.

"Live demonstration of Orbit Multi-Purpose Terminals (MPT) of Ka Band solution has been made to all wings of MOD, Indian Coast Guard (ICG) and potential customers for meeting the expectations of Indian market which shall soon migrate to Ka band in the year 2025-26," Eshchar added.

These collaborations underline the growing and multifaceted defence relationship between Israel and India, with a focus on technology transfer, innovation, and self-reliance, in line with India's broader defence strategy. ■

*-The writer is an Israel-based freelance journalist. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda*

**Elbit Systems has established itself as a key partner in India's defence preparedness, providing solutions across land, naval, and aerospace domains. By participating in the "Make in India" initiative, Elbit helps India reduce reliance on imports, contributing to both national security and economic growth**

# ARKHANGELSK: RUSSIA'S NEW NUCLEAR SEA MONSTER

Last month, Russia unveiled its latest nuclear submarine, the K-564 Arkhangelsk, at an official launching ceremony held in Severodvinsk. This state-of-the-art vessel is part of Project 885M and will bring the total capacity of Russia's nuclear submarines to 16



## RA EDITORIAL DESK

**R**ussian Navy is all set for a major power upgrade in its strategic and tactical maritime capabilities as the latest submarine built under Project 885M (Yasen-M, as per NATO's parlance), a multi-purpose nuclear-powered submarine, *Arkhangelsk*, will be delivered to the Russian Navy by next summer. With an estimated 64 vessels, including 16 nuclear-powered ballistic missile submarines, the Russian Navy has one of the largest submarine fleets in the world.

According to media reports, the head of the All-Russian Navy Support Movement Vladimir Maltsev, confirmed that the Russian Navy will soon be equipped with the submarine, built at the Sevmash Shipyard, which is part of the United Shipbuilding Corporation.

"The *Arkhangelsk* is currently undergoing state trials. The submarine is planned to be delivered to the Russian Navy in the summer of 2025," news agency Tass quoted Maltsev as saying. *Arkhangelsk* was deployed to the sea for the first time in June for sea trials.

The Sevmash shipyard is constructing five Project 885M submarines. Designed for multiple roles, including anti-ship, anti-submarine, and land-attack missions, the Yasen-M submarines are extremely versatile. The submarine first set sail for factory

sea trials in June 2024, and five other submarines of the Project 885M class are under construction at Sevmash. The Severodvinsk, Kazan, Novosibirsk, and Krasnoyarsk have already been delivered to the fleet.

The Yasen-M class submarines will significantly strengthen the capacities of the Russian Navy's Northern Fleet. The attack vessels will pose a serious challenge to NATO military bases, naval convoys, and onshore critical infrastructure in case of crisis and conflict. Russia is planning to expand its fleet of the Yasen-class to 12 vessels. Half of them could be based in the Northern Fleet.

The submarine that will be Russia's fifth vessel of the Yasen class (Project 885M) has started its first round of sea trials in the White Sea. "Nuclear submarine *Arkhangelsk* of the Project 885M. First departure for sea trials," read a short message published by Northern Fleet's newspaper Na Strazh'e Zapolyare. A social media post from the newspaper published on the June 14, shows the 130-metres-long vessel sailing out of the Northern Dvina River with course for open waters.

The keel of the *Arkhangelsk* was laid in 2015 and it was put on the water at Sevmash in November 2023. It was due to be handed over to the Navy in late 2024. The K-564 *Arkhangelsk's* journey to completion



K-564 Arkhangelsk

has been a long one. It took Russia 8 years to build the K-564 *Arkhangelsk* nuclear sub. Its foundation stone was laid on March 19, 2015, marking the beginning of an eight-year construction period till the launch in November 2023. A key reason behind this extended timeline was frequent funding delays that beleaguered its development.

The ability of the Yasen-M class submarines to navigate without detection could potentially pose a significant threat to enemy's naval bases, crucial land infrastructure, and military convoys in times of escalating crisis. Stationed at the Nerpitcha piers of the Western Litsa submarine base, merely 60 kilometres off the NATO nation Norway's border, is the K-564 *Arkhangelsk*. Joining it are two other members of the Yasen-class vessel family – the Severodvinsk and the Kazan.

## THE WEAPONS

The Yasen-M class submarines are equipped with advanced weaponry, including Oniks and Kalibr-PL cruise missiles, capable of both land-attack and anti-ship missions. It will also be able to carry the Tsirkon hypersonic cruise missiles. A Tsirkon was first time tested from the Yasen-class submarine

Severodvinsk in October 2021, from a submerged position at a depth of 40 metres. As of now, the Tsirkon missile has been installed on the Northern Fleet's latest Gorshkov-class frigate. This ship often patrols the Barents Sea and North Atlantic regions off the Scandinavian Peninsula.

Arming the new Yasen-M class submarines with hypersonic Tsirkon cruise missiles is a crucial move for Russia in its ongoing naval competition with NATO. While these submarines can carry Kalibr cruise missiles, the Tsirkon's superior capabilities make it more significant.

The Zircon, a nimble-wing scramjet anti-ship cruise missile, is reported to have a speed capacity of up to Mach-9, which is nine times the speed of sound. It can travel up to 1,000 kilometres, meaning it can be launched from within Russia's defence zone in the Barents Sea, reaching enemy warships virtually anywhere north of the Arctic Circle in the Norwegian Sea.

"The weapons systems of these vessels are significantly superior to their foreign counterparts in a number of their characteristics." Navy Commander at the time Nikolai Yevmenov underlined in a speech delivered during a ceremony in November 2023. ■

**The Sevماش shipyard is constructing five Project 885M submarines. Designed for multiple roles, including anti-ship, anti-submarine, and land-attack missions, the Yasen-M submarines are extremely versatile**

# INDIA JOINS EURODRONE PROGRAMME AS AN OBSERVER

The move taken by OCCAR shows India's willingness to explore opportunities to potentially collaborate on subjects of common interests between the country and Europe

## RA EDITORIAL DESK

**I**n a boost to India's drone industry, the country has been granted observer status on the four-nation Eurodrone program which is edging towards completion. India joins Japan as observer on the project launched by Italy, France, Germany and Spain and run by Europe-based contracting agency Organisation for Joint Armament Cooperation (OCCAR) to build a MALE RPAS drone that will give Europe greater autonomy in the drone sector.

