

WAYU

III/2026

Aerospace & Defence Review

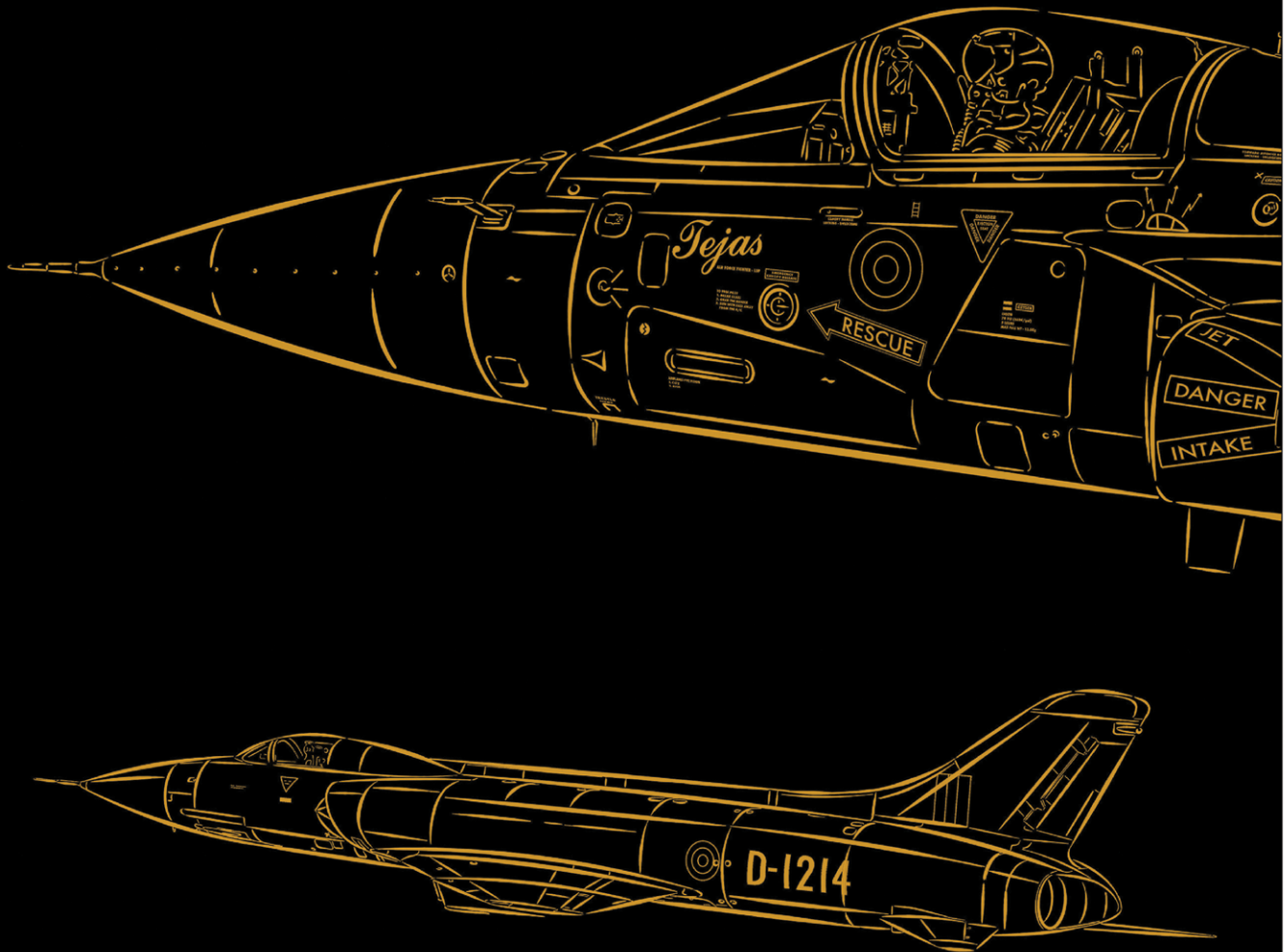


Visit to IAF's No. 17 Sqn
IAF's BVRAAM status
Loitering munitions in South Asia
Rise of Indian Army armour
International Fleet Review

Exercise MILAN/IONS Conclave
Exercise Agni Varsha/Konark Corps
451 Army Aviation Squadron
"Defence Forces Vision 2047"
HADR/50th (Independent) Para Brigade

VAYU

Aerospace & Defence Review



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50 YEARS: OCT 1974–OCT 2024**

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Cover : Photo of an Indian Navy MiG-29KUB on the aircraft carrier R11 Vikrant by Joris van Boven. Alex van Noye along with Joris van Boven were at IFR and MILAN to cover the event and report for us.

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Contracts and AON's

The Defence Acquisition Council (DAC), chaired by Raksha Mantri Mr. Rajnath Singh on 27 March 2026, granted Acceptance of Necessity (AoN) for various proposals worth an estimated cost of about Rs 2.38 lakh crore.



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HAL revenue at Rs 32,250 crores

HAL recorded a revenue of Rs. 32,250 crores (provisional and unaudited) for the financial year ended 31 March 2026, as against the revenue of Rs. 30,981 crores during the previous year. This achievement was made possible despite the challenges faced in deliveries of LCA Mk.1A and HTT-40.



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IAF No. 17 Squadron: The Golden Arrows

Mayyank Kaul visits and writes on No.17 Squadron which was born on 1 October 1951, at Ambala Air Force Station. The man who formed it was Flight Lieutenant DL Springett, and the aircraft it flew was the Harvard IIB, an American trainer that had been in service since the Second World War.



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IAF beyond visual range air-to-air missiles

Sayan Majumdar puts a magnifying glass on the modern aerial warfare and on the ability to look/track first Beyond Visual Range (BVR) and strike decisively which can define the outcome of the battles.



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45 The loitering munitions of South Asia

Rishav Gupta writes on how loitering munitions have transitioned from a niche capability into a defining feature of modern warfare. Now, South Asia has started producing its own definitive proof of concept. The proof arrived in May 2025 in the form of Operation Sindoor, a conflict that saw India and Pakistan trade drone and missile barrages.

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Rise of Indian armour

Sankalan Chattopadhyay express his views as India has unveiled multiple armoured platforms in the last few years. In partnership with the public sector, India's private sector has achieved breakthroughs in multiple crucial technologies. These achievements have changed the Indian defence industry.

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IFR and MILAN 2026

In February 2026, Joris van Boven and Alex van Noije visited the coastal city of Visakhapatnam which served as the stage for a massive display of naval diplomacy with the start of the International Fleet Review (IFR) and Exercise MILAN.

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Interview with Captain Geordie Klein, Netherlands Defence Attaché

Geordie Klein was born on 25 February 1970 in Heemskerk, the Netherlands. His military career commenced at the Royal Netherlands Naval College in Den Helder in 1988. In 1991, the submarine service was joined, where an almost uninterrupted posting was maintained until 2003. He talked to Joris van Boven and Alex van Noije in detail about Netherlands and India.



81 Joris and Alex visit the Indian Army

The Indian Army stands as one of the world's foremost land forces – a permanent, professional institution whose mandate extends well beyond the conventional defence of national borders. Joris van Boven and Alex van Noije while on visit to India cover in detail for us Exercise Agni Varsha 2026 at Jaisalmer, The Konark Corps Jodhpur, Agra HADR and 50th (Independent) Parachute Brigade, Indian Army Aviation Corps, 451 Army Aviation Squadron and "Defence Forces Vision 2047".



96 MBDA: Europe steps up missile production

Richard Gardner reports from Paris that the twin threats from Russia and Iran have brought about a long awaited shift in Europe's defence posture highlighting its vulnerability in the new era of ballistic missile and drone attacks and the urgent need to counter them.



Regular features:

Opinion, Viewpoint, Aviation & Defence in India, World Aviation & Defence News, Vayu 25 Years Back, Tale Spin.

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Strengthening interoperability between the US and India in the Indo-Pacific



From vital sea lanes and trade routes to disaster response, the Indo-Pacific sits at the centre of global security and stability. For the United States, operating across this vast region requires constant readiness, strong coordination and the ability to respond quickly in a contested environment.

Headquartered at Hickam Air Force Base, Hawaii, Pacific Air Forces (PACAF) is a major command of the US Air Force and the air component of US Indo-Pacific Command (USINDOPACOM). Its primary focus is to deter aggression and ensure a free and open Indo-Pacific. It pursues this mission through a strategy of “peace through strength,” which relies on credible, combat ready airpower and strong alliances and partnerships.

India is an important partner in these efforts, as the United States and India continue to expand cooperation through exercises, planning, and operational coordination. Bilateral defence trade and joint training with India have directly contributed to this growing interoperability.

General Kevin Schneider, commander of PACAF, highlights that “the growth in Indian and US bilateral defence trade has corresponded with

growing interoperability,” adding that “the importance of our partnership continues to grow, particularly as we face an increasingly complex and dynamic security environment in the Indo-Pacific.”

Evolving operational priorities

As the Indo-Pacific faces a multifaceted geopolitical environment, strengthening command and control and logistics in contested areas are a priority. To address this,

operational postures are adapting through agile combat employment, a concept focused on dispersing forces, improving survivability and maintaining operational tempo across long distances. This involves pre-positioning materials and operating from a network of smaller, dispersed locations to enable operations at speed and scale.

Engagement with partners like the Indian Air Force directly supports this adaptive posture, focusing on robust partner integration, increased



VIEWPOINT

information sharing, and testing interoperability. Exercises are designed to stress, test, and refine warfighting and crisis response concepts with allies and partners so they can operate as a unified force.

The relationship has matured significantly over the years; Schneider points out, “Our ability to work together has evolved from basic coordination to high end interoperability in complex scenarios.”

This approach to mobility and rapid adaptation was recently tested in the large scale Resolute Force Pacific (REFORPAC) exercise, which brought together more than 400 aircraft and over 12,000 personnel across 50 locations to demonstrate the ability to operate across the Indo-Pacific at scale.

Similarly, collaborative events with India like exercise Tiger Triumph focus heavily on developing these joint capabilities, specifically tailored for logistics, humanitarian assistance and disaster relief in austere environments.

Integrating cyber and space

Air operations are increasingly linked with cyber and space capabilities. The United States is working with allies and partners to deepen operational integration through training, exercises and planning that address emerging



challenges in these domains. The goal across all partnerships is to achieve seamless operation. This ambition reflects the broader US-India Major Defence Partnership, which actively includes increased information sharing, regional security cooperation and deep collaboration in these critical new domains.

Rapid response

Strategic air mobility remains central to supporting both security operations and humanitarian response across the vast distances of the Indo-Pacific. The ability to deploy hundreds of aircraft and thousands

of personnel, as proven in recent exercises, is critical to rapid response.

Looking ahead

This approach also reflects the recognition that the network of allies and partners is one of America’s greatest strategic assets, fostering a shared responsibility for regional security.

The Quad (comprised of the United States, India, Japan and Australia) serves as a key mechanism for such collaboration on critical and emerging technologies, ensuring partners like India are integrated into the evolving operational landscape.

Looking forward, the greatest opportunities lie in continuing to build upon strategic partnerships to promote stability, both bilaterally and through regional groupings like the Quad. Future cooperation is expected to focus on emerging domains, technology and regional security as tactical and strategic coordination in the Indo-Pacific continues to strengthen.

“The foundation of a free and open Indo-Pacific rests on the strength of our strategic relationships,” stated Schneider. “In India, we have a partner whose shared values and approaches ensures our combined resolve to meet regional challenges.”

By Charvi Arora, SPAN Magazine, US Embassy, New Delhi



DPSUs' exports soar by 151%, private sector contribution up by 14%

Defence exports have touched an all-time high of Rs 38,424 crore in the Financial Year (FY) 2025–26, marking a massive rise of Rs 14,802 crore (62.66%) over the previous fiscal year's figure of Rs 23,622 crore. In this landmark milestone, Defence Public Sector Undertakings (DPSUs) and the private sector have contributed 54.84% and 45.16% respectively. DPSU exports surged by 151% compared to the previous year, with private firms showcasing their robust presence by recording an increase of 14%. In terms of value of contribution, the private sector accounted for Rs 17,353 crore worth of defence exports, while DPSUs contributed Rs 21,071 crore. Their respective figures in the previous financial year stood at Rs 15,233 crore and Rs 8,389 crore.

DRDO & IN trials of ADC-150

Defence Research & Development Organisation (DRDO) and the Indian Navy jointly conducted four successful in-flight release trials of the indigenous Air Droppable Container 'ADC-150' from the P8I aircraft off the coast of Goa between 21 February to 1 March 2026, at different extreme release conditions. Indigenously designed and developed to deliver 150 kg payload, the Air Droppable Container enhances the naval operational logistics capabilities for providing quick response to naval vessels under distress, needing critical stores/equipment, medical assistance etc. at blue sea deployed far from the coast.



IAF and Gaganyaan

The IAF supported successful conduct of the second Integrated Air Drop Test of Gaganyaan Crew Module on 10 April 2026. It marked another key milestone for ISRO in the Gaganyaan Mission. Executed using an IAF Chinook helicopter, the trial validated the parachute based deceleration system. The mission stands as a testament to jointmanship between IAF, Indian Navy, ISRO and DRDO.



Indian Navy and Gaganyaan

"The Indian Navy congratulates ISRO on the successful conduct of the Second Integrated Air Drop Test (IADT-02) for Gaganyaan, India's first human spaceflight mission. The successful recovery of the Crew Module by Indian Navy warship, is a significant milestone in this prestigious mission. The Indian Navy "is proud to contribute to India's human spaceflight journey, enabled by seamless joint planning and coordination between ISRO, IN, IAF and DRDO".



DRDO & IN in salvo launch of NASM-SR

Defence Research & Development Organisation (DRDO) and Indian Navy, on 29 April 2026, successfully conducted



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the maiden salvo launch of Naval Anti-ship Missile-Short Range (NASM-SR) from the Navy's helicopter platform off the coast of Bay of Bengal in Odisha. During the trial, two missiles were launched in quick succession from the same helicopter, making it the first salvo launch of an advanced air launched anti-ship missile system.

40 years of IAF's 132 HU

The Indian Air Force, on 10 April 2026, proudly marked a significant milestone as 132 Helicopter Unit, The Hovering Hawks, which completed 40 years of dedicated service to the nation this year. The unit has achieved 100% serviceability for all 16 aircraft of its Chetak/Cheetah fleet—an “outstanding feat reflecting unwavering professionalism, technical precision and commitment to operational readiness. Despite operating a legacy fleet in harsh environment, the unit's air warriors ensure consistent, high level mission readiness, overcoming challenges posed by aging aircraft and demanding operational requirements”.



150th ICG Do-228 serviced

On 28 April 2026, Coast Guard Aeronautical Inspection Service successfully rolled out the 150th Dornier aircraft, CG-765, post major servicing. This milestone “reflects technical expertise, precision maintenance and unwavering commitment to operational readiness,

advancing GoI's Aatmanirbhar Bharat vision and ICG's aviation indigenisation drive”.



LCA AF Mk.2 progresses

CSIR-NAL handed over the first set of composite parts for the Centre Fuselage of LCA AF Mk.2 to ADA and HAL on 30 April 2026; “a key step in strengthening indigenous aerospace manufacturing”.



BEL signs MoU with BMIT

Bharat Electronics Limited (BEL) and Bit Mapper Integration Technologies Pvt Ltd (BMIT), a provider of Electronic System Design and Manufacturing (ESDM) solutions, signed a Memorandum of Understanding (MoU) to collaborate on the design, development and manufacturing of advanced electronic modules, subsystems and systems for defence electronics and aerospace, specifically targeting critical technology domains such as electronic warfare (EW), naval radars and drones.



Secy (DP) inaugurates LCH production line

Mr. Sanjeev Kumar, Secretary (Defence Production), Ministry of Defence, on 13 April 2026, inaugurated Prachand Light Combat Helicopter (LCH) structure assembly line and an Automated Storage & Retrieval System (ASRS) at Hindustan Aeronautics Limited's New Helicopter Factory in Tumakuru, Karnataka. The New Helicopter Facility is a state-of-the-art greenfield facility established for the production of Light Utility Helicopter (LUH) and Prachand LCH and will support future programmes such as Indian Multi Role Helicopter (IMRH) and Deck based Multi Role Helicopter (DBMRH). The Secretary also visited HAL's dedicated LUH production facility, LCH equipping hangar and ASRS facility.



DRDO unveils AAP (Tracked & Wheeled)

The Advanced Armoured Platforms (Tracked and Wheeled), designed and developed by Vehicles Research & Development Establishment, were unveiled on 25 April 2026. The manufacturing of the platforms has been carried out by two industry partners: Tata Advanced Systems Limited and Bharat Forge Limited supported by many MSMEs.

Both the platforms have been integrated with indigenously designed and developed 30 mm crewless



turret, with advanced features to meet the mobility, fire power and protection requirements. The 30 mm crewless turret along with the 7.62 mm PKT gun is configured to launch anti-tank guided missiles as well. The base design has the capabilities to be configured for multiple roles. The indigenous content is to the tune of 65% with plans to increase it to 90%.



MKU in IAF MRO contract

MKU Limited announced a landmark achievement in India's defence sector: the award of long term Maintenance, Repair and Overhaul (MRO) contracts from the Indian Air Force Headquarters. This milestone positions MKU as the first private sector company in India to undertake lifecycle support services for operational military aircraft. Under these contracts, they will deliver comprehensive MRO services for critical aircraft assets operated by the Indian Air Force. The scope encompasses advanced structural assessments; system level repairs and diagnostics; full overhaul services and technology driven maintenance protocols to reduce downtime and extend service life.



GRSE hits a new high turnover

Garden Reach Shipbuilders & Engineers Limited (GRSE), sustaining its strong growth momentum, has recorded the highest annual turnover in its history for FY 2025-26, amounting to Rs. 6,400 crore (Provisional & Unaudited), as against Rs. 5,076 crore in FY 2024-25. FY 2025-26 saw key milestones in naval shipbuilding, with the commissioning of five vessels during the year, including INS Himgiri, the first Project 17A advanced frigate, INS Ikshak, the third Survey Vessel (Large) and the first three Anti-Submarine Warfare Shallow Water Craft (ASW-SWC)—INS Arnala, INS Androth and INS

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Anjadip. Marking a significant year in execution and delivery, GRSE delivered a total of eight vessels to the Indian Navy during FY 2025–26, comprising two Project 17A (P17A) frigates, two Survey Vessel Large (SVL) ships and four Anti–Submarine Warfare Shallow Water Crafts (ASW–SWC).

Army Commanders' Conference concludes

The biannual Army Commanders' Conference (ACC) which commenced on 13 April 2026, culminated on 16 April 26. The conference chaired by Chief of the Army Staff (COAS), was attended by apex military leadership and was addressed by senior functionaries in the government including the Cabinet Secretary, Chief of the Defence Staff, Defence Secretary and Chairman NSAB besides Chief of the Naval Staff. Aligned with the vision of evolving into a 'Future Ready Force', the Indian Army has designated the year 2026 as the year of "Networking and Data Centricity".



Munitions India Ltd in high turnover

"Munitions India Ltd (MIL) proudly announces achievement of an all–time high revenue of Rs. 10954 Crores (Provisional & Unaudited) for FY 2025–2026. The Company recorded a revenue growth of around 33.35% over FY 2024–2025".

BrahMos revenue at Rs. 5200 crores

BrahMos Aerospace revenue has crossed Rs. 5200 crores for the year 2025–2026. The new Lucknow facility has started rolling out the first batch of missiles within a year of commencing operations and Brahmos Aerospace is also steadily growing its foot print in the world market



with two export orders worth Rs. 4000 crores signed in 2025–26, meeting a considerable defence export target. "Brahmos Aerospace is meeting all the requirements of armed forces within stipulated timelines".

Dassault long term contract to Hical Technologies

Dassault Aviation and Hical Technologies, a Bengaluru based leader in aerospace manufacturer for high precision electromechanical systems, has signed a long term contract to manufacture, and supply high precision control system assemblies for the Rafale fighter aircraft. Under the agreement, Hical will deliver "mission critical products that meet Dassault Aviation's stringent engineering, qualification and reliability standards". The contract marks a significant step in India's integration into global aerospace supply chains beyond final assembly and into precision, high value engineering.



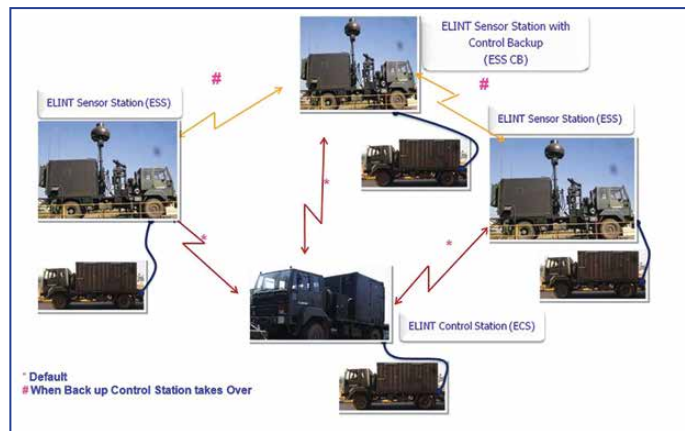
ideaForge to train NATO Forces

ideaForge Technology Inc a leading global drone technology company, has commenced a specialised UAV flight test training programme for NATO military personnel at the prestigious National Test Pilot School (NTPS), United States. Marking the first such initiative by an Indian UAV player, ideaForge will deploy its NATO certified Switch UAV platform as part of a specialised hands–on drone flight testing programme.



BEL contracted for 5 GBMES for Indian Army

Ministry of Defence has signed a contract with Bharat Electronics Limited, Hyderabad for the procurement of five Ground Based Mobile Electronic Systems, worth Rs 1,476 crore, for the Indian Army with minimum 72% indigenous content. The contract, under the Buy (Indian-Indigenously Designed, Developed and Manufactured) category, was inked in the presence of Defence Secretary Mr. Rajesh Kumar Singh at Kartavya Bhawan-2, New Delhi on 5 May 2026.



IG Defence scales to 200 FPV kamikaze drones a day

Defence tech company IG Defence has scaled its manufacturing capacity to 200 FPV kamikaze drones per day, following its deployment during Operation Sindoor and acknowledgement in an official PIB release. Former Army Chief General MM Naravane recently highlighted that future conflicts could require up to 40,000 drones a month, while Army Chief General Upendra Dwivedi, in a recent briefing, emphasised the need for 8,000-10,000 UAVs per corps, including FPV units, to effectively dominate contested airspace along the Line of Actual Control (LAC) and Line of Control (LoC).



DRDO & IAF conduct maiden trials of TARA

Defence Research and Development Organisation and the Indian Air Force (IAF) successfully conducted the maiden flight trial of Tactical Advanced Range Augmentation (TARA) weapon off the coast of Odisha on 7 May 2026. TARA, the modular range extension kit, is India's first indigenous glide weapon system to convert unguided warheads into precision guided weapons.

TARA has been designed and developed by Research Centre Imarat (RCI), Hyderabad along with other DRDO laboratories to enhance the lethality and accuracy of a low cost weapon to neutralise ground based targets. It is the first glide weapon to utilise state-of-the-art low cost

systems. The development of the kit has been undertaken with Development cum Production Partners (DcPP) and other Indian industries, which have already started the production activity.



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ideaForge drones for US school district

In a first, an Indian drone will help secure a school district in the US. ideaForge Technology Limited has received a PO for its integrated autonomous unmanned systems to support campus security through aerial monitoring at schools in Texas, USA. ideaForge UAVs were impressive during the demo and instantly shortlisted by the Lamar Consolidated Independent School District Police Department. The company will deploy NDAA compliant Switch and Q6 V3 to provide surveillance coverage across 20–25 schools, to monitor campus infrastructure enabled by cutting edge technology and data analytics.



ParaZero agreement with India's BonV Aero

ParaZero Technologies Ltd announced the signing of a strategic cooperation agreement with BonV Aero, an Indian aerospace and defence technologies manufacturer and distributor. Under the agreement, BonV Aero will market ParaZero's portfolio of advanced counter UAS solutions in India, with a primary focus on the Company's DefendAir system – a mobile, net based interception platform designed for rapid deployment against hostile drones and will also cover additional DefendAir setups and configurations in the future.



VEM and TKMS for joint torpedo production

TKMS signed a cooperation agreement (Teaming Agreement) with Hyderabad based VEM Technologies Pvt

Ltd. In the first step, the Teaming Agreement will form the basis for the production of a heavyweight torpedo for the existing submarine fleet of the Indian Navy. Furthermore, a more in-depth cooperation between TKMS and VEM "is also conceivable in future torpedo programmes".



BEL and RRP Group sign MoU

Bharat Electronics Limited (BEL) has signed an MoU with RRP Electronics Limited and RRP Defense Limited, both part of the RRP Group, an integrated technology company specialising in manufacturing of semiconductors and aerospace/defence systems, to jointly pursue business opportunities in the domains of semiconductors, electro-optics, unmanned systems and other defence technologies.



Bharat Forge and Liebherr Aerospace launch facility

The aerospace division of Bharat Forge Ltd inaugurated a state-of-the-art Landing Gear Components Machining Facility in Mundhwa, Pune (India), developed in collaboration with Liebherr Aerospace & Transportation SAS. This milestone positions Bharat Forge among the first companies in India, and one of the first at scale, to operate OEM approved landing gear components machining capabilities. It integrates advanced machining centres dedicated to high precision landing gear components and marks "a significant step towards advancing India's aerospace manufacturing ecosystem and strengthening the country's role in global aerospace supply chains".

Autonomous shipbuilding centre by Sagar Defence

Sagar Defence Engineering marked a historic milestone with the stone breaking ceremony of the world's first Autonomous Maritime Shipbuilding and Systems Centre on 12 March 2026, at Juvvaladinne Fishing Harbour,

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Andhra Pradesh. The centre will focus on developing platforms such as unmanned surface vessels (USVs), autonomous underwater vehicles (AUVs), intelligent navigation systems, maritime sensors and communication networks, and command and control platforms for autonomous operations.



Paras Defence in agreement with DBA Northstar

Paras Defence and Space Technologies Ltd has entered into an agreement with US based Bandak Aviation Inc DBA Northstar. The agreement focuses on the supply and support of Northstar's products, including air-to-air refuelling systems and related accessories. In addition, this will lead to associated services being provided for the Indian Armed Forces. Northstar is globally recognised for its expertise in designing, developing, manufacturing, enhancing and provisioning of aerial (air-to-air) refuelling systems.



Simulated LOX module AIP system flagged off

INOX India Ltd (INOXCVA), a player in cryogenic technology solutions, flagged off the simulated Liquid Oxygen (LOX) storage module developed for Test & Trial of Energy Module for India's indigenous Air Independent Propulsion (AIP) system, being spearheaded by Naval Material Research Laboratory (NMRL), Ambernath,

a premier laboratory under Defence Research and Development Organisation (DRDO). INOXCVA's scope for this strategic programme includes the design, engineering, fabrication, testing and supply of cryogenic LOX storage tank developed for the ground based prototype system.



Amara Raja to power naval sonar systems

Amara Raja Design Alpha (ARDA), a specialised engineering R&D firm and a part of the \$2 Bn Amara Raja Group, has developed an indigenous Power Conditioning Cabinet (PCC) for naval sonar systems, marking the company's first deliverable in mission critical defence electronics. About 61% of system's components will be indigenous, enabling around 40% cost efficiencies through advanced power engineering and local manufacturing. In the next phase, ARDA will expand into the design of Power Amplifiers, Signal Interfaces and Power Amplifier Cabinets, helping build a comprehensive indigenous ecosystem for naval sonar systems.



ZUPPA delivers over 500 drones to Indian Army

ZUPPA Geo Navigation Technologies, a Chennai based leader in drone and navigation solutions, has delivered over 500 STQC Certified cyber-secure 'Ajeet' series drones to the Indian Army over the



past few months. The deployment follows the successful completion of rigorous certification processes aligned with the Indian Army's cybersecurity framework for unmanned systems.

Samtel expands into space tech and drones

Samtel Avionics has announced its strategic expansion into space technologies and drone manufacturing, with an investment of over Rs. 200 crore aimed at diversifying its product portfolio over the coming years. As part of this expansion, Samtel has launched a new drone division focused on developing indigenous platforms backed by proprietary intellectual property. The division will prioritise the development of long endurance drones and aims to establish robust maintenance, repair and overhaul (MRO) capabilities for unmanned systems.

Tembo Global Industries to manufacture ammunition

Tembo Global Industries Limited announced that its subsidiary, Tembo Classic Engineering Private Limited (TCEPL), had been granted a licence by the Ministry of Home Affairs, Government of India, for the manufacture of ammunition of various calibers. This significant regulatory approval "marks a major milestone in the company's strategic expansion into the defence and security manufacturing sector".

Shield Armoring introduces PAMA-APC

Shield Armoring Private Limited, a player in India's armoured mobility space and a provider of bulletproofing solutions, unveiled the PAMA-APC, a next generation Armoured Personnel Carrier engineered for defence, paramilitary and high risk security operations. Built on the Toyota Hilux platform, the PAMA-APC is designed "to deliver a strong combination of protection, mobility and operational adaptability". The PAMA-APC is currently being deployed by the Maharashtra Police and Arunachal Pradesh Police.



Zen Technologies receives arms manufacturing licence

Zen Technologies has been granted an arms manufacturing licence by the Government of India. The licence authorises the Company to manufacture 12.7mm, 23mm, 30mm and 40mm cannons, critical weapon systems with strong applicability in air defence, naval operations and counter unmanned aircraft system (C-UAS) roles. These rapid fire cannons serve as highly effective last layer defence solutions against drones, loitering munitions and low flying aerial threats.

Skyroot's Vikram-1 flagged off for Sriharikota

Vikram-1, India's first privately built orbital rocket by Skyroot Aerospace, was flagged off on 25 April 2026 by Mr. A. Revanth Reddy, Chief Minister of Telangana, from the company's Max-Q campus in Hyderabad. The flag-off of the flight hardware marks the completion of the pre-flight testing programme at Skyroot's facilities. The rocket's propulsion stages have already been secured at the spaceport in Sriharikota. With the Vikram-1 launch, Skyroot is set to make India's first private orbital launch attempt, marking its entry into a market currently dominated by a handful of companies globally. The launch will be conducted under the authorisation of IN-SPACE and with the technical oversight of ISRO.



Shield AI opens New Delhi office

Shield AI has opened an office at New Delhi to support its growing partnership with the Indian Ministry of Defence and advance its work with the broader industry ecosystem. Shield AI has established a wholly owned subsidiary, Shield AI India, to support software integration, engineering and autonomy development, and to grow indigenous engineering and software development capabilities for India. The entity will operate across two offices – the first in New Delhi, which is operational now, and another in Bengaluru, which is scheduled to open later this summer.

In November 2024, the company announced a strategic partnership with JSW Defence Pvt Ltd to indigenise and manufacture its V-BAT unmanned aircraft system.

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As part of a \$90 million investment, JSW Defence began construction of a large scale V-BAT production facility at EMC Maheshwaram, Hyderabad in December 2025. Shield AI's expanded India presence also supports its ongoing work with the Indian Armed Forces. Earlier this year, India selected Shield AI to provide Hivemind powered V-BATs and, in addition, licenses for Shield AI's Hivemind autonomy software for the Indian Army.



Sigma Advanced Systems in agreement with Rolls-Royce

Sigma Advanced Systems has signed a seven year long term agreement with Rolls-Royce, marking a steady step forward in its global aerospace journey. The agreement “represents a deepening strategic relationship with one of the world’s largest and most respected aerospace OEMs, placing the company at the heart of critical global engineering programmes”. The contract is valued at nearly £300 million (i.e., roughly Rs 3800 cr), providing the company with a long term revenue stream and stronger visibility over future growth. Under the agreement, Sigma Advanced Systems will supply a wide portfolio of high precision engineered, safety critical components and assemblies for Rolls-Royce’s aerospace programmes.

Naval Commanders’ Conference-2026

The Indian Navy Commanders’ Conference 01/2026 commenced at Nau Sena Bhawan on 14 April 2026 with an inaugural address by Adm Dinesh K Tripathi, Chief of the Naval Staff, to senior naval leadership, outstation Operational and Area Commanders, and Command Headquarters and Naval Headquarters staff. The CNS commended the Navy’s achievements in safeguarding India’s maritime interests, including energy security

amidst the ongoing conflict in West Asia, increased tempo of operations and enhanced inter-service synergy. CNS laid emphasis on the continued focus on combat readiness and adapting emerging technologies to build a Future Ready force.



Delivery of Project 17A frigate ‘Mahendragiri’

Mahendragiri (Yard 12654), the sixth ship of Nilgiri-class (Project 17A) and fourth ship of the class built at Mazagon Dock Shipbuilders Limited (MDSL), was delivered to the Indian Navy on 30 April 2026 at MDSL, Mumbai. The delivery marks a significant milestone in achieving self-reliance in warship design and construction. Project 17A frigates are versatile multi-mission platforms designed to address current and emerging challenges in the maritime domain. P17A ships are fitted with an advanced weapon and sensor suite as compared to the P17 (Shivalik class).



Indian Navy commissions stealth frigate 'Taragiri'

The Indian Navy commissioned its latest stealth Frigate, Taragiri (F41), on 3 April 2026. As the fourth potent platform of the Project 17A class, Taragiri is not merely a ship; it is a 6,670 tonne embodiment of the "Make in India spirit and the sophisticated engineering capabilities of our indigenous shipyards". Built by Mazagon Dock Shipbuilders Limited (MDL), Mumbai, this frigate represents a generational leap over earlier designs, offering a sleeker form and a significantly reduced radar cross section that allows it to operate with lethal stealth. Driven by a Combined Diesel or Gas (CODOG) propulsion plant, Taragiri is designed for 'High-Speed-High Endurance' versatility and multi-dimensional maritime operations. The ship's weapon suite features supersonic surface-to-surface missiles, medium range surface-to-air missiles, and a specialised anti-submarine warfare suite.



Stealth frigate 'Dunagiri' delivered

Dunagiri (Yard 3023), the fifth ship of Nilgiri Class (Project 17A) and second of the class built at Garden Reach Shipbuilding and Engineers Ltd (GRSE), was delivered to the Indian Navy on 30 March 2026 at GRSE, Kolkata, marking a major milestone in achieving self-reliance in warship design and construction. P17A ships are fitted with an advanced weapon and sensor suite compared to the P17 (Shivalik) class. The potent weapons and sensors suite comprises of BrahMos SSM, MFSTAR and MRSAM complex, 76mm SRGM, and a combination of 30 mm and 12.7 mm close in weapon system, along with rocket and torpedoes for anti-submarine warfare.



Fourth survey vessel (Large) 'Sanshodhak' delivered

Sanshodhak (Yard 3028), the last Survey Vessel (Large) ship steered by the Indian Navy's Warship Design Bureau, being built at Garden Reach Shipbuilders & Engineers Ltd (GRSE), Kolkata was delivered to the Indian Navy on 30 March 2026. With a displacement of about 3400 tons and an overall length 110 meters, Sanshodhak is fitted with state-of-the-art hydrographic equipment such as data acquisition and processing system, autonomous underwater vehicle, remotely operated vehicle, DGPS long range positioning systems, digital side scan sonar, etc. Powered by two diesel engines, the ship can achieve speeds in excess of 18 knots.



Delivery of Agray ASW-SWC by GRSE

'Agray', the fourth of eight ASW SWC (Anti-Submarine Warfare Shallow Water Craft), indigenously designed and built by Garden Reach Shipbuilders and Engineers (GRSE), Kolkata, was delivered to the Indian Navy on 30 March 2026 at Kolkata. These ships, approximately 77 metres in length, are the largest Indian naval warships propelled by waterjets and are equipped with state-of-the-art lightweight torpedoes, indigenous rocket launchers and shallow water sonar, enabling effective detection and engagement of underwater threats.

Launch of 1st NGOPV (Yard 1280, Shachi) at GSL

Yard 1280 (Shachi), the first of eleven Next Generation Offshore Patrol Vessels (NGOPVs), was launched at GSL, Goa on 31 March 2026. The construction of NGOPVs is being undertaken concurrently at two shipyards (GSL, Goa and GRSE, Kolkata). These indigenously built ships will augment the existing ten OPVs/ NOPVs for multi-domain operations, such as defence and surveillance, search and rescue, protection of offshore assets, HADR and anti-piracy missions.



Delivery of Malwan – 2nd ASW–SWC by CSL

'Malwan', the second of eight Anti-Submarine Warfare Shallow Water Craft (ASW SWC) built by Cochin Shipyard Limited (CSL), Kochi, was delivered to the Indian Navy on 31 March 2026. The ship is equipped for underwater surveillance, anti-submarine warfare (ASW) operations in coastal waters, low intensity maritime operations (LIMO) along with mine warfare capabilities. Measuring approximately 80 metres in length and displacing 1,100 tons, the waterjets propelled ASW SWCs are equipped with torpedoes, multifunctional anti-submarine rockets and sensors including radars and sonar systems.



Keel laying of two NGOPV for ICG

The keel laying ceremony of Yard 16402 and 16403, the second and third ship of six Next Generation Offshore Patrol Vessels (OPVs), was held at YMPL, Ratnagiri on 17 March 2026. With a range of 5,000 nautical miles, these ships will be capable of achieving a maximum speed of 23 knots. Measuring 117 meters in length and having a strength of 11 officers and 110 men, it will also feature state-of-the-art machinery and advanced technological



systems, including AI based predictive maintenance systems, remote piloted drones, integrated bridge system (IBS), and Integrated Platform Management System (IPMS).

ICG inducts 4th FPV 'Achal'

Bharatiya Tatrakshak inducted its fourth Fast Patrol Vessel (FPV), Yard 1274 'Achal', on 31 March 2026 at Goa Shipyard Limited (GSL). Entirely designed and built in India, the vessel will be forward deployed at Vadar, Gujarat. Achal is armed with a 30mm CRN-91 gun and twin 12.7mm stabilised remote controlled guns, seamlessly integrated with advanced fire control systems. Its cutting edge suite, comprising an Integrated Bridge System, Integrated Platform and Power Management Systems, and a high capacity fire-fighting system, renders "it a deft and resilient force at sea".

Keel laying of FPV-4 & plate cutting for FPV-7 for ICG

Keel laying ceremony for Fast Patrol Vessel-4 (FPV) (Yard 16504) along with plate cutting ceremony for FPV-7 (Yard 16507) of 14 FPV project (Yard 16501-14) for the Indian Coast Guard was held at Mazagon Dock Shipbuilders Limited (MDL), Mumbai on 6 April 2026. The indigenous content of these ships are augmented with gear box by Triveni, Mysore and water jets by MJP India. The water jet propelled FPVs with approx 340 T displacement are designed for coastal security, and law enforcement duties.

Launch of 4th DSC A 23 (Yard 328)

DSC A 23, the fourth ship of five Diving Support Craft (DSC) project was launched on 19 April 2026 at Titagarh, Kolkata. The construction of Diving Support Craft is being undertaken by TRSL, Kolkata. Featuring a 30 m long catamaran hull form and an approximate displacement of 380 tons, these ships "offer superior stability, enhanced deck area and improved sea-keeping characteristics, which makes them suitable for undertaking diving operations in coastal waters and harbours".

CAE and InterGlobe inaugurate new pilot training centre

CAE Simulation Training Private Limited (CSTPL),



AEROSPACE IN INDIA

a joint venture between InterGlobe Enterprises and CAE, has inaugurated its fourth pilot training centre in India. Located in Mumbai, the 44,000 square foot facility supports India's growing aviation training sector and strengthens domestic pilot training capacity. The centre begins operations with its first Airbus A320 full-flight simulator (FFS). A second Airbus A320 FFS is scheduled to enter service later this year, with the capacity to scale up to six FFS over time, in line with market demand. With established centres in Greater Noida, Gurugram, and Bengaluru, the network currently has a collective capacity of 16 full flight simulators, with plans to scale to 23 in the coming years.

NIA and Akasa Air to develop MRO Facility

Noida International Airport (NIA) and Akasa Air have announced a strategic partnership to establish Akasa Air's first Maintenance, Repair and Overhaul (MRO) facility at the Noida International Airport. This collaboration reflects a shared commitment to strengthening India's aviation infrastructure and positioning NIA as one of the country's leading MRO hubs.



Amazon Air expands to Northeast India

Amazon has announced the expansion of Amazon Air to Northeast India with new air cargo routes connecting Kolkata and Guwahati, further strengthening its logistics infrastructure and connectivity across the region. The service will support deliveries across all seven sister states—Arunachal Pradesh, Assam, Manipur, Meghalaya,



Mizoram, Nagaland and Tripura. Amazon Air launched in India in 2023 and has since strengthened the country's e-commerce logistics network.

Air India selects Hughes for in-flight connectivity

Hughes Network Systems, LLC (Hughes), an EchoStar company, announced that Air India had selected the Hughes In-Flight connectivity solution to deliver a consistent Wi-Fi experience using a common connectivity platform across its mixed widebody fleet. Hughes will leverage Airbus HBCplus for A350-1000 aircraft and the RAVE Aerospace solution for Boeing 787-8 and Boeing 777-300ER aircraft. The current selection applies to an initial tranche of existing and new widebody aircraft in the Air India fleet. The single connectivity platform across Airbus A350-1000, Boeing 787-8 and Boeing 777-300ER enables Air India with "multi-orbit connectivity to propel growth, flexibility and market leadership".



Thales and Air India sign FlytCARE for IFE maintenance

Thales announced that Air India had signed a 10 year agreement with Thales for its FlytCARE services package. This agreement provides a full turn-key maintenance approach, covering line maintenance, spares, repairs and logistics management support for Thales' inflight entertainment (IFE) systems on 57 Airbus and Boeing aircraft. This agreement covers Air India's 12 new widebody aircraft equipped with Thales' AVANT UP



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inflight entertainment system. AVANT UP features a vast catalogue of content showcased on stunning 4K HDR touchscreens, along with 60W USB-C and USB-A fast charging for customer devices, and the ability to simultaneously pair two Bluetooth connections. Air India is the first carrier in the Asia Pacific region to fly with Thales' AVANT Up solution.

GalaxEye's successful launch of Mission Drishti

Prime Minister Mr. Narendra Modi congratulated the founders and the entire team of GalaxEye on the



successful launch of Mission Drishti on 3 May 2026. The Prime Minister noted that Mission Drishti by GalaxEye marked a major achievement in India's space journey. Mr. Modi highlighted that the successful launch of the world's first OptoSAR satellite and the largest



privately built satellite in India was a testament to the youth's passion for innovation and nation building. "By



integrating optical imaging with all weather radar in a single platform, this breakthrough marks a significant advancement in India's earth observation capabilities and showcases the ingenuity of our young scientists and engineers", stated Union Minister Jyotiraditya M. Scindia.

APPOINTMENTS

Ravi K assumes charge as CMD of HAL

On 1 May 2026, Mr. Ravi K assumed charge as the 22nd Chairman and Managing Director of Hindustan Aeronautics Limited (HAL) from Dr. D K Sunil, who superannuated on 30 April 2026. Mr. Ravi K brings over 30 years of experience across various sectors such as A&D, manufacturing and electronics. Prior to this, he was the Director (Operations) at HAL, where he led strategic planning.

He has held key leadership roles, including Executive Director and General Manager of the LCA Tejas Division, as well as Executive Director (Corporate

Planning). During his tenure, he concluded various big ticket contracts for HAL, such as the contract to supply 180 LCA Tejas to the Indian Air Force, 156 LCH Prachand to the Indian Army and Indian Air Force and is credited with the operationalisation of the LCA Tejas fleet in IAF. He boosted fleet serviceability through various customer centric initiatives, established seamless data communication with IAF bases and created a Single Point of Contact (SPOC) for timely customer support.



Contracts and AON's

DAC clears proposals worth Rs 2.38 lakh crore

The Defence Acquisition Council (DAC), chaired by Raksha Mantri Mr. Rajnath Singh on 27 March 2026, granted Acceptance of Necessity (AoN) for various proposals worth an estimated cost of about Rs 2.38 lakh crore. For the Indian Army, approval was accorded for the Air Defence Tracked System, armour piercing tank ammunition, High Capacity Radio Relay, Dhanush Gun System and Runway Independent Aerial Surveillance System.