The Organisation for Joint Armament Cooperation (OCCAR), based in Bonn, Germany and overseeing several European defence programmes, has granted the Government of India the Observer Status in the Programme following a formal request received in August 2024.

OCCAR-EA Director Joachim Sucker delivered the Letter of Approval (LoA) signed by the former OCCAR Board of Supervisors (BoS) Chairman, Lt Gen Frédéric Goetynck, to the Ambassador of India to Germany, H. E. Mr Ajit Gupte.

This move is taken by OCCAR as a first step that shows India's willingness to explore opportunities to potentially collaborate on subjects of common interest between the country and Europe.

Currently under development by Airbus, France's Dassault Aviation and Italy's Leonardo, the Eurodrone, with a wing span of 26 metres, is a Remotely Piloted Aircraft System (RPAS) designed to carry-out various long endurance missions ranging from Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) and Attack to, for example, Maritime Surveillance, Anti-Submarine Warfare and Airborne Early Warning missions in the future.

During an October visit to Leonardo facilities



in Italy, Eurodrone program officials inspected the mission computer and Gabbiano electronically scanned radar due to be installed on the platform.

Prime contractor Airbus has stated the Eurodrone will be able to fly in non-segregated airspace, carry weapons, offer naval anti-submarine warfare as well as electronic-warfare capabilities, featuring a 2.3 ton payload, 40 hours of autonomy and 45,000 feet maximum altitude.

Twin turboprops are positioned behind the wing in a pusher configuration.

The development follows years in which EU states dragged their heels on joint drone development. Launched in 2015, the Eurodrone program originally aimed for a first delivery in 2025, although entry into service is now planned for 2029.



From left to right: Ambassador of India to Germany, Ajit Gupte receiving the official OCCAR plaque from OCCAR-EA Director, Joachim Sucker. ©OCCAR



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# APPOINTMENTS

## DG PARAMESH SIVAMANI APPOINTED AS THE 26<sup>TH</sup> DG OF ICG



**New Delhi.** Director General Paramesh Sivamani, PTM, TM has been appointed as the 26th Director General of the Indian Coast Guard (ICG).

The Flag Officer, during his illustrious career spanning over three and a half decades has served in various capacities in ashore and afloat appointments. The officer's professional history is studded with achievements and a proven track record of outstanding and meritorious performance in all assignments that he has held. DG Paramesh Sivamani is specialised in Navigation and Direction and his sea commands include all major vessels of the Indian Coast Guard which include Advanced Offshore Patrol Vessel Samar and Offshore Patrol Vessel Vishwast.

The Flag Officer was at the helm of Coast Guard Region (East), Coast Guard Region (West), Coast Guard Commander (Eastern Seaboard). The Flag Officer is an alumnus of the National Defence College, New Delhi and Defence Services Staff College, Wellington.

He was elevated to the rank of Additional Director General in September 2022 and was subsequently posted at Coast Guard Headquarters, New Delhi as Additional Director General Coast Guard. He was given the additional charge of Director General Coast Guard in August 2024, before assuming the charge as Director General Coast Guard.

## AVM Manmeet Singh Takes Over as Senior Officer-in-Charge Administration, HQ Western Air Command

**New Delhi.** Air Vice Marshal (AVM) Manmeet Singh took over as Senior Officer-in-Charge Administration, Headquarters Western Air Command, New Delhi on January 1, 2025.

Air Vice Marshal Manmeet Singh was commissioned in the Administration Branch of Indian Air Force on June 13, 1992 and is an alumnus of the prestigious National Defence College, Defence Services Staff College (DSSC), Wellington and holds a Master's Degree in Defence Studies and a Post Graduate Diploma in Financial Management from NIFM, Faridabad. During his illustrious service career, he has tenanted key appointments in various



operational Units, Command Headquarters and at Air Headquarters.

## Lockheed Martin Elects John C. Aquilino to Board of Directors

**Bethesda, Md.**

Lockheed Martin's board of directors has elected Admiral John C. Aquilino, former commander of the United States Indo-Pacific Command, to the board, effective on December 11.



Aquilino served as the 26th commander of the US Indo-Pacific Command, responsible for all US military activities in the Indo-Pacific, from 2021 until his retirement as a four-star admiral in July 2024. His previous assignments include serving as the Commander of the US Pacific Fleet, the Commander of the US Fifth Fleet and Naval Forces Central Command, and the Commander of Carrier Strike Group 2.

Commissioned in 1984 following graduation from the US Naval Academy, Aquilino has served as a fighter pilot in every geographic combatant command and participated in nearly every major military operation after his commissioning, including Operations Deliberate Force, Southern Watch, Enduring Freedom, Iraqi Freedom and Inherent Resolve. He is also a graduate of the Navy Fighter Weapons School (TOPGUN), Joint Forces Staff College and Harvard Kennedy School's executive education program in national and international security. Aquilino is considered an independent director under applicable rules and regulations and will serve on the Classified Business and Security Committee.

## Nilabhra Sengupta Takes Charge as CVO, Bharat Electronics Ltd

**Bengaluru.** Nilabhra Sengupta, IRSSE (1997 batch), has taken charge as Chief Vigilance Officer (CVO) of Navratna Defence PSU Bharat Electronics Limited (BEL) on deputation. Nilabhra Sengupta completed his B.E in Electronics & Telecommunications from Jadavpur University, Kolkata, in 1996 and joined the Indian Railway Service of Signal Engineers two years later. Before taking over as CVO of BEL, Sengupta was serving as Chief Signal and Telecom Engineer/Projects at Metro Railway, Kolkata. He was also holding additional charge of Director (Rolling Stock and Systems) in Kolkata Metro Rail Corporation. He has served as ADRM Operations in Eastern Railway, Howrah division, and has also been on deputation to RITES and Bangalore Metro Rail Corporation from 2014 to 2017.

## Electro Rent Appoints Alan Mayer as its New Chief Revenue Officer

**New Delhi.** Leading global electronic test and measurement equipment specialist Electro Rent has appointed Alan Mayer as its Chief Revenue Officer (CRO) to spearhead the company's growth plans. Alan joins Electro Rent with extensive global customer experience across multiple segments and verticals in technology companies, from startups to the Global 500, in both corporate and public sectors. Alan brings 22 years of experience at Dell, where he led sales, services, and customer success teams to champion the evolving needs of customers across the business. He also led the worldwide channel strategy for services and the execution of critical products and programs for channel, distribution, and retail to better serve partners and customers.