The Air Defence Tracked System will provide real time Air Defence Control and Reporting capability, while the High Capacity Radio Relay will provide reliable and fail proof communication. The Dhanush Gun System will enhance the artillery's capabilities to engage targets at longer ranges in all terrains with enhanced lethality and accuracy. The Runway Independent Aerial Surveillance System will provide surveillance capabilities to the Army units, with the armour piercing tank ammunition enhancing the lethality of anti-tank ammunition.

For the Indian Air Force, proposals were cleared for the procurement of Medium Transport Aircraft, S-400 long range surface-to-air missile system, Remotely Piloted Strike Aircraft and overhaul of Su-30 aero engine aggregates. The induction of Medium Transport Aircraft by replacing the transport fleet of An-32 and Il-76 will meet the strategic, tactical and operational airlift requirements of the Services.

The S-400 system will counter enemy long range air vectors targeting vital areas, while the Remotely Piloted Strike Aircraft will enable undertaking offensive counter and coordinated air operations, also providing stealth intelligence, surveillance and reconnaissance activities. The overhaul of Su-30 aero engine and its aggregates will increase the service life of the aircraft and fulfil the operational requirement of the Indian Air Force.

For the Indian Coast Guard, AoN was accorded for Heavy Duty Air Cushion Vehicles. These vehicles will be used for multipurpose maritime coastal operational roles, including high speed coastal patrolling, reconnaissance, search and rescue operations, rendering assistance to ships and carrying personnel and stores including logistics.

In the Financial Year 2025-26, AoN for 55 proposals amounting to Rs 6.73 lakh crore was accorded by the DAC. Moreover, capital procurement contracts were signed for 503 proposals amounting to Rs 2.28 lakh crore in the current fiscal year. Both the quantum of AoN given and capital contracts signed, so far, have been the highest in any given Financial Year.

Contracts for Tunguska & Inspection (Depot Level) of P8I

The Ministry of Defence signed contracts, worth a total of Rs 858 crore, for the procurement of Tunguska air defence missile system and Inspection (Depot Level) of P8I long-range maritime reconnaissance aircraft. The contracts were inked at Kartavya Bhawan-2, New Delhi on 27 March 2026.

The contract for the procurement of Tunguska Air Defence Missile Systems, valued at Rs 445 crore, for the Indian Army, was signed with JSC Rosoboronexport, Russia in the presence of Defence Secretary Mr. Rajesh Kumar Singh. These missiles will enhance India's multilayered air defence capabilities against aerial threats including aircraft drones and cruise missiles. The agreement will further strengthen the Indo-Russian strategic defence partnership.

The contract for the Inspection (Depot Level) of P8I long-range maritime reconnaissance aircraft for Indian Navy under Buy Indian category with 100% Indigenous Content, valued at Rs 413 crore, was signed with Boeing India Defence Private Ltd, a wholly owned Indian subsidiary of Boeing, in the presence of senior officials of the Ministry of Defence. This contract will ensure Depot level maintenance of P8I fleet at in-country MRO (Maintenance, Repair and Overhaul) facility, which is in line with Government of India's commitment to Aatmanirbhar Bharat and Make-in-India.



MoD & BEL contract for Mountain Radars for IAF

Ministry of Defence (MoD) signed a capital acquisition contract with Bharat Electronics Limited (BEL) for the procurement of two Mountain Radars, including associated equipment and required infrastructure for the Indian Air Force, at a cost of around Rs 1,950 crore. The contract,

under Buy (Indian–Indigenously Designed Developed and Manufactured) category, was signed in the presence of senior officials of MoD and BEL in New Delhi on 31 March 2026. This Mountain Radar is indigenously designed and developed by Electronics & Radar Development Establishment of DRDO and will be manufactured by BEL.

BEL receives orders worth Rs. 1660 Cr and 6795 Cr

Bharat Electronics Limited (BEL) secured orders worth Rs. 1660 Crore and include satellite communication network, electronic warfare systems, communication equipment, avionics, software solutions, munitions,



Rs 975 crore contracts for TRAWL Assembly for T-72/T-90

The Ministry of Defence signed contracts with Bharat Earth Movers Limited (BEML) and Electro Pneumatics and Hydraulics (India) Private Limited for the procurement of TRAWL Assembly for T-72/T-90 tanks, at an approximate cost of Rs 975 crore. The contracts were signed in the presence of Defence Secretary Mr. Rajesh Kumar Singh in New Delhi on 21 April 2026.

The TRAWL assembly for T-72/T-90 tanks is a critical equipment developed by DRDO which will enhance the minefield breaching capability of the Indian Army. It would generate additional capability of creating Vehicle Safe Lanes through minefields with anti-tank mines with proximity magnetic fuses.



EVM, strategic components, upgrades, spares, services, etc. Further, BEL secured additional orders worth Rs. 6795 Crores which included mountain radars from MoD, avionics package for LCA from HAL, major export order for communication equipment, electronic fuzes, strategic components, upgrades, spares, services, etc.

SMPP secures additional order for 10,000 BPJs

SMPP Limited, a leading Indian manufacturer of advanced ballistic protection systems for soldiers and weapon platforms across land, air and sea, is on track for an on–time execution of the order for 40,000 Bullet Proof Jackets (BPJs) for India’s paramilitary forces, including the Border Security Force, CISF and Sashastra Seema Bal. This is in addition “to the most advanced BPJs offering



protection from armour piercing bullets being supplied by SMPP to CRPF and Indian Army”. Of the total order quantity, around 28,000 BPJs have already been delivered. The balance units are scheduled for delivery in the next financial year, in line with contractual timelines.

BEL achieves record turnover of Rs. 26,750 Crores



the year and ongoing conflict in West Asia has highlighted the need for self-reliance in strategic sectors and the importance of a resilient domestic industrial defence ecosystem. BEL remains well positioned to effectively navigate these challenges through its expertise across multiple technologies and platforms, strong order book, diversified portfolio, modernised manufacturing facilities and proven execution capabilities. BEL continues to focus on indigenisation by reducing dependency on imports

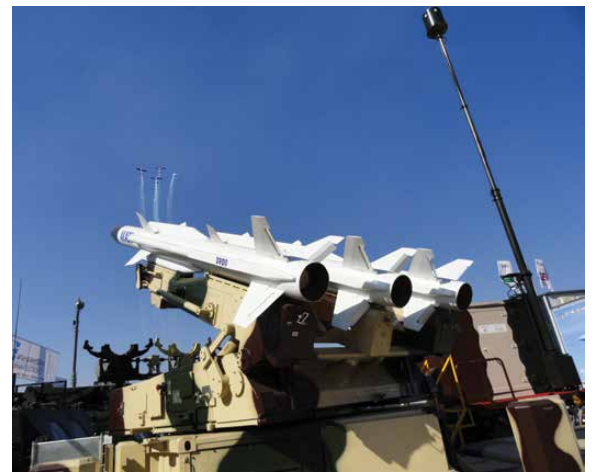
Bharat Electronics Limited (BEL) has achieved a turnover of around Rs. 26,750 Cr (Provisional & Unaudited), during the Financial Year 2025–26, against the previous year’s turnover of Rs. 23,024 Cr registering a growth of 16.2%. This includes Export sales of around US\$ 141.9 million during FY 2025–26, as against the previous year’s export turnover of US\$ 106.17 million, registering a growth of 33.65%.

During the fiscal year 2025–26, BEL secured orders worth Rs. 30,000 Cr including export orders worth USD 346 million. Some of the major orders received during the year in defence include avionics for LCA, mountain radars, EW suite for helicopters, air defence radars, EOIR payloads for airborne and naval platforms, EW systems for Naval platforms,

fire control & sighting system for tanks, mobile communication terminals, network systems, counter unmanned aerial systems, upgrades, spares and services.

The major orders in non-defence sector include communication equipment, IT infra for AIIMS, airport surveillance radars, software solutions, automatic train supervision system, EVM, etc. On the export front, the major orders received include communication equipment, satellite communication network, TR modules, electronic fuzes, drones, etc. With this, the total order book of BEL, as on 1 April 2026, stands at around Rs. 74,000 Cr including an export order book of USD 495 million.

Mr. Manoj Jain, Chairman and Managing Director, BEL, stated, “The geopolitical incidents during



and strengthening domestic supply chains, while simultaneously focusing on future ready technologies such as Artificial Intelligence, cybersecurity, advanced electronic warfare and communication systems, and autonomous platforms. These strategic initiatives will enable BEL to capture emerging opportunities in both domestic and global markets”.



FY 2025–26: HAL registers revenue of Rs 32,250 Crores



HAL Helicopter Division

Hindustan Aeronautics Limited (HAL) recorded a revenue of Rs. 32,250 crores (provisional and unaudited) for the financial year ended 31 March 2026, as against the revenue of Rs. 30,981 crores during the previous year. This achievement was made possible despite the challenges faced in deliveries of LCA Mk.1A and HTT 40 due to supply chain issues arising from geopolitical and technical challenges. However, deliveries of ALH, AL31–FP, RD–33 engines and other products and services were accelerated, helping maintain the top line and healthy profitability.

“HAL has shown resilience and maintained steady growth despite geopolitical tensions, global conflicts, and supply chain challenges in the aerospace and defence sectors. During the past year, HAL strengthened its order pipeline, expanded its manufacturing capability and diversified into the civil segment to support future growth,” stated Dr. D K Sunil, CMD, HAL.



Engines at Koraput Division



Do-228 at TAD Kanpur

HAL’s order book remained healthy at around Rs 2.54 lakh crores as on 31 March 2026, against the opening order book position of Rs 1.89 lakh crores, after adjusting current– year liquidation. The increase is mainly due to the signing of major orders with the MoD for the supply of 97 Light Combat Aircraft (LCA) Mk.1A aircraft for Rs 62,370 crores, six ALH CG for Rs 2,704 crores, and eight Dornier CG for Rs 2,186 crores. The outstanding manufacturing orders for helicopters, aircraft and engines provide long term revenue visibility over the next 7–8 years. Also, the ROH, spares and other order book remained healthy and are expected to remain robust in the coming years.

During the year, the Company has paid an interim dividend of Rs 35/- per equity share at a face value of Rs 5/- each for the FY 2025–26, totalling Rs 2,341 crores. Further, a final dividend of Rs 15/- per equity share at a face value of Rs 5/- each for the FY 2024–25, totalling Rs 1,003 crores has been paid. The total cash outflow for payment of the above dividend during the year is Rs 3,344 crores to its shareholders.



H-228 supplied to Guyana

During the year, the Company made significant progress in capacity augmentation with the operationalisation of the third LCA Tejas production line and second HTT-40 line at its Nasik Division. The company also signed an MoU with Mishra Dhatu Nigam Limited (MIDHANI) to set up a Strategic Metal Bank for critical raw materials, paving the way for self-reliance in critical strategic materials.

HAL made a firm entry into the civil aviation sector with the inaugural flight of the Dhruv NG helicopter. The first series production Hindustan Turbo Trainer-40 (HTT-40) aircraft also made its maiden flight during the year.

As part of its diversification efforts, HAL formed important partnerships this year. The company signed an MoU in Moscow with Public Joint Stock Company United Aircraft Corporation (PJSC-UAC) to produce the civil commuter aircraft, the SJ-100. HAL also signed contracts with Pawan Hans Ltd to supply 10 Dhruv NG helicopters and with Jags Aviation, Guyana, to supply two Hindustan-228 aircraft. The two H-228 aircraft were delivered recently to Guyana ahead of the contracted delivery schedule.

This year, HAL signed the SSLV Technology Transfer Agreement with ISRO, IN-SPACe, and NSIL as part of its transition from a component supplier to a full launch service provider and a key player in the fast growing small satellite market.



Su-30MKI at Nasik Division



LCA Mk.1A aircraft with trainers


The Company also undertook significant digital transformation initiatives, including the roll out of Robotics Process Automation, integration of AI-enabled systems such as Flight Snag Intelligence and deployment of Daily Digital Inspection to enhance efficiency and improve execution. As part of its long term digital strategy, HAL is centralising its IT infrastructure by consolidating servers, establishing a Tier-3 Data Centre and developing a Private Cloud.

Reinforcing its commitment to sustainability, the Company established a cumulative renewable energy capacity of 50.15 MW, and has met around 40% of its electricity requirements from Renewable Energy Sources. On the CSR front, in a first-of-its-kind initiative, the Company launched a HAL Endowment Scholarship Scheme in partnership with the Indian Institute of Technology, Madras (IITM) to support meritorious students from economically weaker sections of the society for a period of 15 years. The Company also sponsored a mountaineering expedition to South America.

To strengthen its leadership pipeline and ensure strategic leadership continuity during the year, HAL rolled out the seventh edition of its flagship Leadership Development Programme (LDP), designed to prepare high potential officers for top management roles.

With new orders in hand, enhanced manufacturing capabilities and a stabilising supply chain, the company is well positioned to deliver strong financial performance in



FY 2026-27 and beyond. 

LCA Mk.1A

HAL hands over four ALH Mk III (MR) to ICG



ALH Mk.III MR



Chief Guest addressing the audience

Industan Aeronautics Limited (HAL) handed over four ALH Mk III Maritime Role (MR) helicopters to the Indian Coast Guard at an event held in Bengaluru on 10 April 2026, meeting delivery timeline and further strengthening ICG's maritime capability. DIG Rajesh Makwana, TM & Bar CSO (Aviation), Coast Guard Commander (Western Seaboard) graced the occasion along with Mr. P B Rangarao, Chief Executive Officer, Helicopter Complex. Helicopter documents were handed over by the Office of the Regional Director, Aeronautical Quality Assurance (ORDAQA), and the Helicopter Division, to the Coast Guard Squadrons of Kochi and Porbandar. These deliveries are part of the nine ALH Mk.III (MR) contract signed in March 2024.



Handing over of documents to ICG



CEO Helicopter Complex Mr. P B Rangarao addressing the audience

HAL has delivered 16 ALH Mk.III (MR) to the Indian Coast Guard till 2022 and an additional order for six more helicopters was signed in March 2026. Speaking on the occasion, the Chief Guest appreciated HAL's efforts to ensure the on-time delivery of helicopters to enhance the ICG's rotary-wing fleet.

The ALH Mk.III MR is the maritime variant of the indigenous Dhruv Advanced Helicopter. It is a multi-role twin engine helicopter equipped for maritime operations, including maritime surveillance, Search and Rescue, Casualty Evacuation, Coastal Security, Law Enforcement, VIP travel, Troop Transport, Logistics and Anti-piracy.

Equipped with advanced avionics, a modern glass cockpit and night operation capability, the ALH Mk.III (MR) "significantly strengthens the Indian Coast Guard's operational readiness across diverse maritime scenarios".

GE Aerospace contract with IAF for F404-IN20 depot



GE Aerospace announced a contract with the Indian Air Force (IAF) to establish an in-country depot facility for the F404-IN20 engines that power IAF's Light Combat Aircraft Tejas fleet. The facility will be set up by the IAF with technical inputs from GE Aerospace and is expected to help India's indigenous defence sustainment effort. Once operational, the facility will eliminate the need to depend on the overseas repair centres, significantly improving turnaround times.

The depot facility will be owned, operated and maintained by the Indian Air Force with GE Aerospace providing technical inputs, training, support staff, and the supply of necessary spares and specialised equipment. This collaboration marks the next step in the four decade long partnership between GE Aerospace and the IAF.


"Our commitment to supporting India's armed forces continues to guide our collaboration and partnership

in expanding local sustainment capabilities of the Tejas fleet," stated Rita Flaherty, Vice President of Sales and Business Development for Defense & Systems at GE Aerospace. "Through the upcoming depot facility, we will support the availability of the F404-IN20 engines for the Indian Air Force, ensuring they have ready access to cutting edge technology to power their defence needs."

GE Aerospace is committed to developing India's aerospace ecosystem, spanning design, development, manufacturing, and sustainment for both commercial and military aviation. For example, 150 engineers have passed out of the company's local two year Edison Engineering Development Programme which develops engineering leaders. Several skilling initiatives over ten years have helped train over 5000 people with core manufacturing skills at the company's Pune factory. In September 2025, the GE Aerospace Foundation, in partnership with United Way, launched Next Engineers at Bengaluru, the four year college and career readiness programme that will help 4000 young engineering aspirants.

Other than the Tejas, GE Aerospace engines also power the Indian Navy's P-8I maritime patrol aircraft and MH-60R helicopters, as well as the Indian Air Force's AH-64 Apache

helicopters, while LM2500 marine gas turbines provide the power for the INS Vikrant aircraft carrier and the P-17 Shivalik Class frigates.

GE Aerospace has been a partner to India's aviation industry for over 40 years. 1,400 GE Aerospace and partner engines are in service, powering major Indian airlines. GE Aerospace's defence engines and systems power the Indian Air Force's Light Combat Aircraft Tejas Mk.1 and helicopters, and the Indian Navy's aircraft carrier battleships and frigates. Its Pune manufacturing facility and 13 local India partners are part of the company's global supply chain. Researchers and engineers at the company's 25 year old India Technology Centre in Bengaluru are building the latest aviation technologies. 

Text courtesy: GE

Joint statement on GE's F414

"GE Aerospace and Hindustan Aeronautics Limited (HAL) are pleased to announce significant progress regarding F414 co-production today, having reached agreement on technical matters. This agreement marks a significant step forward in strengthening economic growth and advancing cooperation for both India and the U.S. and expands the 40 year partnership between GE Aerospace and HAL" – GE Aerospace and HAL spokespersons.



MBDA to implement MICA MRO capabilities in India



MBDA has signed an agreement with the Indian Air Force for the development of a local capability for the Maintenance, Repair and Mid-Life Overhaul (MRO) of MICA missiles.

The MRO facility will be set up, operated and maintained by the Indian Air Force, with MBDA supplying the industrial machinery and tools required, data packages, as well as training and technical support. Developing these facilities locally will foster long term capability building, secure technical expertise for years to come, and develop India's strategic autonomy, reflecting the core principles of Atmanirbhar Bharat, the ambitious campaign launched by Prime Minister Narendra Modi in 2020.

This facility will help India's domestic defence sustainment effort, improving turnaround times, with capacity to support MICA missiles throughout the duration of their time in service, significantly enhancing the operational capability and readiness of the Indian Armed Forces.



India and MBDA share a long history of partnership in equipping the Indian Air Force going back to the early days of air-to-air missiles. Throughout its history, the Indian Air Force has relied on MBDA's missile systems to provide the latest air combat performance across a number of different aircraft types. MBDA today has two focuses: providing the highest performing missile technologies to the Indian Armed Forces, and secondly supporting Atmanirbhar Bharat as part of MBDA's longstanding partnership strategy with India.

With a strong reputation as a reliable partner that has supported the Indian Air Force for over 50 years, European missile firm MBDA understands the importance of operational capability and sovereignty to the IAF. For these reasons, the company has strongly committed to Make in India, to deliver both industrial sovereignty and the best military equipment to India. ➡

Text: MBDA
Photos: VAYU



Emergency Landing Facility (ELF) activation at Sultanpur



The Indian Air Force activated 'Emergency Landing Facility' (ELF) on the Purvanchal Expressway in Uttar Pradesh's Sultanpur District on 22 April 2026, both by day and night, showcasing its operational capability to bolster its defence readiness. UP State Minister for Panchayati Raj and Minority Welfare Mr. Om Prakash Rajbhar, Air Mshl B Manikantan, AOC-in-C, CAC, and other officials were present to witness the IAF aircraft undertake ELF operations.



The operational versatility of the Indian Air Force was demonstrated through the operations by diverse fleet of aircraft, including Jaguar, Mirage-2000, Sukhoi-30MKI, C-295 and An-32, alongside Mi-17 V5 helicopter and Garud Commando team. IAF along with UPEIDA and the local civil administration, validated their Standard Operating Procedures for emergency activation of these ELFs, in the shortest possible time frame both by day and by night.

This operation has majorly boosted IAF's capability to undertake unhindered operations even during non-availability of standard runways, showcasing its



operational resilience. It has demonstrated the professional flying skills of its aircrew and the capability of its ground crew in activating such expressway airstrips at a short notice. These strategically developed airstrips on national expressways substantially augment operational flexibility and serve as critical force multiplier during emergencies, reinforcing national security and disaster response capabilities. The synergy displayed in the ELF activation, not only strengthens the overall strategic posture of the nation but also enhances the HADR capabilities in the region. ➡

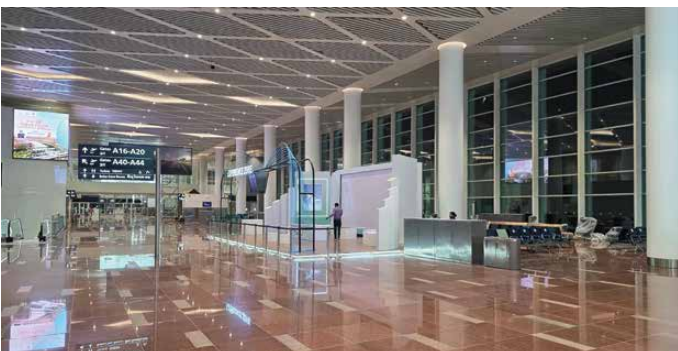
Text and photos: IAF/MoD

Phase I of Noida International Airport inaugurated



The Prime Minister, Mr. Narendra Modi, on 28 March 2026, inaugurated the Noida International Airport at Jewar in Uttar Pradesh. Expressing his pride and joy on the occasion, the Prime Minister said that “today marks a new chapter in the Viksit UP, Viksit Bharat Abhiyan”. He noted that India’s largest state had now become one of the states with the highest number of international airports. PM Modi shared that he felt doubly proud, first, for having laid the foundation stone of this airport and now inaugurating it, and second, because the name of this grand airport was linked to Uttar Pradesh. “This is the state that chose me as its representative and made me a Member of Parliament, and its identity is now associated with this magnificent airport,” remarked Mr. Modi.

Highlighting the far reaching impact of the new airport, the Prime Minister said that the Noida airport



would benefit a vast region encompassing Agra, Mathura, Aligarh, Ghaziabad, Meerut, Etawah, Bulandshahr and Faridabad. He emphasised that the airport would bring numerous new opportunities for the farmers, small and medium enterprises, and the youth of western Uttar Pradesh. “Aircraft will fly from here to the world, and this airport will also become a symbol of a developed Uttar Pradesh taking flight,” stated Mr. Modi, extending his heartfelt congratulations to the people of the state, especially western UP.