# Dr V Narayanan - The New ISRO Chairman and Secretary, DoS

**New Delhi.** Rocket scientist Dr V Narayanan took charge as the chairman of the Indian Space Research Organisation (ISRO) and the secretary of the Department of Space (DoS) on January 14, 2025. He succeeds S Somanath as the 11th chairman of India's premier space research organisation. In a notification on January 7, the Appointments Committee of the Cabinet said Dr V Narayanan will have a tenure of two years.

A distinguished scientist with nearly four decades of experience in rocket and spacecraft propulsion, Dr V Narayanan, 61, joined ISRO in 1984 and functioned in various capacities. During the initial phase, he worked in the Solid Propulsion area of Sounding Rockets and Augmented Satellite Launch Vehicle (ASLV) and Polar Satellite Launch Vehicle (PSLV) at Vikram Sarabhai Space Centre (VSSC). In 2018, he was appointed Director of the Liquid Propulsion Systems Centre (LPSC), one of the major centres of the ISRO, having its headquarters at Valiamala in Thiruvananthapuram, with a unit in Bangalore. The centre is engaged in developing liquid, semi-cryogenic propulsion stages for launch vehicles, chemical and electric propulsion systems for satellites,



control systems for launch vehicles, and transducer development for space systems health monitoring.

Under Dr Narayanan's leadership as Project Director for the GSLV Mk III's C25 Cryogenic Project, the C25 Stage — a vital part of the GSLV Mk III vehicle — was successfully developed. He has contributed to the process planning, process control, and realisation of Ablative nozzle systems, composite motor cases, and composite Igniter cases. Under his guidance, the LPSC delivered 183 Liquid Propulsion Systems and Control Power plants for various ISRO missions. Narayanan's work on the cryogenic systems formed the basis of India's major launches including Chandrayaan-2,

Chandrayaan-3, and Aditya-L1. The LPSC, under Narayanan, is working on making the cryogenic stages and launch vehicles that will be used in the mission human-rated for the upcoming human spaceflight mission Gaganyaan.

Dr V Narayanan's thesis, titled 'Thrust & Mixture Ratio Regulation System of Cryogenic Rocket Engines', formed a pivotal part of India's development of indigenous cryogenic propulsion systems, making it only the sixth country in the world to achieve this feat. Dr Narayanan's academic journey started with a diploma in mechanical engineering (DME). Later, he went on to take the AMIE (Associate Member of the Institution of Engineers) examination, which is recognised as equivalent to an engineering degree by the Government of India. He completed his MTech in Cryogenic Engineering and PhD in Aerospace Engineering from IIT Kharagpur. He also chairs the Programme Management Council — Space Transportation Systems (PMC-STs), which makes decisions in all launch vehicle projects and programmes. He also heads the National Level Human Rated Certification Board (HRCB) for Gaganyaan, India's planned human spaceflight mission. ■

## Dr Sajid Farid Shapoo Joins as New Chief Vigilance Officer of BEML Ltd



**Bengaluru.** BEML Limited has appointed Dr Sajid Farid Shapoo as its new Chief Vigilance Officer (CVO). Dr Shapoo is a distinguished Indian Police Service (IPS) officer from the 1998 batch of the Madhya Pradesh cadre, renowned for his exemplary service and contributions to national security. Dr Shapoo has served in key leadership roles, including as Superintendent of Police in Bind, Satna, Shivpuri, and Dewas

districts of Madhya Pradesh. He was one of the pioneering officers to join the National Investigation Agency (NIA) in 2009, where he led the Investigation Branch and later headed the Intelligence and Operations Division as Deputy Inspector General. During his tenure, he supervised high-profile terrorism related investigations. Dr Shapoo joins after a stellar tenure in Madhya Pradesh, where he served as Inspector General of Law & Order, Inspector General of Anti-Naxal Operations, and most recently, Additional Director General of Special Armed Forces. His illustrious career is marked by numerous accolades, including twice receiving the President's Police Gallantry Medal, the highest honour for bravery in police service. Additionally, he was awarded the Police Medal for Meritorious Services and the Home Minister's Meritorious Service Medal. Dr Shapoo holds a Ph.D. in Security Studies from Princeton University and a Master's in International Affairs from Columbia University, specialising in Middle East and International Security Policy. ■

## Alfonso Martinez Takes Charge as AXISCADES' Group CEO and MD

**New Delhi.** Alfonso Martinez took over as AXISCADES Technologies Ltd's new Group CEO and Managing Director on January 20, 2025. With over 25 years of global experience in engineering and technology, Martinez will lead the company through an exciting phase of growth and expansion. His appointment comes as AXISCADES aims to strengthen its position in the engineering services, defence, and deep tech sectors. Alfonso Martinez brings a wealth of experience from prominent roles in leading organisations. Previously, he was the Global Business Head for Transportation at Quest Global and held key leadership positions at Altran Group (now Capgemini), including Managing Director of Altran Technologies Spain and CEO of Altran Middle East. Martinez is recognised for his strategic leadership, driving growth and innovation while fostering sustainable business transformations. Martinez expressed his excitement to join AXISCADES, emphasising his vision to build on the company's strong foundation of innovation and customer-centric solutions. He aims to leverage the talent within the company to create transformative solutions that address the evolving needs of clients and drive global expansion. His leadership will focus on enhancing technological capabilities and creating long-term value across the business. ■



## NEWS ROUND UP

### BOOSTING ARMY'S AIR DEFENCE CAPABILITIES: GOVERNMENT ISSUES RFI FOR MANUFACTURING OF 23-MM ANTI-DRONE AMMUNITION

**New Delhi.** Seeking to enhance the Army's air defence by manufacturing 23mm anti-drone ammunition, the government issued a Request for Information (RFI) on January 1, 2025 for the manufacturing of 23-mm anti-drone ammunition by the Indian industry. The ammunition is intended to be used with existing Zu 23mm and Schilka weapon system for the destruction of drone and boosting the Army's air defence capabilities.

According to the RFI, there is a requirement of 23-mm anti-drone ammunition in order to increase the hit probability. The purpose of this RFI is to identify the prospective vendor (DPSUs/private vendors) to undertake the manufacturing of 23-mm anti-drone ammunition under "Make in India".

The in-service Schilka system is an air defence system against attacking aircraft and helicopters.

The 23-mm anti-drone ammunition proposed to be procured should have a "proximity/timed fuse capable of being initiated in proximity to drone/loitering ammunition". The fragments of the shell should be of adequate number, size, shape and spread in a pattern to cause damage or destruction to the target and the cartridge case should be "compatible with the existing Zu 23mm and Schilka Weapon System held with the Army Air Defence," says the RFI. ■

### SHAPED BY ADE SCIENTISTS, INDIA'S UNMANNED COMBAT AERIAL VEHICLE PROJECT MAKING SIGNIFICANT STRIDES



**New Delhi.** Scientists at the Aeronautical Development Establishment (ADE), a key laboratory under India's Defence Research and Development Organisation (DRDO), are making significant strides in developing the country's Remotely Piloted Strike Aircraft (RPSA), commonly referred to as the Unmanned Combat Aerial Vehicle (UCAV). This project is crucial for enhancing India's defence capabilities and positioning it among nations with advanced drone technology.

The RPSA program aims to create a stealthy, autonomous drone capable of carrying out precision strikes. The project has transitioned from the Aeronautical Development Agency (ADA) to ADE to leverage ADE's expertise in UAV technology. This move is part of a broader strategy to focus ADA's resources on manned fighter jet programs, such as the Tejas Mk-2 and Advanced Medium Combat Aircraft (AMCA). The RPSA will feature advanced stealth technology to minimise its radar signature, allowing it to evade enemy detection. The aircraft is designed for autonomous operation, including take-off and landing, which is being validated through various flight tests of technology demonstrators like the Stealth Wing Flying Testbed (SWiFT). The RPSA will be equipped with an internal weapons bay for carrying precision-guided munitions, enhancing its strike capabilities without compromising its stealth profile.

Recent flight trials have demonstrated significant advancements in the technologies required for the RPSA. The SWiFT demonstrator,

which has successfully completed multiple test flights, showcases the maturity of India's UAV technology. This includes successful autonomous landings without ground-based radar support, utilising onboard sensor data fusion and satellite navigation systems. This flight demonstrated the ATOL (Autonomous Take-Off and Landing) capability of the stealth UAV, leveraging indigenous technologies developed in-house by ADE.

A senior DRDO official revealed that the Indian Air Force (IAF) has expressed confidence in the project, which could positively influence the CCS. "Scientists have been instructed to prioritise technologies that minimise the RCS (Radar Cross Section) of the RPSA using AI tools. This will enable the aircraft to evade adversary air defences effectively. It's a challenging task, but that's what makes the UCAV mission both exciting and critical," the official stated. The success of the RPSA program is critical not only for India's defence strategy but also for establishing its position in the global UAV market. A robust UCAV capability would enable India to conduct complex operations independently and enhance its strategic deterrence. The work being done by ADE scientists on India's UCAV RPSA program is both vital and promising. With ongoing technological developments and flight testing, India is moving closer to realising its goal of a sophisticated unmanned strike capability. However, addressing the challenges and ensuring consistent progress will be essential for the successful implementation of this ambitious project. ■

## HENSOLDT CONDUCTS RESEARCH IN THE FIELD OF QUANTUM COMPUTING

**Ulm/Germany.** The sensor solutions provider HENSOLDT has been awarded a contract by the DLR Quantum Computing Initiative (DLR QCI) for the QUA-SAR research project. The research project aims to optimise complex radar remote sensing scenarios. In the research project, HENSOLDT is working together with the Microwaves and Radar Institute of the German Aerospace Centre (DLR) and the high-tech start-up Tensor AI Solutions GmbH. The DLR Quantum Computing Initiative is funded by the German Federal Ministry for Economic Affairs and Climate Protection.

Radar remote sensing uses radio waves to collect data about objects or terrain from a distance. Since conditions on the battlefield change in ever shorter cycles, time is an important factor. Radar systems of the future will be multi-platform and multi-sensor networks that must be operational in highly dynamic environments. The best possible distribution of tasks among sensors and sensor networks is becoming a problem that cannot be solved in real time with conventional computers.

Quantum computers promise to be able to solve this challenge in the future, which would provide a decisive advantage in the area of radar resource management. By participating in QUA-SAR, HENSOLDT is complementing its 'Quantum Sensing and Technologies' technology field, which has existed since the beginning of 2024 and is developing HENSOLDT's technological orientation in the field of quantum technologies. ■



## SIGNIFICANT UPGRADE: IAF'S SUKHOI-30MKI TO INTEGRATE INDIGENOUS EW SUITE



**New Delhi.** The Indian Air Force's (IAF) Sukhoi (Su-30MKI) is set to undergo significant upgrades, particularly with the introduction of an indigenous electronic warfare (EW) suite named Yodha and Anidra. The Defence Acquisition Council (DAC) has granted Acceptance of Necessity (AoN) for this upgrade, which is part of a broader initiative to enhance the aircraft's operational capabilities and survivability. The EW Suite, Yodha and Anidra is focused on enhancing self-protection capabilities. It will include external airborne self-protection jammer pods designed to counter enemy radar systems effectively. The Yodha EW Suite is an indigenous electronic warfare system developed by the Defence Research and Development Organisation (DRDO), specifically designed for integration with the Sukhoi-30MKI fighter aircraft. This suite is part of a broader effort to enhance the electronic warfare capabilities of the Indian Air Force (IAF). The Yodha EW Suite is designed to conduct electronic surveillance, jamming, and countermeasure operations. It enhances the aircraft's ability to operate in contested environments by disrupting enemy radar and communication systems.

Alongside Yodha, the Anidra EW Suite complements its functionalities, providing a comprehensive electronic warfare solution for the Sukhoi-30MKI fleet. Both systems are part of a modernisation effort aimed at improving the operational effectiveness of these aircraft in various combat scenarios. The Anidra EW Suite refers to an advanced electronic warfare system developed by the Defence Research and Development Organisation (DRDO). This suite is designed for integration with the Sukhoi-30MKI aircraft, enhancing its operational capabilities in electronic warfare. The Anidra EW Suite is specifically tailored for the Sukhoi-30MKI, a multi-role fighter aircraft used by the Indian Air Force. It works alongside another EW suite named Yodha. This suite is part of a broader initiative that includes systems like Software Defined Radio (SDR), Electro-Optical Fire Control systems, and CBRN (Chemical, Biological, Radiological, and Nuclear) water purification systems. These enhancements aim to improve the aircraft's effectiveness in various combat scenarios.