In a press release, Tata Projects Limited said it had successfully delivered Phase 1 of Noida International Airport, marking the completion of India’s largest greenfield airport and the country’s first net-zero emissions airport. Developed by Yamuna International Airport Private Limited, a wholly owned subsidiary of Zurich Airport International AG, the airport is strategically located in western Uttar Pradesh and is expected to significantly strengthen aviation capacity in the National Capital Region while accelerating economic growth, logistics development, tourism, and urban expansion across the region.

Phase 1 includes Terminal 1, spanning over 1 lakh sqm, designed to handle 12 million passengers annually, supported by advanced digital systems for efficient passenger processing. The airport also features a 3,900 metre runway capable of handling widebody aircraft, a modern cargo terminal, an Air Traffic Control tower, and extensive airside and landside infrastructure. The airport offers seamless connectivity through the Yamuna Expressway and will be integrated with future multimodal transport networks, including metro connectivity. Designed for long term expansion, the airport will eventually serve 70 million passengers annually, supported by two runways, expanded terminal capacity, and dedicated aircraft maintenance facilities. ➡

Images: MoCA/Twitter

INS Tarangini at Colombo

Indian Navy's Sail Training Ship INS Tarangini arrived at Colombo on 6 March 2026, after completing sail training of Sri Lanka Navy Seariders. Three officers and 26 trainees from the Sri Lanka Naval and Maritime Academy had embarked the ship at Trincomalee for the sail training deployment. During the sea sortie, the trainees underwent an intensive sail training and were exposed to nuances of sail setting and watchkeeping under sails.



India-Seychelles "Exercise Lamitiye"

Indian Armed Forces contingent were at Seychelles to participate in the Eleventh edition of Joint Military Exercise "Lamitiye-2026" with Seychelles Defence Forces (SDF). The Joint Exercise was conducted at Seychelles



Defence Academy from 9-20 March 2026. This edition marked a significant milestone with the participation of all three services of the Indian Armed Forces. The contingent comprised of personnel from the ASSAM Regiment and participation from Indian Navy and Indian Air Force included INS Trikand and a C-130 aircraft.

INS Sudarshini at Valletta, Malta

The Indian Naval Sail Training Ship INS Sudarshini arrived at the historic port of Valletta, Malta on 12 March 2026, marking a significant milestone in her landmark transoceanic expedition Lokayan-26. The visit "underscores the deep rooted maritime ties between India and Malta and represents an important leg of the ship's ambitious 22,000 nautical mile global voyage".



INS Trikand at Port Louis, Mauritius

Indian Naval Ship Trikand, stealth frigate of the Indian Navy, called at Port Louis, Mauritius on 10 March 2026 during her operational deployment to the South West Indian

Ocean Region. During the port call, the ship participated in the 58th Mauritius National Day celebrations on 12 March 2026 with a marching contingent, naval band and integral helicopter for the fly-past at the National Day Parade at Champ de Mars, Port Louis.



Exercise Kakadu 2026

INS Nilgiri on her overseas deployment to the Western Pacific participated in the Sea Phase-I of Exercise Kakadu 2026 on 22 March. “Strengthening naval interoperability, cooperation and maritime understanding amongst participating navies” was the goal as per the Indian Navy.



INS Trikand at Maputo, Mozambique

INS Trikand, a frontline guided missile frigate of the Indian Navy, arrived at Maputo, Mozambique, on 26 March 2026 as part of her operational deployment to the South West Indian Ocean Region. The visit “aims to further strengthen maritime cooperation and bilateral relations between India and Mozambique”.



Personnel from 16 foreign countries at SNC, India

Indian Navy’s IOS SAGAR initiative achieved a significant milestone in advancing regional maritime cooperation with the successful completion of an intensive Harbour Training Phase at the Southern Naval Command (SNC), Kochi. Over a period of two weeks, the multinational crew underwent an intensive and comprehensive training capsule across the premier professional schools of the Indian Navy. The training programme was designed to build foundational and advanced competencies across a broad spectrum of naval operations. It included seamanship, navigation, communication procedures, safety of life at sea, firefighting and damage control drills, along with specialised modules such as Visit, Board, Search and Seizure (VBSS) operations and advanced bridgemanship.



INS Trikand at Dar-es-Salaam, Tanzania

INS Trikand, frontline guided missile frigate of the Indian Navy, arrived at Dar-es-Salaam, Tanzania on 3 April 2026, as part of its ongoing deployment in the South West Indian Ocean Region. Engagements during the port call included professional interactions – joint training activities with the Tanzania Navy to enhance interoperability and maritime cooperation.



INS Sunayna (IOS SAGAR) at Male, Maldives

Indian Navy's INS Sunayna, deployed under Indian Ocean Ship (IOS) SAGAR initiative, arrived at Male on 6 April 2026, marking the first port call of her operational deployment. The ship was accorded a warm welcome by the Maldives National Defence Force (MNDF), underscoring a strong and enduring maritime partnership, and close regional ties between the two nations. Notably, two MNDF personnel were also part of the multinational crew embarked onboard.



INS Triakand at Mombasa, Kenya

INS Triakand, frontline guided missile frigate of the Indian Navy, arrived at Mombasa, Kenya, on 7 April 2026, as part of its ongoing deployment in the South West Indian



Ocean Region. The port call coincided with the visit of VAdm Krishna Swaminathan, Flag Officer Commanding-in-Chief, Western Naval Command, to Kenya.

INS Sudarshini at Sète, France

INS Sudarshini, the Indian Navy's Sail Training Ship, departed the port city of Sète on 7 April 2026, marking successful culmination of her participation in the renowned Escale à Sète. This biennial festival is amongst the largest maritime gatherings in the Mediterranean, celebrating global seafaring heritage. A major highlight was the participation of the Indian Naval marching contingent in the Heritage City Parade, commemorating 400th anniversary of the French Navy. Marching through the historic streets of Sète, while "proudly displaying the Indian tricolour, the contingent delivered a flawless display of discipline, unity, and ceremonial excellence".



India-Egypt Special Forces Exercise Cyclone

The Indian Army contingent departed for Egypt to participate in the fourth edition of the India-Egypt Joint Special Forces Exercise, Cyclone – IV, which was conducted at Anshas from 9 to 17 April 2026. The exercise is a continuation of the growing military cooperation between India and Egypt and follows the successful conduct of the previous edition in India. The Indian contingent, comprising 25 personnel from Special Forces units, trained alongside their Egyptian counterparts in a realistic operational environment.



India-Uzbekistan Exercise Dustlik

The Indian Army contingent departed for the 7th edition of India-Uzbekistan joint military Exercise Dustlik which was conducted at Gurumsaray Field Training Area, Namangam, Uzbekistan from 12 to 25 April 2026. Exercise Dustlik is a yearly event conducted alternatively in India and Uzbekistan. Last edition was conducted at Foreign Training Node, Aundh (Pune) in April 2025. The Indian Armed Forces contingent comprising 60 personnel was represented by 45 personnel from the Indian Army, majorly from a Battalion of the Mahar Regiment and 15 personnel from the Indian Air Force. The Uzbekistan contingent also comprised of approximately 60 personnel, from Uzbekistan Army and Air Force.



IOS Sagar at Phuket, Thailand

Indian Ocean Ship (IOS) SAGAR arrived at Phuket, Thailand, on 14 April 2026 on completion of a six day transit from Malé, Maldives, marking the second port call



of its ongoing mission. During the port call at Phuket, IOS SAGAR engaged in professional interactions with the Royal Thai Navy (RTN), aimed at strengthening bilateral defence cooperation and enhancing mutual understanding.

INS Sudarshini at Casablanca, Morocco

Indian Navy's Sail Training Ship, INS Sudarshini, made port call at Casablanca, Morocco on 15 April 2026, as part of its ongoing transoceanic deployment under Lokayan 26. During the three day visit, the crew of INS Sudarshini engaged with personnel of the Royal Moroccan Navy, hosted senior officials and distinguished guests onboard, and participated in professional and cultural interactions aimed at further strengthening naval cooperation, diplomatic ties and goodwill.

INS Sunayna at Jakarta, Indonesia

Indian Navy's INS Sunayna, an Offshore Patrol Vessel deployed under the IOS SAGAR initiative, arrived at Jakarta, Indonesia on 21 April 2026, marking the third port call of its operational deployment to the Indian Ocean Region.



INS Nireekshak at Colombo for IN-SLN DIVEX

INS Nireekshak, the Diving Support and Submarine Rescue Vessel of Indian Navy, arrived at the port of Colombo, Sri Lanka, on 21 April 2026 to participate in



the 4th edition of IN–SLN DIVEX 2026, a bilateral diving exercise. The joint exercise saw diving teams from both the Navies undertake a series of specialised diving operations and training aimed at enhancing interoperability, cohesion and exchange of Best Practices.

INS Sudarshini at Las Palmas, Spain

The Indian Navy’s Sail Training Ship INS Sudarshini arrived at Las Palmas on 23 April 2026, as part of her ongoing transoceanic deployment under Lokayan 26. The port call to the Canary Islands archipelago is significant as it marked the maiden visit of an Indian naval ship to the archipelago. The stopover served as a strategic pause before the ship embarked on her ambitious trans–Atlantic passage. The visit “underscores growing maritime cooperation and engagement between the Indian Navy and the Spanish Navy”.



IOS Sagar at Changi, Singapore

Indian Ocean Ship (IOS) SAGAR, INS Sunayna, arrived at Changi Naval Base, Singapore, on 26 April 2026, marking her fourth port call during the ongoing IOS SAGAR deployment under the vision of MAHASAGAR (Mutual and Holistic Advancement for Security and Growth Across Regions). The ship engaged with the RSN through a series of professional and community interactions. Activities conducted included visits of IOS Sagar crew to RSN’s Navigation and Damage Control simulators, Information Fusion Centre and the Navy Museum in Singapore, promoting exchange of Best Practices and enhancing regional maritime awareness.



Exercise Flintlock 2026 at Côte d’Ivoire

The multinational Joint Special Forces Exercise Flintlock 2026 successfully culminated in Côte d’Ivoire on 2 May 2026, marking a “significant step in India’s expanding Defence Cooperation in Africa and its steadfast commitment to global security”. From intensive special operations drills to the exchange of tactical expertise, training alongside Guinean counterparts enhanced interoperability, synergy and mutual trust.



India–Cambodia CINBAX–II 2026

The Indian Army contingent took part at the second edition of India–Cambodia Bilateral Military Exercise CINBAX–II 2026. The exercise was conducted at Techo Sen Phnom Thom Mreas Prov Royal Cambodian Air Force Training Centre (Camp Basil), Kampong Speu Province, Kingdom of Cambodia from 4 to 17 May 2026. The exercise was conducted under the framework of Chapter VII of UN Mandate, showcasing Company level joint training for conduct of operations in sub–conventional environment. The Indian Army contingent comprised 120 personnel, majorly from a battalion of the Maratha Light Infantry Regiment. The Cambodian contingent comprised of 160 personnel, from the Royal Cambodian Army.



IAF No. 17 Squadron: The Golden Arrows

Seven decades of India's most decorated air squadron



There is a saying in the Indian Air Force that some squadrons have history, and some squadrons are history. No. 17 Squadron falls firmly in the second category. Known as the Golden Arrows, this unit has been flying for India since 1951. It has flown American trainers, British jets, Soviet fighters and now French Rafales. It has fought in Goa, in the 1971 war, in Kargil and in Operation Sindoor. Through every era of Indian air power, the Golden Arrows have been in the thick of it.

Where it all began

The squadron was born on 1 October 1951, at Ambala Air Force Station. The man who formed it was Flight Lieutenant DL Springett, and the aircraft it flew was the Harvard IIB, an American trainer that had been in service since the Second World War. In those early days, the squadron was tasked with tactical reconnaissance. It was not glamorous work, but it was foundational work.



By November 1955, the Golden Arrows had entered the jet age. They converted to the de Havilland Vampire, a British twin boom jet fighter that was the IAF's first



combat jet. Then, in 1957, they made another switch and became the first IAF squadron to receive the Hawker Hunter. That matters because the Hunter was a far more capable machine than anything they had flown before. It

was fast, it could carry bombs and it could strike hard. The Golden Arrows were the tip of the spear, and everyone in the IAF knew it.

Goa, 1961: When India launched Operation Vijay to liberate Goa from Portuguese rule in December 1961, the Golden Arrows were among the first into the skies. Flying their Hunters, they struck a Portuguese wireless station, helping to cut off the colony from outside communication. Goa fell in days. It was a quick, decisive military action, and the squadron played its part cleanly and effectively.

The 1965 War: The 1965 Indo-Pakistan war is where things got more complicated. The Golden Arrows operated in a reserve capacity during this conflict. They were not leading the charge on the front lines in the way they had in Goa, but being reserve does not mean being unimportant. Reserve squadrons hold the line, cover gaps and are ready to move at short notice. The squadron remained ready throughout the conflict.



The Bangladesh Liberation War: The 1971 war is the one that defined a generation of IAF pilots. It was the war where India fought on two fronts simultaneously and the Golden Arrows were deployed in both. Under the command of Wing Commander Narinder Chatrath, the squadron flew close air support missions, counter air missions and fighter reconnaissance sorties across the eastern and western theatres.

Their Hunter jets played a notable role in the war. The aircraft had proven itself a reliable ground attack platform,



and the pilots used it well. The squadron collected gallantry awards during this campaign, reflecting the calibre of flying done under pressure, across multiple fronts, in a war India ended with a decisive victory. Bangladesh was free, and the Golden Arrows had flown a piece of that history.

In 1975, the squadron converted to the MiG-21M, stepping into the Soviet era of Indian air power. The Harvard and Vampire and Hunter were gone. Russia had arrived.

A Presidential Honour: In November 1988, the Golden Arrows received their Colours from President R. Venkataraman. In military tradition, being presented Colours by the head of state is one of the highest institutional honours a regiment or squadron can receive. It is formal recognition that the unit has served with distinction. For the Golden Arrows, it was a marker of nearly four decades of service. They wore it well.

Kargil: The finest hour

If there is one moment that defines the Golden Arrows above all others, it is the Kargil War of 1999. This was the squadron's most tested, most celebrated and most painful chapter.

By 1999, the squadron was flying MiG-21s and was based in Bathinda. When Pakistani soldiers infiltrated Indian positions along the Line of Control in Kargil, the Indian military scrambled to respond. The IAF launched Operation Safed Sagar, the first large scale use of air power in Jammu and Kashmir since 1971. The Golden Arrows were at the centre of it.



The squadron was commanded at that time by Wing Commander Birender Singh Dhanoa, a man who would eventually rise to become Chief of Air Staff of the Indian Air Force. Dhanoa personally flew reconnaissance sorties over Tiger Hill and Toloing. Under his command, the Golden Arrows flew more reconnaissance and strike missions than any other IAF unit in the war. They were everywhere.

The first photo reconnaissance mission of the war was flown on 21 May 1999, by Squadron Leader Ajay Ahuja and Squadron Leader P. Narain. Those early sorties produced something critical. The images captured by the Golden Arrows were the first hard confirmation that Pakistani troops had crossed the Line of Control and were occupying Indian territory. The air strikes that followed on 26 May were launched based on that intelligence.

Bombing raids began on 3 June. Night bombing missions started on 27 June and continued through 12 July. The strikes hit Mushkoh Valley, Matayin, Jubar Top and areas around Point 5140. It was high altitude warfare, in thin air, against dug-in enemy positions on mountain peaks. The flying was extraordinarily difficult.



The story of Sqn Ldr Ajay Ahuja

No account of the Golden Arrows is complete without stopping here. On 27 May 1999, Squadron Leader Ajay Ahuja was preparing to fly a photo reconnaissance mission. Just as he was getting airborne, word came in that Flight Lieutenant K. Nachiketa, a pilot from another squadron,

had ejected from his MiG-27 after an engine flame out near the Batalik sector. Nachiketa was down somewhere near Pakistani positions and nobody knew exactly where.

Ahuja did not hesitate. He changed course, taking his MiG-21 toward the last known location of the downed pilot. He knew there were Pakistani shoulder fired Stinger surface-to-air missiles in the area. He knew flying slow patterns over enemy positions made him a target. He went anyway.

He circled for close to an hour with his wingman, trying to pin down Nachiketa's exact location. When his wingman hit bingo fuel and had to return, Ahuja stayed. He kept circling. He finally located what he believed was the crash site and passed the coordinates to mission control so rescue helicopters could be launched.

Then a Stinger hit his aircraft. Ahuja's last radio call was calm. He reported that something had hit his plane, said a missile strike could not be ruled out, gave his location and said he was ejecting. He ejected safely. He landed alive.



His body was returned to India two days later. The post-mortem report was unambiguous. He had been shot twice at close range, once near the ear and once in the chest. He had a fractured knee from the landing. The gunshot wounds were the cause of death. He had been murdered on the ground after surviving the ejection, in clear violation of the Geneva Convention.

India filed a formal protest. Pakistan denied everything. The case was never resolved.

Squadron Leader Ajay Ahuja was posthumously awarded the Vir Chakra, India's third highest gallantry award. He was 36 years old. He left behind his wife Alka and a young son named Ankush. His Commanding Officer, Dhanoa, later said he had wanted to call Ahuja back before things went wrong. He never got the chance.

For the squadron, Ahuja was not just a pilot who died in the war. He was the kind of person who defined what the squadron stands for. He died trying to save a brother pilot from a different unit. He had no obligation to stay. He stayed anyway. That is the most Golden Arrow thing imaginable.



The squadron won more gallantry awards in the Kargil War than any other IAF unit. In 2005, the Golden Arrows were formally awarded Battle Honours for their performance in Operation Safed Sagar.

Grounded and brought back

In 2006, the MiG-21 era began winding down for the Golden Arrows. The aircraft were aging out, and the squadron eventually ran out of jets to fly. It was number plated, the military term for being officially put to sleep. The Golden Arrows went quiet.

They stayed that way for a decade. In September 2019, Air Chief Marshal Birender Singh Dhanoa, the same man who had commanded the squadron in Kargil exactly twenty years earlier, returned to Ambala Air Force Station to resurrect it. He handed the squadron insignia to Group Captain Harkirat Singh in a ceremony that carried more weight than most. The Golden Arrows were back and Rafales were coming.

Five Rafales landed at Ambala on 29 July 2020. From Harvard to Vampire to Hunter to MiG-21 to Rafale. Seven decades, five aircraft types, one identity.

Operation Sindoor: The new chapter

On 7 May 2025, after terrorists killed 26 civilians in Pahalgam, India launched Operation Sindoor. The

Golden Arrows, now under Group Captain Amit Gehani, flew unescorted into hostile airspace and struck nine verified terrorist training camps in Pakistan and Pakistan Occupied Kashmir. Over 100 terrorists were killed. Later missions targeted more than eleven Pakistani Air Force bases. The Rafales used SCALP cruise missiles and HAMMER glide bombs, firing from standoff distances that kept pilots out of the reach of Pakistani air defences.

The operation involved some of the longest beyond visual range air engagements in modern conflict. The Rafale’s electronic warfare suite performed in heavy jamming conditions. It was not a drill.



Gehani later said in an interview that the Rafale fulfilled every responsibility it was given during Sindoor. He said it is fully equipped to take on jets like the Chinese J-10 or J-35 and that no one should doubt the aircraft's capabilities.

Two names from this period deserve special mention. Squadron Leader Shivangi Singh, the first woman to fly

What the Squadron stands for

The Golden Arrows are not just a fighter unit. They are an institution. They were the first to receive the Hunter. They were the first to receive the Rafale. They fought in four wars and multiple operations. They produced an Air Chief Marshal. They lost a hero on a Kargil hillside and have never let anyone forget his name. They came back



Rafales in the Indian Air Force, flew with the Golden Arrows. During Operation Sindoor, Pakistan ran a propaganda campaign claiming they had shot her down and taken her prisoner near Sialkot. It was entirely false. She was at Ambala. When President Droupadi Murmu visited the base in October 2025 and was photographed with Shivangi, the claim was buried for good.

On 8 October 2025, the 93rd Indian Air Force Day, the Golden Arrows received a Unit Citation from IAF Chief Air Chief Marshal Amar Preet Singh for their performance in Operation Sindoor. Group Captain Gehani and Master Warrant Officer Shambhu Nath Raul accepted it on behalf of every person in the squadron. Nine IAF officers received the Vir Chakra that day across various units. It was a day Sqn Ldr Ahuja would have been proud of.

Later that month, President Murmu flew a 30 minute sortie in a Rafale piloted by Gehani, at 15,000 feet and 700 km/h. She called it unforgettable. She was right.



from disbandment and flew combat strikes inside Pakistan.

Every generation of the squadron has added something to the story. The next generation will add more. The golden arrows on the crest are not just a symbol. They point forward. ➡

**Article and photos:
Mayyank Kaul**

IAF Beyond Visual Range Air-to-Air Missiles



Su-30MKI with a large missile load

“Whoever has the longest reach controls the engagement,” comments fighter analyst Ben Lambeth of the Rand Corporation. In modern aerial warfare, the ability to look/track first Beyond Visual Range (BVR) and strike decisively defines the outcome of battles. The Russian semi-active radar homing (SARH) R-23R (AA-7 Apex) was the first beyond visual range air-to-air missile (BVRAAM) to enter Indian Air Force (IAF) service and was carried by MiG-23MF interceptors. The missile had an impressive “snap up” capability and thus could destroy targets far above the launch platforms.

However, the French Matra Super 530D (D for doppler) carried under the wings of IAF operated Mirage 2000H/TH provided IAF for the first time a decent capability against hostile low flying targets. Until the present millennium the inventory was further complemented by Russian R-27R (AA-10 Alamo) under the wings of MiG-29B/S. From 2002 onwards the Sukhoi Su-30MKI appeared with active radar homing (ARH) RVV-AE (AA-12Adder) empowering the IAF for the first time a “fire-and-forget” capability.