As of early January 2025, the Yodha and Anidra EW Suite are reported to be in the final stages of user evaluation or development trials, indicating that it is nearing operational readiness and will soon be deployed within the IAF. The integration of these systems aims to protect the Su-30MKI from enemy radar and weapon systems while executing missions against targets shielded by air defence systems. The development of the indigenous EW suite is being spearheaded by the Centre for Airborne Systems and Displays (CASDIC), which has completed a feasibility study for integrating these systems into the Su-30MKI. The project is expected to take approximately 32 months for design and development, with flight testing activities planned to commence shortly thereafter.

The upgrades are crucial for maintaining the IAF's competitive edge in aerial combat and ensuring effective operations in contested environments. The indigenous nature of the Yodha and Anidra systems reflects India's commitment to self-reliance in defence technology, aligning with the country's broader "Aatmanirbhar Bharat" initiative aimed at enhancing domestic production capabilities. The integration of the Yodha and Anidra EW systems into the Su-30MKI represents a significant advancement in India's aerial warfare capabilities, enhancing both survivability and mission effectiveness against advanced threats.

# NEWS ROUND UP

## STRATEGIC PARTNERSHIP: LOTUS ADVANCE TECHNOLOGIES PARTNERS STEADICOPTER TO PRODUCE ROTARY UNMANNED AERIAL VEHICLE IN INDIA



**New Delhi.** India's Lotus Advance Technologies Pvt Ltd has formed a strategic partnership with Israel's Steadicopter Pvt Ltd to produce Tactical Rotary Unmanned Aerial Vehicles (RUAVs) in India. This collaboration, announced on January 17, 2025, aims to enhance the capabilities of the Indian Armed Forces and Paramilitary Forces by integrating advanced technology tailored to local needs. The partnership emphasises the "Make in India" initiative, aiming to reduce reliance on imports by leveraging Lotus Advance Technologies' advanced manufacturing capabilities and Steadicopter's innovative designs. The production will take place at Lotus's facility in Uttar Pradesh, which is certified by Hindustan Aeronautics Limited (HAL) and the Directorate General of Aeronautical Quality Assurance (DGAQA).

On its website Lotus mentions—"The Golden Eagle, developed by Steadicopter, and brought to India by Lotus Advance Technologies under the Make in India policy introduced by our honourable Prime Minister, Narendra Modi, is a revolutionary Rotary Unmanned

Aerial Vehicle (RUAV) tailored to meet the rigorous demands of modern military operations. Engineered for precision, endurance, and adaptability, the Golden Eagle empowers armed forces with advanced situational awareness, seamless reconnaissance capabilities, and mission-critical support."

Steadicopter's one of the standout products is the Golden Eagle HS (Heavy Strike), an advanced Rotary Unmanned Aerial System (RUAS). This system is set to redefine aerial tactical operations by incorporating Rafael's powerful Spike SR and LR2 missiles. These integrations enable precise, stand-off strike capabilities against various hard targets, including armoured vehicles, structures, and maritime vessels, thereby enhancing battlefield dominance. The RUAVs will be specifically designed to meet the operational requirements of the Indian military, including applications in border surveillance, urban warfare, and disaster management. This customisation will consider India's diverse terrains and climatic conditions. The collaboration will incorporate cutting-edge features such as advanced sensor suites, precision strike capabilities, and extended flight times. These enhancements are expected to improve intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) operations for the Indian forces.

This partnership marks a significant step forward in bolstering India's defence manufacturing capabilities and aligns with the country's broader goals of self-reliance in defence technology. ■

## GOVERNMENT OF TELANGANA SIGNS MoU WITH JSW DEFENCE TO ESTABLISH MANUFACTURING FACILITY IN THE STATE



**Davos.** The Government of Telangana has entered into a Memorandum of Understanding (MoU) with JSW UAV Limited, a wholly-owned subsidiary of JSW Defence, to establish a state-of-the-art manufacturing facility to make Unmanned Aerial Systems (UAS) in the state. As part of this strategic initiative, JSW UAV is set to invest approximately Rs 800 crores in the project, through a technology arrangement with a leading US-based defence technology company.

The MoU was signed in the presence of Chief Minister of Telangana, Revant Reddy and Parth Jindal of JSW Group in the presence of senior dignitaries from the state on the side lines of the ongoing World Economic Forum (WEF) at Davos. JSW Defence Pvt Ltd. – a part of the US\$ 24 billion JSW Group – has a strategic partnership with Shield AI, Inc, a leading US defence technology company, to indigenise and manufacture Shield AI's "V-BAT", a Group 3 Unmanned Aerial System (UAS). This collaboration marks a significant step in boosting India's defence capabilities by bringing in world-class UAS technology to the country. ■

## BIRD AEROSYSTEMS RECEIVES ORDER FROM AN AFRICAN COUNTRY TO SUPPLY ITS AIRBORNE MISSILE PROTECTION SYSTEM

**Tel Aviv.** The re-emerging of the shoulder launched missile in the world results in contracts for protection systems. Israeli company BIRD Aerosystems, received an order from an African Ministry of Defence (MOD) to supply its Airborne Missile Protection System (AMPS). This cutting-edge solution will be deployed to protect the fleet of Mi-17 and Mi-24 helicopters from advanced missile threats, including MANPADS. Delivery is expected during 2025. The AMPS family of solutions is engineered to detect, verify, and neutralise threats with unmatched precision. A key system of the AMPS family is BIRD's Self Protection Radar Electro-Optic System (SPREOS) DIRCM, which integrates multiple functions—threat detection, confirmation, tracking, and jamming into a single, compact Line Replaceable Unit (LRU). With virtually zero false alarm rates and optimised jamming techniques, SPREOS ensures unparalleled protection for airborne platforms. ■

## SAFRAN SELECTED BY THE GERMAN BUNDESWEHR FOR THE SUPPLY OF INFRARED MULTIFUNCTION BINOCULARS

**Murr, Germany.** The German Bundeswehr's procurement office (BAAINBw) has selected Safran Electronics & Defense Germany to equip the German forces with the latest generation of portable infrared observation binoculars. These binoculars will provide additional operational capabilities to the German infantry by covering a wide range of operational needs, including day/night observation and target acquisition, irrespective of weather conditions, and even in GNSS-denied environments. Safran Electronics & Defense Germany, based in Murr, Baden-Württemberg, is the primary point of contact for the German armed forces and provides support and operational maintenance for Safran products in coordination with users and key German logistics centres. Safran Electronics & Defense Germany offers a wide range of products from portable optronics to resilient navigation solutions and is a trusted partner of the BAAINBw. ■

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# NEWS ROUND UP

## STRATEGIC PARTNERSHIP: OPTIEMUS COLLABORATES WITH TAIWAN-BASED KUNWAY TECH TO MANUFACTURE DRONES IN INDIA



leverage its local expertise and infrastructure to manufacture KunWay's drone products from its state-of-the-art manufacturing facilities in Noida, India.