Subsequently, IAF BVRAAM stock was diversified by highly sophisticated MBDA MICA (Missile d’Interception, de Combat et d’Autodéfense) and Meteor BVRAAM with the service entry of Dassault Rafale multi-role strike fighters and upgradation of Mirage 2000H/TH to Mirage 2000I/TI standards. 350 MICA RF/IR and 200 MBDA Meteor BVRAAM were procured for Rafale platforms plus 493 MICA RF/IR for upgraded Mirage 2000I/TI. For Rafale, to decimate hostile airborne platforms, BVRAAM missiles load usually include six MBDA MICA RF/IR for air defence-oriented missions. 3.1 metre long, 112 kg weight, the MICA was originally designed as a ‘multi-aircraft’ missile that could easily be integrated onto any



MBDA MICA

modern fighter aircraft, without significantly reducing the aircraft speed or negatively affecting its aerodynamic characteristics. MICA is capable of both BVR (60km+) and close range interception thanks to its dual active radar (as in MICA RF) and Imaging Infra-Red (as in MICA IR) seeker and Lock On Before Launch (LOBL) as well as Lock On After Launch (LOAL) capability. Minimum range is said to in the region of 500 metres.

Carried under the aircraft’s fuselage or under wings, and fired by ejection or by rail, MICA is ‘permitted’ to be ejected from the airframe up to 4g while wing pylons can release MICA up to 9g. Products of research and development during the 1990s, both MICA RF and MICA IR have a range in excess of 60 km as the MICA IR version receives mid-course update commands from the radar to compare target location with the location of its seeker’s



Astra BVRAAM

track for LOAL engagements. In the case of MICA RF, after the target has been designated by the host aircraft's radar, this then makes first phase of its flight in inertial guidance mode, and then homes onto the target in flight in fire-and-forget mode, using its '4A' active-radar homing head. The MICA is well reputed for its general level of sophistication and reliability in terms of 'kill percentage' even in adverse European meteorological conditions in dense electronic warfare environment infested with saturation jamming as the missiles in turn sport a formidable Electronic Counter Counter Measures (ECCM) system to burn through hostile jamming.

Its excellent manoeuvrability is aided by combination of long chord wings, efficient tail control surfaces while at short range, thrust vector control (TVC) facilitates high off-boresight angle (HOBA) engagements. Interestingly, seeker of the MICA IR may also be utilised for discrete optronics monitoring prior to launch. Again, the MICA IR with its angular resolution will be able to mount stealthy strikes on unsuspecting opponents especially if the launch platform gets well pre-positioned by friendly Airborne Early Warning & Control (AEW&C) platforms, the lethal 12 kg high explosive blast fragmentation warhead being triggered by a Doppler radar proximity fuse.

Meanwhile, the French armament directorate (DGA) has launched a development programme that will modernise the MICA BVRAAM and surface-to-air missile (SAM), introducing a new generation of the weapon (MICA NG). Maintaining the size, weight and electronic interfaces of the present missile, MICA NG will be a most effective successor to the baseline MICA. With an improved seeker and new propulsion, it will have the agility and performance to cope with modern threats and countermeasures, which includes targets with reduced infrared and electromagnetic signatures, atypical targets (unmanned aerial vehicles and small aircraft), in addition to the threats normally countered by air-to-air missiles (combat aircraft and helicopters).

Maintaining the same MICA RF and MICA IR versions, among enhancements to the MICA NG are the addition of a new infrared seeker that uses a matrix sensor providing greater sensitivity. The radio seeker will use an Active Electronically Scanned Array (AESA) antenna, giving smart detection abilities. The reduced volume of electronic components within MICA NG will allow it to carry a larger quantity of propellant, thereby significantly extending range of the missile.

Rafale's air combat capability is significantly boosted with service entry of the European MBDA Meteor active-



Astra Mk3 BVRAAM

radar homing BVRAAM with its 110+ nautical miles range to provide an ultra-long range interception capability against fighter sized targets critical in attaining ‘first look–first shoot–first kill’ ability alongside fulfilling the BVR role for ‘outer–air battles’, obligatory for IAF in response to proliferation of BVRAAMs in its neighbourhood including United States AIM–120C–5 AIM–120C–8 variant of AMRAAM in Pakistan Air Force (PAF) service. A 3.65 metre long, stealthy, low drag, lightweight (185 kg) BVRAAM design from MBDA, the 110+ nautical miles range Meteor with a more linear velocity profile is in active service.

Born from the multi–national Project S225X examining the future BVRAAM technologies and designed for a network–centric warfare (NCW) environment, the

Meteor has a data–link capability, guided not only by the launching aircraft but also by another fighter or even by AEW&C platforms. The extended range is ensured by Meteor’s solid Boron fuelled Variable–Flow Ducted Ramrocket (VFDR) propulsion system, also referred to as Throttle–able Ducted Rocket (TDR), along with a speed of more than Mach 4 and high terminal velocity. Thus, even when launched from extreme stand–off ranges, the missile will retain the energy at the end game to defeat fast, manoeuvring targets. The control system consists of four small moving tail surfaces but at inherent high speed, sufficient to perform sharp manoeuvres. The engine’s two air intakes, positioned on the both sides of the lower part of missile’s body, are shaped to reduce the missile’s radar cross–section.

Meteor is capable of engaging a wide range of airborne targets autonomously, including cruise missiles with less than 1 metre square Radar Cross Section (RCS). For mid–course navigation guidance Meteor utilises Inertial Navigation System (INS) combined with update commands provided by the launch, or any friendly aircraft via the two way secure microwave datalink, to adequately offset Identification Friend or Foe (IFF) complexities or challenges at long ranges. During terminal phase the Ku–band (NATO: X band) active–radar homing seeker (advanced version of the MICA RF ‘4A’) employs advanced proportional based navigation software.

As the Meteor is designed for an NCW environment, it is compatible for the futuristic concept of “Cooperative Fighter Operations” or Mixed Fighter Force Concept



Indian Astra

(MFFC) that is essential for future BVR engagements and optimum performance and results. Conceptually, in IAF service, pairs of Rafale will be data-linked as one illuminates the other launches the missiles against the targets. In such engagements the 'striker' fighter will be able to impart the greatest kinetic energy to the Meteor BVRAAM by accelerating up to Mach 2 and then manoeuvring out of the engagement. The illuminator, with the powerful radar capable of performing like a mini-AEW&C platform will remain subsonic, keeping a decent distance from the target, providing command-guidance updates alongside illuminating the target. Meteor BVRAAM may potentially get integrated with upgraded Sukhoi Su-30MKI multi-role air superiority fighters, those are to receive Indian Virupaksha Active Electronic Scanned Array (AESA) radars and mission computers.

Meanwhile, the Indian Air Force (IAF) is all set to arm its Sukhoi Su-30MKI multi-role air superiority fighters with Rafael Advanced Defense Systems Derby Mk3 Beyond Visual Range Air-to-Air Missile (BVRAAM). Rafael Advanced Defense System, the Israeli missiles and munitions giant, at Paris Air Show 2015 unveiled the missile, then known as I-Derby ER, the extended range (100-km+) version of its Derby Active Radar Homing BVRAAM. It is an evolutionary version of the I-Derby BVRAAM unveiled earlier at Aero India 2015. The Derby entered service in the mid-1990s and is fielded with multiple customers worldwide.

The Israeli Defence Force-Air Force (IDF-AF) realised the value and operational flexibility of BVRAAM long ago as it was repeatedly frustrated by high altitude over flights by the MiG-25 Foxbat-B reconnaissance models of the Soviet Expeditionary Force between October 1971 and March 1972. Soviet MiG-25Rs based at Cairo covered the Israeli-held coastline Haifa to Port Said and flew the length of Sinai Peninsula involving 500 km penetration of the Israeli airspace. With a speed of Mach 2.5 to 2.8 at a cruising altitude of 80,000 ft they successfully evaded the formidable Israeli defences including F-4 Phantoms thus gathering valuable "real time" intelligence and transmitting them to ground-stations through secure data-links for further analysis. Appropriate IDF-AF BVR tactics underwent development and during June 1982 two Syrian MiG-25 Foxbat-A were destroyed by the IDF-AF with carefully planned and executed "snap up" attack by F-15 fighter/AIM-7 Sparrow BVRAAM combination emphasising the growing maturity of the BVR tactics and procedures of the IDF-AF pilots. For the first time the formidable high-altitude MiG-25 interceptor, hitherto regarded as "untouchable" was shot down. The United States Raytheon AIM-120 AMRAAM succeeded AIM-7 Sparrow in IDF-AF inventory in course of time and holds the distinction of being the first operational ARH "fire-and-forget" BVRAAM.

However, Derby BVRAAM, developed by Rafael Missile Division, was born from an Israeli desire to retain full control of the BVRAAM technology especially in relation to electronic counter counter measures (ECCM) modes.



Meteor on the Rafale

The 3.62 metre long 118 kg weight BVRAAM shares design commonality with Python 4 (including warhead and proximity fuse and even sharing same launcher); with the addition of mid-body wings while its own 'no escape zone' overlaps that of the Python 4. The Derby is fitted with an ARH seeker with a compact gimballed antenna, developed by Israeli Aerospace Industries' (IAI) MBT Division. Derby has look-down/shoot-down capability and advanced programmable and adaptable ECCM to operate under dense electronic warfare environments while reconfigurable upon the emergence of new threats. For BVR engagements a LOAL mode is adopted in which the missile initially fired using cues from the launch aircraft's fire control radar, or perhaps an Infra-Red Search & Track (IRST) system employing inertial guidance immediately after launch until the ARH seeker is activated at appropriate distance to home in on the target with substantial kinematics performance allowing 'end game' manoeuvrability thanks to slightly enhanced rocket motor.

For greater accuracy over extended ranges, the 'Derby Uplink' capability allows targeting data to be transmitted from the launch aircraft to provide accurate mid-course guidance while dealing with fast-moving or manoeuvring targets. The missile also has the ability to receive data-link updates from other platforms besides the launch aircraft thereby permitting 'stealthy' engagements. According to Rafael even 'baseline' "multi-shot capable" Derby has a launch-range in excess of 63 km if launched at Mach 0.9 at 25,000 ft against a head-on target, although its maximum range, or its effective seeker range, remain highly classified.

During Aero India 2007 on being suggested so by this Vayu magazine correspondent on aspects of Derby's maximum range, top Rafael officials along with their aides burst into laughter and intended to retain the veil of secrecy by reaffirming it as mystery. Now very much apparent, Rafael was contemplating an extended ranged version for over a decade. Derby also has a very low minimum range and an option for Lock-On Before Launch (LOBL) mode thus also capable of being employed for short-range engagements with Derby's seeker slaved to the aircraft's



Russia's RVV BD

radar or the pilot's helmet mounted cueing system. During short range engagements Derby's capabilities are regarded similar to Python 3 close-combat missile trapping enemy aircrafts in "killing fields" 60 km inwards.

In the present Derby Mk3 evolution, the BVRAAM appears to have reached its inherent optimum potential. The latest variant is equipped with a new seeker that employs an advanced solid state Software Defined Radar (SDR) technology, based on combat proven technology derived from the Tamir interceptor used in Rafael Iron Dome system. The new lighter and more compact seeker has cleared valuable space which has been used by the missile designers to augment the propulsion system by adding a dual pulse rocket motor for "second kick" mode, thereby increasing the range of the Derby Mk3 beyond 100 km against "straight line" targets, and more importantly specifically to accelerate the missile at the critical terminal phase of the flight prior intercept of manoeuvring targets by increasing the BVRAAM kinematic envelope, and trapping the target in "no escape zone".

Coupled with a three-pulse rocket motor, supporting the boost, sustain, and endgame pulses, this design provides superior manoeuvrability and performance throughout the flight and engagement envelope. Sky Sting is designed as a BVRAAM. Rafael's sources did not specify the range; however, it is rumoured to be around 250 km and

significantly exceeds the I-Derby ER/Derby Mk3, which is Rafael's longest range AAM. Another new element in the Sky Sting missile is its RF seeker. Unlike the Stunner's dual seeker, Sky Sting uses only an RF seeker, as Rafael performed trade-off studies that proved that the new seeker could deliver the required performance with a single seeker at the extended range and under contested electronic warfare environment.

On 19 October 2022, Russian, and subsequently Indian media claimed that a Russian Sukhoi Su-57 shot down a Ukrainian Sukhoi Su-27 using the Vypel R-37M Beyond Visual Range Air-to-Air Missile (BVRAAM). The aforementioned incident was the first registered "kill" by the fifth-generation Sukhoi Su-57 while the R-37M missile has risen to prominence during the 'Special Military Operations' repeatedly demonstrating Single Shot Kill Probability (SSPK) and enabling the Russian Air Force to maintain air superiority. R-37M was derived from the Vypel R-37 (AA-13 Arrow) BVRAAM developed to replace the MiG-31 mounted R-33 (AA-9 Amos). R-37 was designed and developed to shoot down ultra-high-value airborne platforms like Airborne Early Warning & Control (AEW&C), Air-to-Air Refuelling (AAR), Long Range Maritime Patrol (LRMP) and Joint Surveillance Target Attack Radar System (J-STAR) platforms, from stand-off ranges without necessarily having first to deal

with their fighter escorts. Mid-body strakes enhance lift while folding tail controls allow semi-conformal carriage.

The new version is known as R-37M/Izdeliye 610/RVV-BD (Raketa Vozduh-Vozduh Bolshoy Dalnosty) armed with powerful Agat 9B-1388 active seeker designed for engaging low-altitude targets. The dual-mode solid-fuelled R-37M/RVV-BD BVRAAM was unveiled at MAKS-2011 for the first time, capable of fulfilling the BVR role for "outer-air battles" by taking out enemy AEW&C and AAR platforms at the initial stages of conflict. However, the missile has proven potent even against fighter sized targets. 4.06 m long RVV-BD weighs 510 kg, has a range up to 398 km in "cruise glide" mode and is capable of destroying targets with overload up to 8 g at an altitude from 15 m to 25 km. The hypersonic (Mach 6) missile is armed with a 60 kg high explosive fragmentation warhead.

The R-37M is launched in fire-and-forget mode towards the target's hypothesised position, and once the R-37M comes within suitable range of the target; it activates its own active seeker and homes in on the target at high speed providing little reaction time to the adversary. The active seeker is equipped with a new miniature digital processor with an abundant memory and increased speed and resistant to electronic warfare. The missile is equipped with non-contact active radar and standby contact fuzes. In Russian Air Force service, the R-37M missiles arm the MiG-31BM interceptors, Sukhoi Su-35S and Sukhoi Su-57 air superiority fighters. This missile is all set to be produced in India and equip IAF Sukhoi Su-30MKI fleet.

Finally, self-reliance in air launched missiles and particularly in Beyond Visual Range Air-to-Air Missile (BVRAAM) system is of strategic importance considering the new paradigm of air superiority warfare, and with the service entry of indigenous hypersonic (Mach 4 plus) Active-Radar Homing (ARH) Astra BVRAAM India's Defence Research and Development Organisation (DRDO) seems to have produced a missile that is arguably capable of matching or outmatching similar class of missiles of United States, Russian and European origin. As part of induction phase trial the missile was tested on 18 March 2015 from an Indian Air Force (IAF) Sukhoi Su-30MKI fighter against a simulated live target to verify the control system and missile stability during flight. The prototype of the missile was first tested during on 9 May 2003 from the Integrated Test Range (ITR) at Chandipur-on-sea area off the Odisha coast. On 27 March 2007, vertical launch of the missile was carried out, suggesting the development of a surface-to-air missile (SAM) variant. Following further tests dual-mode guidance was fully proved during May 2009 followed by captive flight tests on a Sukhoi Su-30MKI were carried out near Pune in November when several sorties were conducted.

The series of numerous tests initiated on 20 May, 2011, also from the ITR at Chandipur around 0950 hours focussed on evaluating the performance of the smokeless non-metallised high specific impulse propulsion system, rocket motor, and the configurations of the vehicle and aero-dynamics evaluation with the missile incorporating

significant changes and incorporating advanced technologies in due course. Today it is very much evident that the ambitious programme has achieved significant milestones in the arena of technical brilliance and self-reliance.

The project is guided and led by the Hyderabad based Defence Research and Development Laboratory (DRDL). Single stage, smokeless, solid fuelled Astra with a length of 3570 mm, body diameter of 178 mm, weighs 154 kg, and is powered by high energy lithium thermal batteries making it the lightest in its class and thus enjoying wide range of applications. The BVRAAM will be capable of destroying manoeuvring 9-g enemy targets at high altitude in the head-on mode at a range of 80 km and in tail-chase mode at 20 km, thanks to its redesigned cropped delta (replacing low drag low aspect ratio) wings and capability to pull a lateral acceleration of 40-g in both yaw and pitch planes which means it should be able to engage a non-maneuvring targets well in excess of 100 km and capable of operating in the altitude bracket from sea level to 20 km. The missile can to some extent function as a Close Combat Missile (CCM), as the minimum range is around 10 km.

The all-important seeker was initially provided by Russian Agat (possibly more advanced than 9B-1348E integrated to R-77 variants) with an autonomous homing range of 25 km plus enabled off-boresight launches up to an angle of 45 degrees and produced in India through a total transfer of technology process. Prior ARH homing during terminal stage Astra follows Fibre Optic Gyro (FOG) based Inertial Navigation System (INS) during midcourse with high G accelerometers along with secure data link to allow midcourse re-tasking. While autopilot and guidance software uses Artificial Intelligence (AI) for accurate guidance and optimised trajectory, the on-board electronic counter counter measures (ECCM) capability allows it to stay on course in spite of enemy Electronic Counter Measures (ECM) procedures. The 15 kg high explosive warhead is pre-fragmented and Radar Proximity Fuse (RPF) armed plus directional to enhance lethality and Single Shot Kill Probability (SSKP). This RPF weighs approximately 2.5 kg and has a detection range of up to 30 m, a detonation range of 15 m and a missile target velocity between 100 m/s and 1,600 m/s. Additionally DRDO is currently working on a new laser fuse.

As a further step towards indigenisation and self-reliance, on 15 September 2017 Astra BVRAAM was test fired from a Sukhoi Su-30MKI at Kalaikunda Air Force Station (AFS) with an indigenous Ku-band pulse Doppler radar seeker developed by Research Centre Imarat (RCI). With an antenna diameter of 140 mm and weight of 12.5 kg the lock on range is well in excess of 12 km and gimbal angles of plus/minus 55 degrees. The same indigenous seeker is also set to arm the Akash-1S surface-to-air missile (SAM) variant and also QRSAM. The final development trials were completed on the same month. During user trials in 2019 Astra BVRAAM decimated a manoeuvring target at a distance of 90 km.


Projected to be a game changer on tactical level Astra BVRAAM are reportedly to be integrated with all frontline Indian Air Force (IAF) fighter aircraft such as the Sukhoi Su-30MKI, Rafale, MiG-29UPG/K, Mirage 2000I/TI and the indigenously developed Light Combat Aircraft (LCA) Tejas, and can be launched both in autonomous and buddy mode operation. Reportedly, the Mk2 version of Astra, undergoing tests, have a maximum launch range in excess of 160 km and tail chase range of up to 35 km propelled by a dual pulse rocket motor similar to United States Raytheon AIM-120D AMRAAM. Astra Mk2 will use the dual pulse solid rocket motor for extended reach and better kinematics during the kill phase. The missile will share smokeless propulsion of its predecessor Mk1, whilst imbibing newer technologies being implemented in other missile programmes of DRDO like Barak 8 and Rudram-1. Astra Mk2 variant will make use of indigenous seeker manufactured by Bharat Electronics Limited. DRDO is also looking at rocket/ramjet propulsion to provide greater range and enhanced kinematics performance to the BVRAAM. However, adopting a rocket/ramjet approach has certain limitations as the need for controlled airflow to the ramjet ducts means that the “skid-to-turn” manoeuvring of a conventional rocket-powered missile is not acceptable (because it will risk masking an intake) yet “bank-to-turn” manoeuvring results in a reduced instantaneous turn rate.

The ambitious Astra Mk3 called ‘Gandiva’ (Arjuna’s bow in the Mahabharata) Beyond Visual Range Air-to-Air Missile (BVRAAM), developed in collaboration with Russia, is a Solid Fuel Ducted Ramjet (SFDR) powered missile with a range in excess of 340 km at an altitude of 20 km and 190 km at an altitude of 8 km along with a 20° Angle of Attack (AoA) and ± 10 km snap-up/snap-down capability. The missile sports a launch speed of Mach 0.8 to Mach 2.2 and can intercept targets at Mach 2.0 to Mach 3.6 and with throttle control and sustained energy, can maintain velocity throughout its flight. The 220 kg missile, with a length of 3838 mm and a diameter of 178/200 mm, is being prepared for its first flight test from the air. The missile is designed to enter Indian Air Force (IAF) service on Sukhoi Su-30MKI and Tejas platforms plus in air force of Russian Federation. For comparison’s sake, single stage, smokeless, solid fuelled Astra Mk1 weighs 154 kg, has a length of 3570 mm and body diameter of 178 mm.

The SFDR missile system utilises a solid fuelled air breathing ramjet engine and can achieve longer ranges as they do not require oxidisers, as they take oxygen from the atmosphere. The high speed and manoeuvrability of SFDR missiles ensure significantly greater No Escape Zone (NEZ) as SFDR technology takes every performance aspect of the Astra to the next level, crucially longer range, higher sustained speed and kinetic energy during the difficult endgame phase when such missiles close in on normally manoeuvring targets. It includes fire suppression material in the fuel tank. The DRDO and Russia have worked together on the development and testing of the nozzle-less booster, boron-based ramjet sustainer and fuel flow controller, in addition to the design of the dual air intakes.

Astra Mk3 employs a two way data link for mid-course guidance, allowing it to receive real-time target updates from the launch aircraft or AEW&C. This ensures the missiles receive feedbacks from host fighters or AEW&C platforms and can adjust its trajectory based on enemy evasive manoeuvres, significantly increasing its probability of kill. For terminal guidance, Astra Mk3 is armed with an indigenous Ku-band pulse Doppler radar seeker developed by Research Centre Imarat (RCI).

To be designed to fulfil the BVRAAM role for “outer-air battles”, Sukhoi Su-30MKI and Tejas equipped with Astra Mk3 will be able to engage hostile ultra-high value airborne platforms like Airborne Early Warning & Control (AEW&C), In-Flight Refuelling (IFR), Long Range Maritime Patrol (LRMP) and Joint-Surveillance Target Attack Radar System (J-STAR) platforms, without necessarily having first to deal with their fighter escorts, thus emerging as formidable aerial snipers. Under such circumstances, the primary concern of the IAF and the Astra development team will be of positive identification of enemy targets at those extended ranges since Identification Friend or Foe (IFF) remains a problem because of incorrect and absent returns and “spoofing”.