Based out of the Chiayi AI Drone Centre in Taiwan, KunWay is devoted to drone products, AI system design and development to provide

**New Delhi.** Optiemus Infracom Ltd on January 14 said its wholly-owned subsidiary Optiemus Unmanned Systems Private Ltd has entered into a strategic partnership with Taiwan-based KunWay Technology to manufacture drones in India.

While open to exploring Kunway's extended product portfolio on a case-to-case basis, Optiemus Unmanned Systems as part of this collaboration, will localise, manufacture, and sell a range of KunWay's drone products tailored for the Indian market.

The partnership also reflects the commitment for both the companies to contribute towards the 'Make in India' vision and Optiemus Unmanned Systems will

appropriate solutions for drone applications and has customers in the US and Japan.

The company has continued to develop and combine AI technology to achieve precise operations, optimising products according to the evolving needs of its global customers.

"In line with keeping abreast with these changing times, we are looking to expand our portfolio of products in the Indian market. Our partnership with KunWay is in line with this goal and we aim to launch their products in the Indian market and localise as per the need of defence and homeland security and bring India on a global stage of drone manufacturing," said Ashok Gupta, Executive Chairman, Optiemus Infracom. ■

## ADSB LAUNCHES FIRST VESSEL IN PRESTIGIOUS FALAJ 3 PROGRAMME



**Abu Dhabi, UAE.** EDGE Group entity Abu Dhabi Ship Building (ADSB), the regional leader in the design, construction, repair, maintenance, refit, and conversion of naval and commercial vessels, celebrated a significant milestone with the launch of the first FALAJ 3 class vessel during a ceremony held at the ADSB shipyard. This launch marks a pivotal phase in fulfilling the contract with the Ministry of Defence (MOD), paving the way for an advanced fleet of vessels designed to enhance national defence capabilities.

Under the patronage of Rear Admiral Pilot Staff Major General Saeed bin Hamdan bin Mohammed Al Nahyan, Commander of the UAE Naval Forces, the ceremony brought together dignitaries, military officials, and senior EDGE and ADSB leadership to commemorate the vessel's debut. ■

## RAFALE-M JET DEAL AWAITING CCS CLEARANCE AFTER MINISTRY OF DEFENCE APPROVAL

**New Delhi.** The Cabinet Committee of Security (CCS) chaired by Prime Minister Narendra Modi is expected to give a formal nod to the deal to buy 26 Rafale-M fighter jets for the Navy from French firm Dassault Aviation. The Ministry of Defence (MoD) recently approved the acquisition of 26 Rafale-Marine fighter jets from France, along with three Scorpene submarines. This decision marks a significant step in enhancing the capabilities of the Indian Navy, which is facing challenges due to a dwindling fleet of conventional submarines and fighter jets. The purchase is for 26 Rafale-M jets, comprising 22 single-seat and 4 twin-seat trainers with the estimated deal of the cost being around 63,000 crore (approximately \$7.5 billion). The agreement includes weapons, simulators, crew training, and logistical support. The deliveries are expected to commence approximately three years after the contract is finalised.

The acquisition was approved by the Defence

Acquisitions Council (DAC), led by Defence Minister Rajnath Singh, and now awaits final approval from the Cabinet Committee on Security (CCS) before contracts can be signed. This approval process is crucial as it will follow extensive techno-commercial negotiations that may take several months to finalise.

The decision to procure Rafale-M jets comes in response to increasing security threats in the Indian Ocean region, particularly from China's expanding naval capabilities. The Indian Navy currently operates a limited number of MiG-29K jets, which have faced serviceability issues over time. The introduction of Rafale-Ms is seen as an interim measure until indigenous fighter programs can be operational.

Additionally, the deal for three Scorpene submarines—costing around 38,000 crore—is also part of this strategic enhancement. These submarines will be built at Mazagon Docks in Mumbai and will feature advanced air-independent propulsion systems



for improved underwater endurance. Following the MoD's approval, the next steps involve finalisation of contracts which the CCS will review and approve the terms before formal contracts are signed. The detailed negotiations regarding pricing and terms with the French government are expected to commence soon. The aim is to complete all procurement processes within this fiscal year, aligning with India's broader defence modernisation goals. ■



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# NEWS ROUND UP

## PARAS DEFENCE TO ESTABLISH INDIA'S FIRST DEDICATED OPTICS PARK WITH INVESTMENT OF RS 12,000 CRORE

**New Delhi.** Paras Defence and Space Technologies Limited has announced a significant investment of Rs 12,000 crore to establish India's first dedicated optics park in Navi Mumbai, Maharashtra. This ambitious project, formalised through a memorandum of understanding (MoU) with the Maharashtra government, is set to span over the next ten years, with operations expected to commence in 2028 and full completion targeted by 2035.

The optics park aims to serve as a technology hub focusing on various applications, including defence, space, automotive, and semiconductor technologies. It is anticipated to create approximately 2,000 direct employment opportunities, contributing to local economic growth and reinforcing India's commitment to technological independence under the 'Make in India' initiative.