Hopefully in the long term, development of electro-optical seeker technology coupled with on-board threat database will let the missiles themselves determine the legitimacy of the targets. Astra Mk3 is longer ranged and more agile than Chinese PL-15 and Pakistan operated AIM-120C5 and AIM-120C8 AMRAAM and will endow the Indian Air Force (IAF) a clear “first-shot advantage” in aerial duels thereby seizing initiative and putting the adversary in defensive posture. As part of the ‘Aatmanirbhar Bharat’ initiative, development and domestic mass production of Astra Mk3 will strengthen India’s indigenous aerospace industry, boost research and development in next generation propulsion and guidance systems, and lay foundation for next generation airborne missiles. 



Article by Sayan Majumdar

The Loitering Munitions of South Asia

Cheap Precision in a Nuclear Rivalry

The economics of precision strike have been rewritten. What once demanded a multimillion dollar cruise missile or an entire strike package of manned aircraft, can now be approximated, with acceptable probability, by an autonomous platform costing a fraction of the price. Loitering munitions have transitioned from a niche capability into a defining feature of modern warfare and South Asia has now produced its own definitive proof of concept.

The proof arrived in May 2025 in the form of Operation Sindoor, an 88 hour conflict that saw India and Pakistan

trade drone and missile barrages with a scale and sophistication unprecedented in the region's post-nuclear history. Before examining that confrontation in detail, it is worth briefly noting the global template that both militaries had been studying with growing urgency.

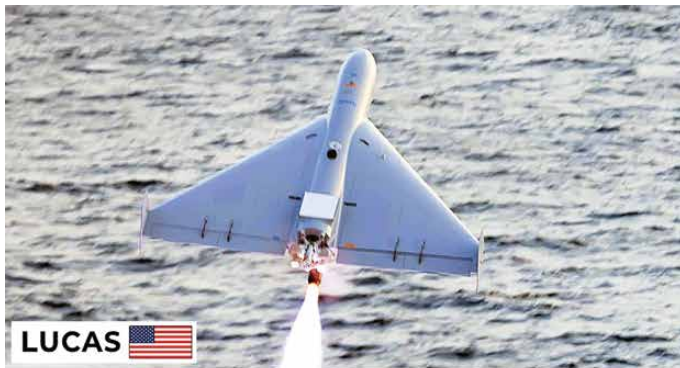
What Ukraine and the Middle East taught the world

Russia's deployment of the Geran-2, a domestically produced variant of Iran's Shahed-136, against Ukrainian infrastructure established the foundational doctrine: swarm cheap, force expensive responses, exhaust magazines. With interceptors costing hundreds of times the price of each incoming drone, Kyiv's air defence calculus was structurally compromised from the outset. The arithmetic was brutal and replicable.

The Middle East sharpened the lesson further. Latest under Operation True Promise IV, Iran's IRGC launched multi-wave Shahed-136 barrages targeting strategic installations across Qatar, Bahrain, Kuwait and the UAE simultaneously. The American response was revealing: Operation Epic Fury also saw the US deploy its own LUCAS, a low cost one way attack drone whose architecture openly mirrors the Shahed-136, in strikes against Iranian military infrastructure, with possible earlier combat use during operations in Venezuela. Both sides were now fielding derivatives of the same weapon concept against each other. For planners in New Delhi and Rawalpindi, the signal was unambiguous: saturate, exhaust and penetrate.

History of loitering munitions and design philosophy

The delta wing loitering munition concept traces its origins to late Cold War research into expendable autonomous strike drones. In the 1980s, Germany explored the idea through the Dornier DAR programme, which studied compact unmanned aircraft designed for long endurance missions and low cost mass production. The triangular delta wing configuration was central to the concept, offering aerodynamic stability across a wide range of angles of attack while remaining structurally simple to manufacture. However, the end of the Cold War led to the programme's cancellation before operational deployment. Elements of the R&D were later transferred to Israel, where they contributed to the development of the IAI Harpy. Introduced in the late 1980s, the Harpy established the modern operational template for loitering munitions. Equipped with an anti-radiation seeker, it could patrol contested airspace for extended periods before



diving onto enemy radar emitters, making it an effective tool for Suppression of Enemy Air Defences (SEAD). The concept later evolved into the more advanced IAI Harop, which incorporated electro-optical sensors and human-in-the-loop targeting for greater flexibility.



Die Drohne Anti-Radar (DAR)

The continued relevance of the delta-wing design lies in its aerodynamic and manufacturing advantages:

Delta platforms generate reliable lift across varying flight conditions and can be constructed using flat composite panels with minimal tooling and few complex mechanical components. Secondly, the large chord depth near the wing root also provides significant internal volume for fuel, enabling long endurance without increasing structural complexity.

These characteristics make the configuration ideal for expendable long range strike drones where affordability and manufacturability are critical. Iran's Shahed-136 represents a modern interpretation of this philosophy, relying on a simple piston engine and GPS-inertial navigation to strike pre-programmed targets. By prioritising low cost and scalability over sophisticated targeting systems, such platforms enable saturation attacks in which large numbers of drones overwhelm air defence networks through volume rather than individual platform capability.

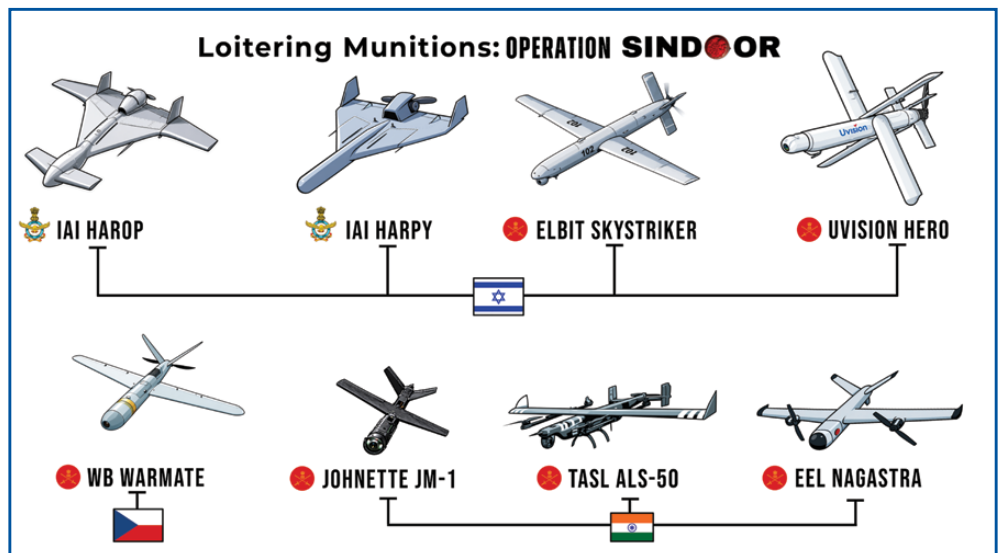
Operation Sindoor: Anatomy of South Asia's first drone war

On the intervening night of 6 and 7 May 2025, India launched Operation Sindoor, a response to the April 22 Pahalgam terrorist attack that had killed 26 civilians. The operation struck nine sites associated with Lashkar-e-Taiba and Jaish-e-Muhammad in Pakistan and Pakistan-

administered Kashmir. Seven of these targets were struck using loitering munitions and precision guided artillery, while two were engaged by air launched cruise missiles. The entire initial strike phase lasted approximately 25 minutes.

It was not a conventional air campaign. No Indian aircraft crossed the international boundary. Instead, India executed what its Chief of Defence Staff later described as "non-contact warfare", standoff strikes using BrahMos and SCALP cruise missiles, Rampage and Crystal Maze air-to-surface missiles, and, critically, multiple types of loitering munitions operating simultaneously across different mission profiles.

The opening phase of the drone campaign deployed a wave of both indigenous and foreign origin loitering munitions against targets along the Working Boundary in the Sialkot and Narowal sectors, with Pakistan subsequently recovering approximately nine airframes from these districts. The indigenously produced Nagastra-1 VTOL loitering munitions were also deployed in the initial phase along the Line of Control, with Pakistani forces recovering at least one largely intact airframe in the Bhimber area, enabling positive identification by open source analysts.



Loitering Munitions deployed by Indian Armed Forces during Operation Sindoor [Open Source]

The more strategically consequential instrument was the IAI Harop. Beginning after the initial strike phase, and following Pakistan's retaliatory drone and missile sorties, India deployed Harop loitering munitions in a sustained Suppression of Enemy Air Defences (SEAD) campaign that continued through 8 and 9 May. According to the Centre d'Histoire et de Prospective Militaires (CHPM), a Swiss military studies institute that published an independent assessment of the conflict, eight Pakistani air defence sites were struck on 8 May and a further four on 9 May.

The early warning radars at Churian and Pasrur were among those visually documented as neutralised. Critically, the cumulative effect was not merely physical,

Pakistani radar operators switched off remaining emitters to avoid attracting further anti-radiation strikes, creating gaps in coverage that the Indian Air Force subsequently exploited. Pakistan's military claimed to have shot down over 70 Harop drones over the course of the conflict.

Pakistan's response, launched as "Operation Bunyan-un-Marsoos" on the nights of 8-9 May, introduced its own loitering munition arsenal into the battlespace in numbers that tested India's air defence structure. The Pakistani military deployed YIHA-III drones in what Indian sources described as saturation barrages targeting military airfields and installations across northern and western India, sites including Awantipur, Srinagar, Jammu, Pathankot, Amritsar, Adampur and Bhuj. Many of these barrages reportedly embedded precision loitering munitions within swarms of lower grade drones, using attributable chaff to clutter Indian radars while directing higher value systems against priority aim points. India's indigenously developed Akashteer air defence management system, integrated into the broader IACCS network, was credited with coordinating the layered response that intercepted the bulk of incoming threats. The Indian Army released imagery of recovered YIHA-III, as well as Songar armed drones debris. India claimed to have intercepted hundreds of Pakistani drones over the course of the four day conflict. Pakistan claimed it struck 34 targets, however, independent verification found no critical damage to any stated targets.

The ceasefire of 10 May concluded the kinetic phase, but the analytical work was only beginning.

Loitering Munitions in Indian Service: A layered arsenal

India enters the post-Sindoor era with one of the more diverse loitering munition inventories in the Indo-Pacific region, combining high end imported systems with a rapidly maturing indigenous base.

IAI Harop stands as the cornerstone of India's offensive drone capability. Procured from Israel Aerospace Industries initially in 2009 for approximately \$100 million, the fleet was expanded significantly, with 54 additional Harops inducted by 2019, bringing total holdings to approximately 110-160 units redesignated P-4 in Indian service. The Harop carries a 23 kg warhead and has an endurance of over six hours with a 200 km range, enabling extended loiter before a man-in-the-loop operator commands terminal attack. Its electro-optical sensor and anti-radiation seeker combination makes it optimised for both fixed-target precision strike and autonomous SEAD. Sindoor confirmed its operational effectiveness in the SEAD role at scale. In Aero India 2025, Adani Defence & Aerospace showcased "Agnikaa" showcasing its plans to locally produce the Harop in India.

IAI Harpy, the older anti-radiation predecessor to the Harop, remains in service for passive SEAD operations. Unlike the Harop, it functions autonomously, loitering and then diving on any radar emitter it detects without requiring operator confirmation. In a contested electromagnetic

environment, the Harpy's autonomous engagement logic makes it a persistent suppressive presence even when datalinks are degraded. A CAPSS India publication on Sindoor confirmed that Harpy loitering munitions were employed in the IAF's SEAD operations against Pakistan's SAM network alongside Harops.

Sky Striker, procured through a joint venture between Elbit Systems of Israel and India's Alpha Design Technologies (an Adani Group entity), offers a precision strike capability at the medium range. Produced domestically in India, the Sky Striker carries a warhead of 5-10 kg and has a range of 100 km. Wreckage of a SkyStriker was recovered in the Sialkot area during Sindoor, confirming its operational deployment. Its domestic production pathway makes it less vulnerable to the export control pressures that affect purely imported systems.

WB Electronics Warmate, procured from the Polish defence firm WB Group through its Indian subsidiary WB Electronics India, serves India's tactical strike requirement. India reportedly received approximately 100 Warmate units. With a range of 30 km, operational speed of 80 km/h and high explosive or thermobaric warhead options, the Warmate is suited to targets along the Line of Control, fortified positions, artillery emplacements, and command posts. Sindoor confirmed its use against targets in the Sialkot and Narowal sectors.

Nagastra-1, developed by Economic Explosives Limited (EEL), a Solar Industries subsidiary, in collaboration with Bengaluru startup Z-Motion Autonomous Systems, is India's first majorly indigenous loitering munition to reach operational service. A fixed wing, electrically powered platform weighing 8-9 kg with a 1-1.5 kg high explosive fragmentation warhead, the Nagastra-1 has a 30 km range when operator-controlled and a GPS/NavIC-guided autonomous mode with a reported CEP of 2 metres. Solar Industries is actively developing the Nagastra-2 and Nagastra-3; the latter, currently in advanced trials, is designed for ranges exceeding 100 km, enabling deep strike missions from tactical formations.

Advanced Loitering Systems (ALS) family, produced by Tata Advanced Systems Limited, is a VTOL loitering munition designed for the Indian Air Force's tactical missions. It fills the gap between man-portable systems like the Nagastra and the larger, longer-range SEAD-optimised Harop. It is offered in two variants, ALS-50 and ALS-250, with a range of 50 kilometres and 250 km respectively.

Johnette JM-1, a low-cost tactical solution, was also deployed during Operation Sindoor that managed to successfully navigate to its target. Integrated with 500 gm warhead, it is deployed with target's co-ordinates pre-fed into the system before launch.

Hero series, produced as PALM-30/150/400 via the joint venture between Israel's UVision and India's Aditya Precitech - Avision, was among the systems which was also deployed during Op Sindoor.

	Name	OEM	Origin	Range	Warhead	Operator	Est. Numbers in Service
1	Harop (indigenously designated "Agnikaa")	Israel Aerospace Industries (IAI)	Israel	~200 km 6+ hr endurance	23 kg HE	Indian Air Force	~110–160 units
2	Harpy	Israel Aerospace Industries (IAI)	Israel	~500 km Approx 9 hr endurance	~32 kg HE	Indian Air Force	~100+ units
3	SkyStriker	Elbit Systems (IL) + Alpha Design Technologies and Adani (IN) — JV	Israel–India JV	~100 km	5–10 kg HE	Indian Army	~100–200 units (est.)
4	Warmate	WB Group / WB Electronics India	Poland	~30 km ~80 km/h cruise	HE or Thermobaric	Indian Army	~100 units
5	Nagastra–1	Economic Explosives Ltd (EEL) / Solar Industries + Z–Motion Autonomous Systems	India	~30 km	1–1.5 kg HE Fragmentation	Indian Army	480+ units (confirmed order)
6	ALS–50 / ALS–250	Tata Advanced Systems Limited (TASL)	India	50 km (ALS–50) 250 km (ALS–250)	Not officially disclosed	Indian Air Force	Undisclosed
7	JM–1	Johnette Technologies (India)	India	~15–30 km	500 g HE	Indian Army	~80
8	Hero / PALM series	UVision (IL) + Aditya Precitech – Avision (IN) — JV	Israel–India JV	~40 km (PALM–30) ~150 km (PALM–150) ~150+ km (PALM–400)	~0.5–20 kg (variant)	Indian Army / IAF	Undisclosed

Along with this mix of indigenous and foreign, other Indian private entities are involved in-house research and design of loitering munitions, with some notable examples emerged recently:

Sheshnaag–150 by NewSpace Research & Technologies: Designed for deep-strike capabilities, featuring a 1,000+ km range, 3–5 hour endurance and autonomous AI-powered targeting to overwhelm air defences. As of April 2026, the company reported successful vehicle-borne launch trials.

Nagastra–2/Nagastra–3 by Economic Explosives Limited (EEL): Follow-on variants of the Nagastra–1, designed to extend operational range beyond 100 km with improved endurance and higher payload capacity. Both platforms emphasise autonomous navigation and precision strike capability, with Nagastra–3 currently in advanced testing for deeper tactical engagements.

Achuk by Redon Systems: A barrel launched loitering munition designed for rapid tactical deployment, featuring modular HE/HEAT payloads, AI-enabled targeting, and swarm compatibility. The system emphasises portability and scalability for frontline units, with development focused on enhancing precision strike capability in contested environments.

Divyastra by HoverIt: Divyastra Mk1/Mk2 is medium-long range strike platform, aims to enable 500 km and 2000 km strike range respectively, with AI-enabled targeting capabilities. Divyastra Mk1 has completed its 5.5 endurance trials, while taxi trials for Divyastra Mk2 are in progress.

Mehar Baba Swarm Drone Competition

India's push toward swarm enabled warfare is not limited to industrial production but extends into institutional innovation. The Mehar Baba Swarm Drone Competition, launched by the Indian Air Force, has emerged as a critical bridge between military requirements and private-sector innovation. By incentivising startups and academic teams to develop autonomous swarm capabilities, the programme is accelerating progress in distributed targeting, collaborative navigation and AI-enabled mission execution. In the context of Operation Sindoor, where both sides demonstrated early stage swarm tactics, such initiatives signal India's intent to move from platform-centric operations toward networked, intelligent drone warfare.

Pakistan's loitering munition arsenal: Volume and versatility

Pakistan's loitering munition posture reflects a strategic logic shaped by budget constraints, an asymmetric conventional balance with India, and deep defence-industrial ties with both China and Turkey. The emphasis, clearly visible in both procurement patterns and domestic development, is on volume, scalability and the saturation employment model. At present, two state owned entities are frontrunners in UAV development, National Aerospace Science & Technology Park (NASTP) and Global Industrial Defence Solutions (GIDS). However, the details regarding the clear picture of how many different types of loitering munitions are in service or inducted remains unclear due to strict nature of defence reporting in Pakistan, and

hence, cannot be verified independently. We have certain names which have been visually confirmed through actual promotions, displays and obviously, combat.



BAYKAR-NASTP YIHA III. Photo via Wikipedia.

YIHA-III is Pakistan's most combat proven loitering munition, and Sindoor was its most significant operational test. Jointly developed by Turkey's Baykar and Pakistan's National Aerospace and Technology Parks (NASTP), the YIHA was inducted in January 2024, confirmed through a ceremony held at PAF Base Murid. The YIHA-III features a UMTAS ATGM tandem charge HEAT/HE warhead derived from Turkish anti-tank missile technology. It launches from a runway or catapult system, loiters until target identification and executes a vertical terminal dive. Critically, it is designed to operate in swarm mode, a capability Pakistan exploited extensively in the 7-9 May exchanges. India's capability of intercepting over 400 YIHA-III drones during the conflict, if accurate, indicates the scale at which Pakistan was willing to expend these assets. At least one YIHA III drone was also captured in near intact state.

Apart from YIHA III, existence of other types of loitering munitions in service with Pakistan armed forces is unconfirmed due to lack of reporting. However, there is a wide array of platforms which have been unveiled through expo displays, both in domestic and international events.

NASTP Dark Angel Series represents NASTP's broader loitering munition development portfolio, ranging from tactical anti-armour variants to longer range strike configurations. The Dark Angel series encompasses a

family of fixed wing loitering munitions oriented toward medium range precision strike.

GIDS Sarkash (also designated Sarfarosh) is Pakistan's

most ambitious domestically developed loitering munition, though its design attributes, including a cylindrical turbojet powered airframe launched from canisters, position it closer to the cruise missile category. Unveiled by the state-owned Global Industrial & Defence Solutions (GIDS) at IDEAS 2024 in Karachi, the Sarkash carries a 50 kg warhead, weighs 175 kg and has a reported range of 1,000 km. GIDS markets it for use against high value targets such as radars and command facilities. Whether it will be produced at the volume required for attritable employment, or remain a strategic

niche weapon, is the key open question.

GIDS Blaze Series of Blaze 25, Blaze 50 and Blaze 75 offers Pakistan a more tractable mass production proposition. The electrically powered Blaze 25 is optimised for anti-tank operations with a 75 km range; the Blaze 50 offers a 180 km range with a 20 kg warhead for medium engagements; and the Blaze 75, the heaviest in the series, extends to 500 km with a 30 kg warhead. All three were displayed publicly for the first time at IDEAS 2024 and subsequently made their international debut at Egypt's EDEX exhibition, signalling GIDS's export aspirations. The Blaze series may prove to be Pakistan's answer to India's Nagastra family, tactically deployable, domestically produced and scalable.

GIDS Yalghaar 200 and Yalghaar 400 (numbers representing the range of the systems, in km) was introduced in World Defence Show 2026 in Saudi Arabia and designed for medium range operations, with warhead capacities of 20 kg and 30 kgs respectively.

Integrated Dynamics, a Karachi-based UAV solutions company, has modified its Rover ISR UAV into a loitering munition and is a hand launched system with a range up to 15 km and 1.5 kg payload capacity with thermobaric/HE warheads.

Xpear MX-150, that is built by another Karachi based private company Woot Tech is a tactical tube launched system, that carries a 2 kg warhead and a range of 30 km, covering close support and anti-armour niches.



greater range and speed while retaining scalability and relatively lower costs. The aim is to enable long range precision strikes in larger numbers without the financial burden of traditional cruise missile systems, with emerging platforms like the HiMark-25, GIDS Yalghaar, Sarfarosh and Baaz Delta reflecting this shift.

Conclusion

The May 2025 conflict between India and Pakistan confirmed what had been visible in every major theatre of drone warfare over the preceding five years: loitering munitions are not a curiosity or a supplement to conventional strike power. They are now a primary instrument, capable of conducting SEAD, deep precision strike, area denial and force saturation simultaneously at a cost that both nuclear armed rivals can afford to sustain.

There is a long list of loitering munitions that embed “made-in-Pakistan” tag, however, the evidence to support their current operational status (inducted/testing/evaluation) is not clearly available in public.

The indigenous development race

The doctrinal and operational impetus from Op Sindoor has accelerated domestic drone manufacturing in both countries in ways that make the pre-2025 landscape appear static by comparison.

In India, Solar Industries has emerged as the leading private sector loitering munition manufacturer, with the Nagastra series moving from concept to combat debut in under four years. Prime Minister Modi’s inauguration of India’s first private drone testing runway in June 2025 signalled political endorsement at the highest level. The iDEX (Innovations for Defence Excellence) framework has created a pipeline of startup-to-service pathways that is compressing development timelines dramatically. Companies including NewSpace Research and Technologies, Raphe mPhibr and several DRDO incubated entities are advancing competing designs across weight classes. India demonstrated a coordinated 75 drone swarm in a live exercise, indicating that the shift toward networked autonomous attack formations is not merely theoretical.

In Pakistan, the NASTP-Baykar partnership for the YIHA-III created a template for technology co-development that Islamabad is likely to replicate. The IDEAS 2024 exhibition revealed a domestic industry that, while less mature than India’s, is developing a coherent family of loitering munitions across weight classes and mission types. The Blaze series in particular suggests that Pakistan Aeronautical Complex and GIDS have understood the mass production imperative. Additionally, one of the key approaches observed in Pakistan’s loitering munition development is the integration of jet propulsion into expendable drone platforms. This creates a hybrid between loitering munitions and cruise missiles, offering

South Asia has entered the era of affordable mass precision strike. India fields a diverse and increasingly indigenous loitering arsenal stretching from the 30 km man-portable Nagastra-1 to the Harop’s 200 km anti-radiation capability. Pakistan counters with the YIHA-III’s swarm capacity and a domestic industry, Blaze, Sarkash, Dark Angel, that is industrialising at speed. Both nations are racing to close capability gaps that Sindoor exposed.

What loitering munitions have not changed is the fundamental danger of two nuclear armed states with unresolved territorial disputes, a history of miscalculation and shrinking escalation timelines. What they have changed is the ease with which the opening moves of a future conflict can be made, the speed at which air defence networks can be degraded, and the scale at which precision damage can be inflicted before political pressure forces a pause. For a rivalry defined by its proximity to catastrophic thresholds, these are not incremental changes. They are structural ones. ➡



Article by Rishav Gupta
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Rise of Indian armour



India has unveiled multiple armoured platforms in the last few years. In partnership with the public sector, India's private sector has achieved breakthroughs in multiple crucial technologies. These achievements have changed the Indian defence industry.

Zorawar

6 July 2024, marked a red letter day as India rolled out the first prototype of the “Zorawar” light tank from the Hazira facility of L&T in Gujarat. Jointly developed by L&T and CVRDE, DRDO, it materialised in a very short span of two and a half years. The platform was developed under “Project AFV-LT” to be deployed mainly in the high altitude region in the aftermath of Chinese aggression against India in the Himalayan region in 2020. It is named after the legendary general Zorawar Singh, who, as governor of Maharaja Gulab Singh Jamwal of the princely state of Jammu and Kashmir, successfully recovered Baltistan and Ladakh from Tibetan grip, which was under the suzerainty of the Qing Empire of China.

Designed for rapid deployment and maneuverability in the mountainous region, “Zorawar” is a 25 tonne platform. Despite being light, utmost attention has been given to lethality, survivability, mobility and comprehensibility. Currently, a John Cockerill 3105 turret equipped with a 105 mm high pressure rifled gun is integrated into a hull designed and developed by CVRDE. There is a 7.62–mm co-axial PKT gun as well as a 12.7 mm NSV remote weapon system (RWS) from BEL. It carries two Nag anti-tank guided missiles (ATGMs) as well for enhanced anti-armour operation. India is currently developing indigenous guns and APFSDS for self-reliance. The turret will be manufactured by Electro Pneumatics & Hydraulics (EPH) Pvt Ltd in a joint venture with John Cockerill.



Zorawar Light Tank.

Though currently not equipped with an Active Protection System (APS), it has multiple laser warning receivers. Munitions India Ltd has supplied 81 mm anti-tank/anti-laser (AT/AL) smoke grenades to defend against an incoming enemy ATGM. The main gun can attain a very high elevation, which is crucial to engaging targets on higher ground. It's equipped with an auto-loader with bustle storage for enhanced crew safety. While there is a limitation of protection in such a light category, the hull is equipped with modular armour blocks as a measure against enemy attacks. Zorawar was originally to be powered by the MTU 8V 199 800-hp engine (there is no assertion if the Renk HSWL 256 was selected as the original transmission), but it could not be materialised. Currently it is powered by a 760-hp Cummins VTA903E-T760 engine and Renk HMPT 800 transmission. With a power-to-weight ratio of more than 30, it can attain excellent mobility in rough terrain.

An indigenous motor transmission unit (MTU) is under development. The hydro-gas strut suspension system (HSS) and composite rubber tracks (CRT) ensure smooth mobility. With reduced vibration and lowered fatigue, the combat preparedness of the crew is enhanced. The platform currently lacks a dedicated C-UAS system. Overall, it is an excellent development for immediate necessity. Currently, there is a requirement of 354 light tanks. The Indian Army has placed an initial order of 59 Zorawar. The remaining 295 tanks will be manufactured under the government funded design and development project for the Indian industry in the 'Make-I' category of the Defence Acquisition

Procedure (DAP). Multiple entities are taking part in this project. Subsequently, the numbers might get increased according to the requirements. Zorawar has concluded the development trials and is currently going through rigorous user trials. The platform is expected to join by next year. Zorawar is one of the offers for the AFV-LT. There are other participants as well. KSSL has confirmed to unveil a platform in the near future. Besides, reportedly TASL and AVNL are also to have their own projects.

NAMIS Mk-2

India unveiled the NAMIS Mk-2 (Nag Missile System) on the occasion of the Republic Day Parade, 2026. It is a successor to the earlier NAMIS Mk-1, also known as NAMICA (Nag Missile Carrier). While designated as a dedicated anti-armour platform, it is effectively an upgraded BMP-2 (Sarath). It has several upgrades to its predecessor. It retains the 30mm 2A42 autocannon of the BMP-2, being the most distinguishing feature. An add-on metal frame attached to the turret of Sarath to mount anti-tank guided missiles. It carries four, unlike the six in the Mk-1 Nag ATGMs.



NAMIS Mk-2. Image Twitter.

The ADTS-BEL TIFCS of the Mk-1 has been replaced with new and improved MSEOP (Multi-Sensor Electro Optical Payload). Two sights provide necessary situational awareness to the gunner and commander. Each sight contains a thermal camera, a day camera and a laser range finder. While it retains the 7.62mm co-axial PKT of

Sarath, no RWS has been spotted. Till now, orders of 120 NAMICA and 2701 Nag ATGMs have been placed.

Vikram VT-21

India flagged off the next generation of tracked and wheeled infantry combat vehicles under “Project Vikram VT-21” on 25 April 2026, paving the way for eventual induction of the “Future Infantry Combat Vehicle” (FICV) and “Wheeled Armoured Fighting Vehicle” (Wh-AFV). The Advanced Armoured Platform (Tracked and Wheeled) (AAP-Tr & Wh) was launched by DRDO’s VRDE to provide emerging operational requirements of the Indian Armed Forces for FICV and Wh-AFV. Eventually, Kalyani Strategic Systems Limited (KSSL), a defence subsidiary of Bharat Forge Ltd. (BFL) and Tata Advanced Systems Limited (TASL), was selected as one of two partners for the Development Cum Production Partner (DCPP) model.

1990s, when India launched an indigenous ICV project as a successor to the BMP-2 Sarath. It resulted in “Abhay,” which was quite an impressive platform at that time. However, it was not adopted.

Despite not being in service, Abhay has been continuously used for the development of advanced indigenous technology.

R&D(E) developed a composite hull, which reduced the weight by 35 to 40 percent without compromising the structural and ballistic performance of the metallic hull. It was further evolved into a composite hull infantry combat vehicle. The hull comprises monocoque top and bottom parts manufactured in E-glass epoxy using the Vacuum Assisted Resin Transfer Molding (VARTM) process. Ceramic composite armour for the side walls of the hull provides protection against 14.5-mm AP rounds.



Vikram flag-off.

Both the companies have developed a tracked and a wheeled platform each. Thus, there will be four platforms under this programme.

The co-development enabled the programme from concept to combat ready in under three years. VRDE has worked as the nodal lab in assistance of multiple other DRDO land for the development of the necessary technologies and maturation. The indigenous content amounts to 65% with plans to eventually increase it to 90%.

AAP-Tr

The development of this project dates back to the late



Vikram-Tr side view. Photo TASL.

Other than this, various other armours like titanium, high hardness steel, high nitrogen steel, dual hardness spaced, anti-fragment armour and light explosive reactive armour (ERA) have been successfully designed, developed, fabricated and integrated for providing specified protection at various locations of the platform. All these applications, developed for Abhay and CICV, have been further evolved for the AAP. R&D (E), DRDO, has matured advanced composite technologies like Glass Fiber Reinforced Plastic (GFRP), Carbon Fiber Reinforced Plastic (CFRP), etc., which are providing structural integrity to the hull (both AAP-Tr and AAP-Wh) under field stress. It is currently equipped with rubber enforced dual pin tracks. In the future, CRT is expected.

AAP-Wh

VRDE co-developed WhAP (Wheeled Armoured Platform) with Tata Advanced Systems Ltd and Mahindra Defence Systems (MDS). Tata has successfully exported its WhAP variant Kestrel to Morocco. The hull is constructed of high strength steel with ceramic armour bolted on to offer all round protection against 7.62-mm AP. The WhAP has a monocoque V-hull for protection against IEDs and mines. A double configuration is applied with an inner panel and bottom panel. The bottom panel is designed to deflect the blast energy and get deformed to minimise the energy transfer to the vehicle. Energy absorbing mats are applied to the floor interface to provide protection to the crew. Suspended mine blast attenuation type crew seats are used for enhanced safety.



WhAP Wheeled Armoured Platform. Image TASL.

A spall liner is applied for protection against lethal fragments in case of a break-off. It can run on flat tires in case of sudden tire deflation. Since its inception, WhAP has gone through continuous modernisation to reach the current final iteration of AAP-Wh. The protection level has been enhanced significantly thanks to the application of a more modern metallurgy (same as applied in the AAP-Tr).

The original back-to-back seating has been replaced with inward facing for better inner space and quicker troop movement. The firing ports are omitted for better protection against NBC threats.

Integration of common technologies

Both the platforms are currently equipped with an indigenously designed and developed 30 mm crewless turret integrated with a RWS and twin ATGM launchers. The optronics and STAR (see through armour technology) provide excellent 360 degree situational awareness. The platforms are provided with STANAG levels 4 and 5 protection (most likely frontal protection STANAG Level 5: against 25 mm, at 500 meters and all around STANAG Level 4: against 14.5 mm AP, at 200 meters) with modular blast and ballistic protection. An improved water obstacle crossing capability is provided by incorporating hydrojets providing amphibious operational flexibility. AAP has a high ground clearance. The HSS (most likely) ensures a smooth journey reducing stress and fatigue of the crew. Currently, there is no official statement on MTU, but eventually, the AAP will be equipped with an indigenously developed engine (industry partner Ashok Leyland) and an indigenous automatic transmission (industry partner L&T).

By the end of April 2026, a tracked platform from TASL and a wheeled platform from KSSL have been readied. These two platforms have already cleared the Technical Evaluation Committee (TEC). Vikram will now enter into subsequent development trials and user trials and induction is expected in three years. The hulls of the other two platforms also have gone through several tests. Currently, there is a requirement of 1750 tracked FICV and 198 Wh-AFV for recce and support. 5 Recce battalions (Bn) of the Mechanised Infantry Battalions (MIB) will be equipped with the 198 platforms. Reportedly, there is a requirement of another 530 Wh-AF for 10 standard Bn. It must be noted that TASL and KSSL are not the only participants. There are other competitors like L&T, MDS and AVNL. So, soon there will be many new platforms. Interestingly, the original requirement of the FICV was 2610. So, in the future, the orders might rise.

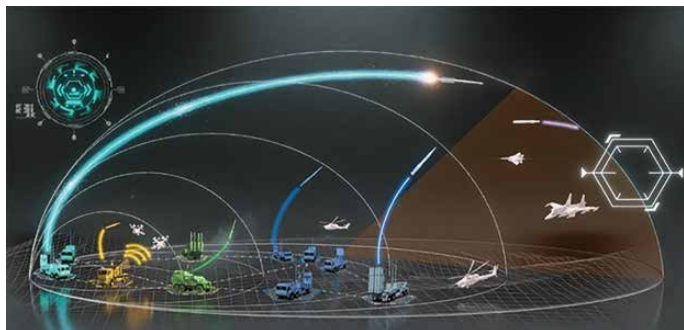
It's nothing less than remarkable that in the past twenty years Indian public and private sectors have leapfrogged obstacles in advancement and maturation in indigenous technologies. India is on the verge of being self-reliant



in metallurgy, armaments, vetronics and mobility. While India still has to go a long path, it cannot be denied that the achievements have put India in the front line of the countries capable of successfully developing any platform required. Zorawar and Vikram are testament to India's growing prowess.

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Layered defence in the age of drone warfare



The rapid proliferation of unmanned aerial systems (UAS) has fundamentally altered the character of modern conflict. Nowhere is this transformation more evident than in the Middle East, where Iranian drone capabilities and the responses they have triggered have turned the region into a real world testing ground for counter-drone technologies. The persistent use of loitering munitions, swarm drones and reconnaissance UAVs by Iran and its aligned militias has compelled regional states and allied forces to develop sophisticated layered counter UAS architectures.

Today, countering drone threats is no longer a niche capability. It has become an essential component of national air defence strategies, integrating sensors, electronic warfare systems, kinetic interceptors and increasingly, directed-energy weapons. The experience of countries such as Israel, Saudi Arabia, and United Arab Emirates, along with deployed systems of the United States Central Command, provides important insights into the evolving architecture of modern counter-drone defence.

The Iranian drone challenge

Iran has emerged as one of the world's most prolific producers of military drones, developing a wide range of UAVs including reconnaissance platforms, armed drones and loitering munitions. Systems such as the Shahed series attack drones have demonstrated how inexpensive unmanned platforms can deliver strategic effects.

Iran's doctrine relies heavily on volume, cost asymmetry and distributed launch platforms. A drone costing tens of thousands of dollars can force the defender to expend interceptor missiles costing several hundred thousand or even millions of dollars. This cost imbalance becomes particularly dangerous when drones are deployed in large swarms alongside cruise missiles or ballistic weapons.

As a result, regional actors have had to rethink traditional air defence models, which were originally designed to counter manned aircraft and ballistic missiles rather than large numbers of small, low flying unmanned systems.



Israel: The most integrated counter drone architecture

Among regional powers, Israel possesses the most sophisticated layered air defence ecosystem. Its approach integrates early warning sensors, electronic warfare and multiple interceptor layers.

At the tactical level, systems such as Drone Dome detect and neutralise small UAVs using radar, electro-optical sensors and electronic jamming. For kinetic interception, Israel relies heavily on the widely known Iron Dome system, originally designed to intercept rockets but increasingly adapted to counter drone threats. At higher tiers of defence, systems like David's Sling and Arrow 3 provide protection against longer-range aerial threats. Perhaps the most transformative development in Israel's counter-drone arsenal is the deployment of the laser based Iron Beam. Directed energy weapons dramatically reduce interception costs, potentially allowing defenders to counter drone swarms at a fraction of the cost of missile interceptors.

Saudi Arabia: Protecting strategic infrastructure

Saudi Arabia has faced sustained drone and missile attacks in recent years, particularly targeting its oil infrastructure and critical energy facilities. As a result, the kingdom has built an extensive layered air defence network. Long range defence is provided by the Patriot Missile System and the high-altitude THAAD systems. These platforms are designed primarily to intercept ballistic and cruise missile threats but can also engage larger UAVs.

For point defence against smaller drones, Saudi Arabia employs gun systems such as the Oerlikon Skyguard and short-range missile systems like Pantsir-S1. The kingdom has also begun experimenting with directed energy counter-drone technologies, including the Chinese

origin Silent Hunter laser system designed to neutralise small UAVs.

United Arab Emirates: Integrated air defence networks

The UAE has adopted a similar multi-layered approach. The country's integrated air defence network combines long range radar coverage with advanced missile defence systems, including the Patriot Missile System and THAAD. Short range air defence platforms such as SPYDER provide protection against drones and cruise missiles within tactical engagement ranges. The UAE's air defence strategy is heavily reliant on networked detection, rapid command and control integration and layered interception, allowing it to respond to simultaneous drone and missile threats.

United States Forces: Base defence against drone attacks

Across the Middle East, US military installations have increasingly faced attacks from drones launched by Iranian aligned militias. To protect bases and personnel, US forces have deployed a range of counter-UAS systems. These include the radar guided C-RAM for close-in defence and the NASAMS for short-to-medium-range interception. Additionally, US forces rely heavily on electronic warfare tools capable of disrupting drone communications and navigation signals. These "soft-kill" methods can neutralise drones without the need for expensive missile interceptors.

The layered counter-drone defence model

Experience across the Middle East demonstrates that no single system can effectively defeat drone threats. Instead, successful defence depends on a multi-layered architecture, typically structured as follows:

Layer 1 – Detection and early warning. Long range radars, airborne early warning aircraft, and RF detection systems provide the initial identification and tracking of UAV threats.

Layer 2 – Electronic warfare. Radio frequency jamming, GPS spoofing and cyber disruption aim to disable or divert drones before they reach defended zones.

Layer 3 – Point defence systems. Anti-aircraft guns and close-in weapon systems protect critical facilities such as military bases, ports and energy infrastructure.

Layer 4 – Short range missile interceptors. Systems such as Iron Dome and NASAMS provide tactical interception capability against incoming drones and cruise missiles.

Layer 5 – Medium and long range air defence. Patriot and similar systems protect urban areas and strategic infrastructure from larger aerial threats.

Layer 6 – Directed energy weapons. Laser systems like Iron Beam offer low cost, high-volume interception capability against drone swarms.



The Emerging economics of air defence

One of the defining challenges of modern drone warfare is the economics of interception. Iran's strategy of deploying large numbers of inexpensive UAVs places defenders at a financial disadvantage when relying solely on missile interceptors. This reality is driving the rapid development of low cost counter drone technologies, particularly electronic warfare and directed energy weapons. These systems offer the potential to neutralise large numbers of drones without incurring prohibitive costs.

Strategic lessons for future air defence

The Middle Eastern experience offers valuable lessons for military planners worldwide. First, the drone threat is unlikely to diminish; on the contrary, advances in autonomy, artificial intelligence and swarm technology will make unmanned systems even more capable. Second, air defence must evolve from a platform centric model to a network centric architecture, integrating sensors, command systems and multiple interception layers.

Finally, economic sustainability will become a decisive factor. Air defence systems must be capable not only of defeating drone threats but also of doing so at a cost that does not exhaust the defender.

Conclusion

The Middle East has effectively become the proving ground for modern counter drone warfare. Faced with persistent Iranian drone attacks, regional powers and allied forces have developed increasingly sophisticated layered defence architectures that combine sensors, electronic warfare, kinetic interceptors and directed energy weapons.

As drone technology continues to evolve, these layered counter-UAS systems will remain central to protecting military installations, critical infrastructure and urban populations. For defence planners across the world, the lessons emerging from this region underscore a clear reality: in the age of drone warfare, effective air defence will depend on integration, adaptability and the ability to counter threats at scale.



**By Col Aravind Mulimani,
Vice President – Projects (Air
Defence), Zen Technologies
Ltd**

Interview with Col Aravind Mulimani

VP, Projects (Air Defence), Zen Technologies



The rapid spread of drone technology is reshaping modern warfare. From inexpensive commercial quadcopters to loitering munitions and increasingly autonomous systems, unmanned aerial platforms have become integral to battlefield operations. As a result, counter-UAS solutions are emerging as a vital element of national defence frameworks. In this interaction with Vayu Aerospace & Defence Review, Col Aravind Mulimani, Vice President – Projects (Air Defence) at Zen Technologies, shares insights on the evolving drone threat, the growing role of artificial intelligence in counter-UAS systems, and how the company is enhancing its capabilities to address new operational challenges.

VAYU: *Zen Technologies has expanded significantly into counter-drone and air defence solutions in recent years. What drove the company to focus on this segment?*

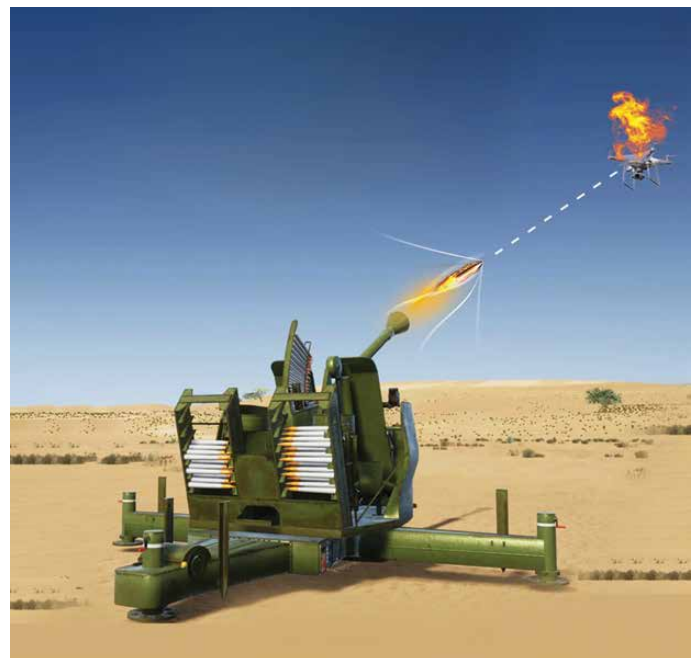
The move into counter-drone and air defence systems is largely driven by the changing nature of modern warfare. Conflicts such as Nagorno-Karabakh and the Russia-Ukraine war, the long drawn Israeli conflict in Gaza and the on-going US/Israel-Iran crisis have clearly demonstrated how low cost drones can influence battlefield outcomes. At the same time, India has experienced increasing drone activity along its borders, underlining the importance of developing indigenous counter-UAS capabilities.