The Maharashtra government has pledged its support by facilitating necessary approvals and incentives to ensure the project's success. Munjal Sharad Shah, Managing Director of Paras Defence, emphasised that this project will not only enhance the domestic manufacturing ecosystem but will also position India as a global innovation leader in optical technologies. ■



## SPAIN'S ALPHA UNMANNED SYSTEMS ANNOUNCES STRATEGIC COLLABORATION IN INDIA WITH UKAY METAL INDUSTRY AND PENTAGONE PERFORMANCE INDUSTRY



These UAVs are designed for a wide variety of applications, including naval and military surveillance, inspection, and mapping missions, offering a unique combination of power, endurance, and flexibility in their class. India is rapidly emerging as a key market for UAV technologies, particularly in the professional and defence sectors. With growing demand for advanced solutions in surveillance, agriculture, and defence under the (Aatmanirbhar Bharat Defence Programme), Alpha

**Madrid, Spain.** Alpha Unmanned Systems, a prominent Spanish manufacturer of UAV helicopters for defence and professional applications, announced January 16 a strategic alliance with Ukay Metal Industry in India. This collaboration marks a significant step in Alpha Unmanned Systems' expansion into the Indian market, a rapidly growing area with high potential for independent UAV solutions in both defence and civil sectors. As part of this alliance, Pentagone Performance Industry will lead the marketing and distribution efforts of Alpha's flagship UAV helicopters, the Alpha 900 and Alpha 800, in India.

Unmanned Systems sees immense potential in this region. Collaboration with Ukay Metal Industry, an established and accredited manufacturer, will ensure a strong and successful presence in the Indian market. Pentagone Performance Industry, known for its expertise in marketing and distributing advanced technological products, will play a central role in driving Alpha's product growth in India. The alliance aims to meet the increasing demand for reliable and high-performance UAVs, leveraging local knowledge and expertise to ensure the effective and successful implementation of Alpha's systems. ■

## CYIENT EXPANDS STRATEGIC PARTNERSHIP WITH DEUTSCHE AIRCRAFT, SECURES MULTI-YEAR DEAL FOR D328ECO® TECHNICAL PUBLICATION

**Hyderabad/Wessling.** Cyient, a global Intelligent Engineering services company, on January 20, 2025 announced that it has expanded its strategic partnership with Deutsche Aircraft, a leading German regional aircraft manufacturer. Cyient has been awarded a multi-year contract to manage the advanced technical documentation to support the product lifecycle of safety-critical aviation systems for the 40-seater regional turboprop the D328eco. The solution will support Deutsche Aircraft's global customer base with a modular and scalable architecture, personalised user experience, faster time to market, and worldwide access through any device. It will take advantage of Cyient AI products embedded in the solution.

The collaboration further strengthens Cyient's position as a trusted partner in the Indian and European aerospace markets, while for Deutsche



Aircraft, it marks a significant stride in the "Make in India" mission. Cyient partners with over 300 customers, including 30% of the top 100 global innovators, to deliver intelligent engineering and technology solutions for creating a digital, autonomous, and sustainable future. As a company, Cyient is committed to designing a culturally inclusive, socially responsible, and environmentally sustainable Tomorrow Together with its stakeholders. ■



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## NEWS ROUND UP

### SCHIEBEL AWARDED NEW RPAS CONTRACT WITH EMSA

**Vienna.** Schiebel has been awarded another multi-year service contract for the CAMCOPTER® S-100 Unmanned Air System (UAS) with the European Maritime Safety Agency (EMSA). The contract is for service provision with Remotely Piloted Aircraft Services (RPAS) for supporting EU member states in emission monitoring and maritime surveillance operations.

For the third time in a row, Schiebel has been awarded a tender with EMSA. In 2018, Schiebel signed its first contract to support European coast guards and maritime authorities, followed by a second contract in 2021. The now newly awarded contract spans for up to four years - two fixed years with an option for an additional two years.

Since 2018, the S-100 has conducted over 1780 deployment days for EMSA and operated across Europe, in Croatia, France, Finland, Denmark, Spain, Estonia, Romania, Lithuania, Iceland, Germany and Belgium. Stationed either on land or on ships, the S-100 performs general night and day maritime surveillance, search and rescue operations and oil spill detection, as well as monitoring of sulphur content of ships' emissions to ensure compliance with the International Maritime Organisation (IMO) limits.

The CAMCOPTER® S-100 can carry multiple payloads with a combined weight of up to 50 kg. Due to its unique and proven nature, and its ability to fly slowly and hover, it is ideally suited for maritime operations. ■



### KNDS, RHEINMETALL, THALES SIGN SHAREHOLDER AGREEMENT, MOVE AHEAD ON MAIN BATTLE FEBRUARY AND ITANK PROJECT



**Paris.** Armoured-vehicle makers KNDS and Rheinmetall and defence-electronics firm Thales signed the shareholder agreement for the project company that will develop a future main battle tank for Germany and France, moving a step closer to starting actual work on a program held up for years by wrangling between various partners.

KNDS Deutschland, KNDS France, Rheinmetall and Thales will each hold 25% in the new company, which will be based in Cologne, Germany, with the accord signed in Paris on January 23 deemed essential in creating the joint firm, the companies said in statements. The firms announced their plan to set up the joint entity nearly nine months ago.

On a country level, the work share between France and Germany will be split 50/50. The balance between the various partners "was a little complicated" to set up, Emmanuel Chiva, the head of French armament agency DGA said in May.

The future tank, known as the Main Ground Combat System, is meant to replace the Leopard 2 and Leclerc tanks in service with the German and French armed forces, respectively. With the timetable to field the MGCS at risk of slipping, KNDS and

Rheinmetall have been proposing competing tank concepts and upgrades as a stop-gap measure for operators of aging tanks.

While the companies said the MGCS program aims to replace the Leopard 2 and Leclerc tanks by 2040, a statement by the French Armed Forces Ministry said the future tank will replace France's Leclerc by 2035.

KNDS sees a market for hundreds of main battle tanks during the next 10 to 15 years – starting well before the envisioned arrival of the future tank. The company presented upgrades of the Leopard 2 and the Leclerc Evolution at the Eurosatory defence show in Paris last year. Rheinmetall showcased a version of its KF51 tank with an uncrewed turret at the show, as the company's head of vehicle systems in Europe said the MGCS was taking longer than planned.

Meanwhile, the threats to heavy armour on the battlefield are evolving, with drones having become major tank killers in Ukraine. Rheinmetall in September unveiled an upgraded version of the UK's Challenger battle tank, with a 120 mm smoothbore cannon and upgraded armour, which the company says is a step up in survivability. ■

# DRDO SUCCESSFULLY CONDUCTS SUCCESSIVE FLIGHT-TRIALS OF VERY SHORT-RANGE AIR DEFENCE SYSTEM OFF THE ODISHA COAST

**New Delhi.** Defence Research & Development Organisation (DRDO) successfully conducted three successive flight-trials of Very Short-Range Air Defence System (VSHORADS) from Chandipur off the coast of Odisha. These tests were carried out against high-speed targets flying at very low altitude. During all the three flight-tests, the missiles intercepted and completely destroyed the targets having reduced thermal signature mimicking low flying drones at different flying conditions. The flight-tests were carried out in final deployment configuration where in two field operators carried out weapon readiness, target acquisition and missile firing.

The flight data captured by various range instruments like Telemetry, Electro-Optical Tracking System and Radar deployed by Integrated Test Range, Chandipur, confirmed the pin-point accuracy and established the unique capability of VSHORADS missile system in neutralizing drones along with other classes of aerial threats. The flight-tests were witnessed by senior officials of DRDO, Armed Forces and development and production partners.

VSHORADS is a Man Portable Air Defence system designed and developed indigenously by Research Center Imarat in collaboration with other DRDO laboratories and Development cum Production Partners. The missile system has the capability to meet the needs of all the three branches of the Armed Forces, viz. Indian Army, Navy and Air Force. Defence Minister Rajnath Singh congratulated DRDO, Armed Forces and the industries for the successful flight tests, terming it as a great success. Secretary, Department of Defence R&D and Chairman DRDO Dr Samir V Kamat also congratulated the entire DRDO team, users and the industry partners.



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# NEWS ROUND UP

## IDEAFORGE SWITCH MINI BECOMES THE FIRST SMALL UAV TO EARN THE PRESTIGIOUS "FIT FOR INDIAN MILITARY USE" CERTIFICATION

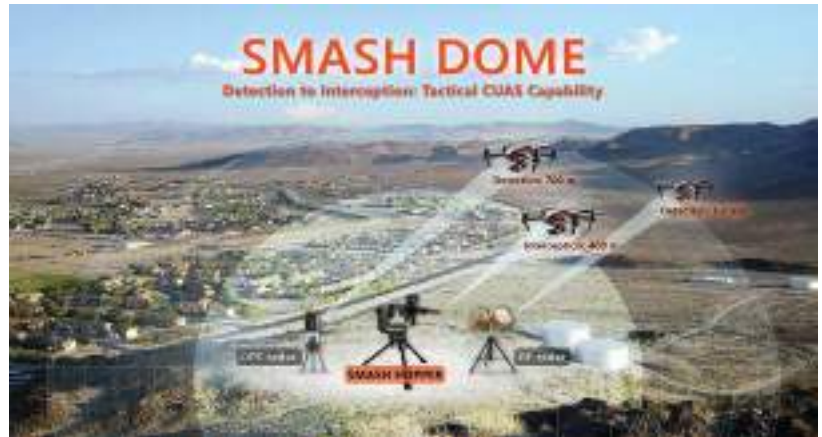
**Mumbai.** ideaForge Technology Limited, a global leader in drone technology on January 23 announced that its SWITCH MINI UAV has earned the prestigious "Fit for Indian Military Use" certification. The SWITCH MINI UAV with its unmatched performance, quality, reliability, and the ability to meet the rigorous demands of the Indian military is the only small UAV to obtain this certification, making it a landmark achievement for the Indian Drone Industry. This certification, granted after stringent evaluations by the Directorate General of Quality Assurance (DGQA), solidifies ideaForge's position as a global leader in dual use drone technology.

The "Fit for Indian Military Use" certification is a testament to the SWITCH MINI UAV's adherence to the highest quality benchmarks and its time-tested operational excellence over years of deployment by the Indian Armed Forces. It validates the UAV's capability to deliver unmatched and reliable performance under demanding operational conditions, including high-altitude environments with extreme weather challenges. This recognition further boosts ideaForge's credibility in both domestic and international markets as a trusted partner for dependable defense and civil solutions.

The SWITCH MINI UAV is a versatile, high-performance Vertical Take-Off and Landing (VTOL) drone designed for Intelligence, Surveillance, and Reconnaissance (ISR) missions. Engineered to excel in high-altitude terrains with extreme temperatures, high winds, and low air density, it provides enhanced situational awareness while keeping personnel out of harm's way. This man-portable UAV, carried on the back of a soldier, acts as an indispensable force multiplier, ensuring mission success even in the most challenging environmental, terrain and operational conditions.



## SMART SHOOTER UNVEILS COUNTER-UAS SOLUTION - SMASH DOME



**Tel Aviv.** Israeli company Smart Shooter unveiled its latest counter-UAS (C-UAS) solution: SMASH Dome. This lightweight, portable, and adaptable solution supports both covert and overt operations, delivering tactical area defence against Unmanned Aerial Systems (UAS).

As drones continue to proliferate as low-cost, high-impact threats, traditional jammer-based methods have become less effective. Many drones have evolved to include hardened defences against GNSS jamming, and their accessibility challenges conventional defence frameworks.

SMASH Dome addresses this evolving threat with a multi-layer, cost-effective C-UAS solution that integrates detection and tracking together with precise kinetic interception.

At the core of SMASH Dome's kinetic response is the SMASH Hopper - a lightweight, remote-controlled weapon station (LRCWS) equipped with an assault rifle and a ballistically calculated Fire Control System (FCS).

The SMASH Hopper is developed for accurate hit capabilities against drones and UASs, independent of communication link or model. Hopper may be integrated with a Command-and-Control (C2) system (e.g., ATAK), enabling automatic UAS target detection and tracking, and providing operators with real-time, calculated ballistic solutions. It can integrate different kinds of weapons and ammunition to enable kinetic interception of different types of UASs.

Complementing the SMASH Hopper, SMASH Dome's architecture incorporates active RF radar and passive optical detection systems to detect, classify, and track UAS targets. With detection ranges spanning up to 1-2 km (detection ranges vary according to sensor type), the sensors continuously transmit target data to Smart Shooter's proprietary tracking system, ensuring continuous monitoring and real-time drone interception readiness.

The SMASH Dome is designed for deployment on manned and unmanned vehicles and platforms, as well as for use on the ground, along borders, and at strategic facilities.

According to the Israeli company, SMASH Dome's person-in-the-loop design ensures precision and operational control. Through the FCS feed, operators maintain visual confirmation of targets, enabling automatic drone tracking and initiation of kinetic response with a simple command. This precise approach minimises collateral damage and enhances overall operational efficiency, particularly in densely populated or sensitive areas.

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