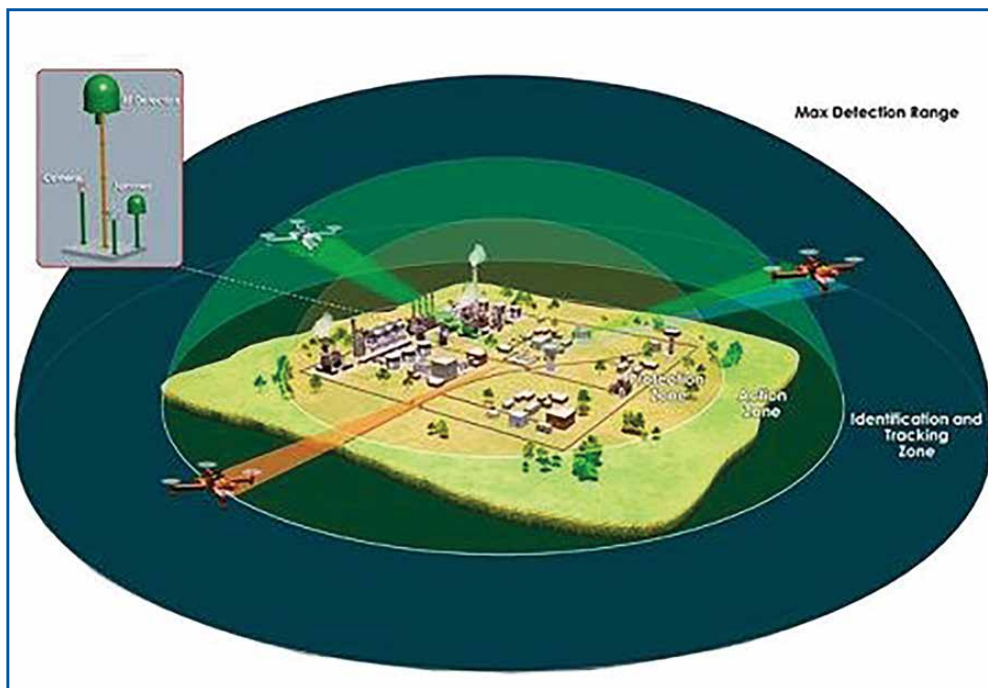
For Zen Technologies, this expansion is also a natural extension of our expertise in simulation technologies, sensor integration, AI-driven analytics, and command-and-control systems. These capabilities translate directly into operational counter-drone platforms. Combined with India's emphasis on defence indigenisation, the sector represents both a strategic necessity and a strong growth opportunity.

VAYU: *How closely does Zen work with the armed forces while developing these systems? To what extent does operational feedback from users shape the final product?*

Our development process is highly collaborative and driven by operational requirements. Most programmes begin with inputs from the armed forces that define the operational gaps and mission profiles the systems must address. During development, prototypes undergo extensive trials where service personnel evaluate them in realistic operational scenarios. Feedback from these trials plays a critical role in refining detection performance, deployment speed, system interfaces, and interoperability with existing command networks.

Given Zen's long experience in training technologies, we also place strong emphasis on operator usability and decision support. Even after induction, operational feedback continues to guide upgrades and system enhancements. Our concept of design and development





The threat spectrum has expanded considerably in recent years. One major concern is modified commercial drones, which are inexpensive, widely available, and increasingly used for reconnaissance or explosive delivery. We are also seeing the rapid rise of FPV attack drones capable of precision strikes. Loitering munitions represent another significant threat due to their long range strike capability. Perhaps the most complex challenge involves coordinated drone swarms that can overwhelm traditional air defence systems. Looking ahead, autonomous and AI-enabled drones are likely to become an increasingly important factor.

are driven by scalable architecture and giving our armed forces readiness for future wars rather than catching up with current challenges. Aside from being the best in class and most comprehensive CUAS solutions, this makes Zen systems obsolescence proof, which is the best gift Zen Technologies can give to the defence users and the nation.

VAYU: *When developing EW and counter-drone simulators, how does Zen Technologies ensure that operators experience realistic conditions such as signal interference, evolving threats and decision making under pressure?*

Realism is central to our approach. Our electronic warfare and counter-drone simulators recreate complex electromagnetic environments that include signal congestion, jamming, spoofing and interference. We maintain dynamic threat libraries that replicate different drone platforms, communication protocols and emerging tactics. Training scenarios are mission oriented and require operators to interpret sensor data, prioritise threats and respond in real time.

To simulate operational pressure, we incorporate time constraints, multiple simultaneous alerts, and ambiguous data inputs. Advanced analytics within the system allow instructors to assess operator performance and decision making in detail.

VAYU: *Recent conflicts, like Russia-Ukraine War, Operation Sindoor and the ongoing Middle East conflict, have highlighted the rapid evolution of drone threats. From Zen's perspective, what types of hostile drone systems are currently the highest priority when designing counter-drone solutions?*

Addressing this evolving threat environment requires layered counter-UAS architectures combining detection, electronic warfare and kinetic interception capabilities.

VAYU: *After Operation Sindoor, have you observed a noticeable rise in demand for counter-UAS systems? Has it influenced procurement priorities or customer inquiries for Zen's solutions?*

Recent operational developments have reinforced the importance of counter-drone capabilities. Real world incidents involving drone activity near sensitive installations have increased awareness of the threat across defence and security agencies. Consequently, there is growing interest in integrated counter-UAS solutions that combine detection, electronic warfare and kinetic response options. This trend is reflected in increasing engagement with both domestic and international customers exploring comprehensive drone defence solutions. In the context of post Sindoor scenario, our defence forces have accelerated not only the CUAS capability building, but also bringing about a very versatile mix of CUAS capabilities with security forces.

VAYU: *How is Zen incorporating AI and machine learning into its counter-UAS platforms and what practical advantages does it bring?*

Artificial intelligence and machine learning are becoming critical components of modern counter-drone systems. Our platforms use AI algorithms to analyse data from multiple sensors—including radar, RF detectors and electro-optical cameras—to improve drone detection and classification while reducing false alarms. AI also enables multi-sensor data fusion, allowing the system to create



a unified operational picture from diverse inputs. In scenarios involving multiple drones or swarm attacks, AI-based software can prioritise threats and assist operators in selecting the most appropriate countermeasure.

VAYU: *We are now seeing the emergence of fiber-optic drones that are largely resistant to conventional RF jamming. How is Zen adapting its counter-drone approach to deal with such evolving threats?*

Fiber-optic controlled drones represent a new challenge because they do not rely on radio-frequency communication links. As a result, traditional RF jamming techniques are less effective. To address this, counter-UAS architectures must increasingly rely on multi-sensor detection using radar, electro-optical, infrared and acoustic systems. In many cases, neutralisation may require kinetic or hard-kill options. The key strategy is designing modular and layered systems that can incorporate new sensors and countermeasures as threats evolve.

VAYU: *What is the current status of exports for Zen Technologies, particularly in the counter-drone and air defence segment, and what are the company's ambitions in terms of global markets going forward?*

Zen Technologies already has a strong international presence, with our systems operational in more than 60+ countries. Our export markets are particularly strong across the Middle East, Africa and Southeast Asia. Historically, exports were driven by training simulators,

but we are now seeing growing global demand for counter-drone and electronic warfare simulation systems as well. Our long-term objective is to significantly expand our global footprint and position Zen as a leading supplier of indigenous defence technologies, in particular the Zen CUAS solutions for the global defence users.

VAYU: *We recently came across Zen's mobile anti-drone patrol vehicle concept. Could you share more about the platform beyond technical specifications, such as development timelines, prototype trials and evaluations, and the 4x4 platforms currently being considered? Additionally, the system currently appears to focus on soft-kill capabilities. Are there plans to integrate hard-kill options in the future as part of this mobile counter-drone platform?*

The mobile anti-drone patrol vehicle is designed to bring counter-UAS capability closer to frontline operations. By integrating detection, tracking, identification and neutralisation systems on a tactical vehicle platform, it allows forces to protect moving formations, convoys and temporary deployments. The current configuration focuses primarily on soft-kill electronic warfare measures such as RF and GNSS jamming and spoofing solutions, which are suitable for urban or law enforcement environments. However, the architecture is modular and future variants could incorporate hard-kill capabilities, including remote weapon stations or interceptor systems, which would find tremendous operational use in the military environment where no collateral damage implications are visualised.

From factory floor to frontline



For a long time, manufacturing was treated as a back-office function. Important, yes, but rarely discussed in the same breath as national security or strategic power. That separation no longer exists. Over the past few years, governments have been forced to confront a simple truth. You cannot defend borders, sustain deterrence, or respond to crises if your industrial base is fragile. Weapons systems matter, but the ability to build, repair, upgrade, and scale them matters just as much. In some cases, more. This shift did not happen overnight. It was triggered by supply chain shocks, geopolitical realignments, and a growing realisation that efficiency-led globalisation had quietly introduced strategic risk.

When manufacturing quietly became strategic

The pandemic exposed weaknesses that many policymakers had long overlooked. What had been treated as a procurement or logistics issue suddenly looked like a national security risk. Supply chains built for maximum efficiency proved fragile when faced with real disruption.

The war in Ukraine made this reality impossible to ignore. Western countries learned that possessing advanced weapon systems counts for little if there is no capacity to produce or replenish them at scale. Europe exhausted large portions of its artillery ammunition far faster than expected, forcing governments to revive production lines that had been dormant for years. Security, it became clear, was less about sophistication and more about industrial readiness.

Aerospace and defence felt this strain early. These sectors depend on long lead times, specialised materials, and tightly controlled supplier networks. Disruption does not get absorbed easily. When a single supplier fails, entire programmes slow down. When a region becomes unavailable, gaps open that cannot be closed quickly.

This has pushed governments to rethink their assumptions. The focus is no longer only on who builds critical systems, but on where they are built, how resilient the supply chain truly is, and whether manufacturing capacity can expand under pressure. These may sound like industrial concerns, but they now sit at the core of national security planning.

Supply chain is the new battlefield

Today, strategic competition increasingly plays out far from the frontline. It shows up in licensing regimes for critical minerals, in tariffs on components, and in the race to secure advanced manufacturing capability. These moves may look administrative on the surface, but they shape who can build, sustain, and scale aerospace and defence systems when it matters.

Europe's aerospace sector offers a useful example of how these vulnerabilities play out. Demand for aircraft and defence platforms has been strong, but skills shortages, limited industrial capacity, and shallow supplier depth have created bottlenecks. These are not routine commercial challenges that can be solved with short-term sourcing decisions. They are strategic risks that affect readiness, delivery schedules, and national capability. As a result, the global push to secure titanium, superalloys, electronics, and propulsion inputs is no longer driven only by price or availability. It is driven by control and continuity. Governments have realised that even trusted OEMs can be exposed through upstream material dependence.

Industrial capacity matters more than inventory

Stockpiles can bridge short disruptions. They cannot replace lost industrial capability. A defence platform that exists only on paper or in limited numbers, is not credible unless it can be produced, sustained, and upgraded over decades. Deterrence is not just about what sits in storage today. It is about what can be built tomorrow, at scale, and under pressure. Advanced aerospace and defence manufacturing is not just about machines on a factory floor. It is about process knowledge, quality systems, skilled people, and the ability to integrate into complex global programmes. These capabilities are built slowly through repetition, discipline and trust. Once they are lost, they are extremely difficult and expensive to recreate.

Why aerospace and defence manufacturing is different

Unlike many other industries, aerospace and defence manufacturing operates under conditions of near zero

tolerance for failure. Precision, traceability and compliance are not optional. They sit at the core of how programmes are certified, operated and sustained over decades. The F-35 programme is a good illustration of this reality. Its global supply chain spans more than 1,500 suppliers across multiple countries. Every one of them is required to meet identical quality, documentation and traceability standards. A deviation as small as a fastener or a process lapse at a lower-tier supplier can ground aircraft across fleets. In such an environment, the idea of optimising purely for price quickly breaks down. What matters far more is confidence that every partner in the chain will perform, every time.

This is why governments and OEMs increasingly value partners who can operate at this level consistently, across geographies and programmes. The relationship shifts away from transactional sourcing toward long-term manufacturing platforms that can be trusted with responsibility, not just volume.

Airbus's approach to dual sourcing reflects this thinking. By spreading production across trusted partners in Europe, India and the UK, Airbus is not chasing redundancy for its own sake. It is building resilience into its programmes. The suppliers it values are those that can scale when required, comply with multiple regulatory regimes, and remain operationally and financially stable for decades. Cost still matters, but it sits behind these fundamentals.

A platform based manufacturing model makes this possible. It allows load balancing across sites, flexibility during demand spikes, and continuity when disruptions occur. Just as important, it creates institutional memory. Teams that have lived through audits, rate changes, and programme transitions carry knowledge that cannot be documented or replaced quickly. In mission-critical aerospace and defence programmes that accumulated experience is often the difference between smooth execution and systemic risk.

India's moment in the global rebuild

India is entering this conversation at a pivotal moment. For years, the country was viewed mainly as a cost-efficient manufacturing destination. That perception is changing. Today, the discussion is about capability, governance, and reliability. Indian private firms are no longer operating at the margins of global aerospace programmes. They are increasingly embedded within them.

Policy initiatives around defence self-reliance have helped, but the real shift has come from execution. Indian companies are supplying machined aerostructures, engine components, and defence electronics directly into global supply chains. Many now operate as Tier-1 and Tier-2 suppliers to major OEMs, working under AS9100, ITAR, and export control regimes. Fifteen years ago, this would have been difficult to imagine.

Investments in advanced manufacturing, quality systems and programme management are beginning to show results. New facilities for critical materials and components are part of this story. More importantly, however, is the emergence of integrated aerospace and defence manufacturing platforms that can engage deeply

with global OEMs and governments, not as low-cost vendors, but as trusted industrial partners.

Platforms, not plants


At Sigma, we think of manufacturing not as a collection of factories, but as a strategic platform. Our focus has been on building depth rather than just footprint. That includes advanced capabilities, strong governance, and the ability to work across borders. The acquisition of specialised manufacturing capabilities in the UK was driven by this thinking. It was about complementarity, not expansion for its own sake. When governments look for partners today, they are not looking for the lowest bidder. They are looking for assurance. Assurance that programmes will be delivered, that quality will be maintained, and that capacity will be available when it matters most.

From cost advantage to strategic trust

Trust is now the real currency in defence manufacturing. It is built over time through consistent execution, transparency, and alignment with national priorities. Cost still matters, but it is no longer the deciding factor. Manufacturing platforms that combine technical depth with financial discipline and long term thinking are becoming strategic assets. They give governments real options, reduce dependency risk, and create flexibility in a world that is far less predictable than it once was.

What governments are really looking for now

At its core, this shift is about preparedness. Governments want to know that their industrial base will hold under pressure. That it will not fragment when supply chains tighten or geopolitics intervene. That capability exists not just in theory, but in practice. This thinking is now formalised. NATO, for example, has begun reviewing and auditing member state defence manufacturing capacity as part of its readiness planning. Factories are no longer treated as background infrastructure, but as strategic assets alongside bases, fleets and forces.

Manufacturing has moved from the margins to the centre of national security planning. The factory floor is no longer far from the frontline. For those of us building aerospace and defence manufacturing platforms, this brings responsibility as much as opportunity. The work we do now will shape not just programmes, but preparedness for years to come. 



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Rethinking Air Power: Precision, persistence and the future of force application

Air power's strategic potential remains constrained not by technological limits, but by doctrinal inertia rooted in the 1991 Gulf War paradigm. Modern capabilities of air power, such as persistent Intelligence, Surveillance and Reconnaissance (ISR) tracking, mass precision effects and real time logistics observation, enable decisive air campaigns that can either terminate conflict or soften the way to it. Military history warns that such technological doctrinal mismatches persist until battlefield reversals compel reassessment, underscoring the urgent need to shorten the doctrinal lag by rethinking at the pace of technological evolution.

The obsolescence of Gulf War Doctrine in modern conflict

The targeting philosophy that defined Operation Desert Storm in 1991 represented a paradigm shift in military affairs. The integrated air campaign designed to systematically degrade Iraqi command and control, destroy air defences, eliminate Scud missile batteries and achieve air superiority before committing ground forces, reflected a particular strategic logic: air power existed to enable ground operations, not to replace them. This doctrine, refined through subsequent interventions in Kosovo, Afghanistan and Libya, has become the default framework through which military planners evaluate the utility of air power. Yet as geopolitical tensions between the United States (US) and Iran escalate, this inherited wisdom demands rigorous reassessment. The assumption that air power alone cannot achieve strategic objectives is increasingly a statement about outdated doctrine rather than inherent limitations of the medium.

The ground force assumption

The conventional wisdom that wars cannot be won from the air rests on a historically grounded but doctrinally static premise. Critics of air-centric strategy correctly observe that air power struggles to hold terrain, control populations and destroy the diffuse organisational networks that sustain insurgent and conventional adversaries alike. These limitations are real. However, the critics conflate the limitations of historical air power with those of air power as such, a category error that obscures transformative developments in reconnaissance, precision strike, and

persistent surveillance that have fundamentally altered the equation.

The ground-centric view of victory emerged from conflicts in which air power operated with significant constraints: limited sensor reach, weapons with finite persistence, communications architectures that could not process battlefield information at machine speed and adversary forces that could disperse, conceal and regenerate faster than targeting cycles could eliminate them. These conditions no longer describe the operational environment that advanced air forces can create.

The ISR revolution

The transformation of ISR represents perhaps the most consequential shift in the air power equation. Modern ISR systems, such as satellite constellations, high altitude unmanned platforms, networked sensor grids and artificial intelligence enhanced data fusion, have created an unprecedented capacity for persistent awareness of adversary activities across vast geographic expanses. While Cold War and Gulf War-era planners worried about "area denial" and the fog of war, advanced ISR has fundamentally compressed the sensor-to-shooter timeline and expanded coverage to continental proportions.

The implications for targeting philosophy are profound. Traditional air campaigns focused on achieving localised effects against high value, relatively static targets: airfields, command centres, radar installations and industrial facilities. Modern air power can now maintain continuous tracking of mobile targets, observe adversary logistics in near real time and identify patterns of operation that reveal intentions before they materialise into action. This is not merely an incremental improvement in targeting accuracy; it represents a qualitative shift toward what some strategists term "omniscient awareness" of the battlespace.

Mass precision: A contradiction resolved

The phrase "mass precision" may appear oxymoronic to those trained on twentieth century military theory, which held that precision and mass were inversely related. Precision weapons were few, expensive and required ideal conditions; massed fires were inaccurate, indiscriminate and politically costly due to concerns about collateral damage. This dichotomy no longer holds.

Contemporary precision guided munitions can be delivered at scale. The economics of precision strikes have been transformed by advances in guidance technology, manufacturing efficiency and networked targeting, which allow multiple platforms to engage multiple targets with a high probability of effect. The operational concept of "mass precision" now describes the simultaneous or near simultaneous application of precision effects across a wide area, overwhelming adversary decision cycles and generating cascading system failures across their operational architecture.



When combined with advanced ISR, mass precision enables a targeting philosophy that operates not on individual high value nodes but on the connective tissue of adversary systems: logistics convoys, maintenance facilities, communications relays, fuel depots and the human networks that sustain military operations. The objective shifts from destroying enemy forces to degrading enemy capacity and making the adversary's military apparatus inoperable rather than eliminating it piece by piece.

Persistence and the elimination of regeneration

One of the core limitations of historical air power was the adversary's capacity to regenerate losses. Air campaigns could destroy factories, but industry could relocate. Planners could eliminate tank battalions, but reserves could be mobilised. The temporality of air power operated on a different scale than the adversary's ability to recover, adapt and reconstitute.

Modern air power, particularly when using unmanned systems and long endurance platforms extensively, introduces a new variable: persistence. Persistent presence over the battlespace, maintained not by rotating crews through exhausting sorties but by platforms that can loiter for days or weeks, fundamentally alters the regeneration calculus. When a logistics convoy destroyed today is followed by continuous observation that prevents its replacement tomorrow, when maintenance facilities are struck before repair efforts can be brought in, and when leadership is engaged before coordination can be re-established, the adversary's organisational capacity to recover erodes not gradually but systematically.

This is the conceptual foundation for what some military theorists now call "time-sensitive targeting at operational scale," as in the sustained, intelligent application of precision strike against the operational rhythms of adversary forces, degrading their capacity faster than they can adapt or regenerate.

Doctrinal re-imagination

The practical obstacle to realising this transformation is not technological but organisational and intellectual. Military institutions, including the United States Air Force, have inherited doctrinal frameworks, career promotion patterns and operational concepts that privilege the Gulf War model. Joint force integration still treats air power as a supporting arm rather than a potentially decisive instrument in its own right. Acquisition programmes prioritise platforms and systems designed for the previous era's conflicts. Training and education emphasise tactics optimised for scenarios that no longer exist.

Rethinking the application of force requires addressing these institutional dimensions. It requires developing operational concepts for air power used independently of ground operations and concepts that account for political constraints on collateral damage, the specific vulnerabilities



of twenty first century adversaries, and the integration of cyber, electronic warfare and space capabilities into a coherent operational design.

The Iran scenario illustrates these challenges. An Iranian adversary presents a complex target set: distributed leadership, resilient command networks, tunnel systems, mobile missile launchers and a population whose attitudes toward military operations are not uniform. Traditional air power doctrine would prescribe a campaign of degrading these targets in preparation for a ground invasion that may never come. But a reimagined approach might instead focus on systematically isolating Iranian military capacity from its support structures by targeting energy infrastructure, financial networks, supply chains and the technological inputs that

sustain military capability, while maintaining persistent observation to prevent adaptation and reconstitution.

Conclusion: The imperative of doctrinal evolution

The proposition that air power alone cannot win wars is an empirical claim about historical experience, not a theoretical law. It reflects what air power has done under particular doctrinal, technological, and political constraints, but not what it could do under conditions of transformed ISR, mass precision, persistent presence and reimagined operational concepts.

Military history demonstrates that periods of technological transformation are often followed by periods of doctrinal lag, during which institutions cling to inherited frameworks until strategic failure forces reassessment. The current tensions between the United States and Iran, and the broader challenge of deterring or defeating adversaries across the spectrum of conflict, provide the strategic impetus for that reassessment.

The future of force application through the medium of air will not resemble the Gulf War. It will be characterised by distributed, networked operations; by precision effects delivered at scale and speed; by a persistent presence that denies the adversary the time and space to adapt; and by targeting philosophies that aim at system degradation rather than force attrition. The intellectual challenge is to develop these concepts, to resource them appropriately and to overcome the institutional inertia that privileges the familiar over the effective.

Air power has always been the medium of the future. The question is whether today's air forces will seize that future or remain trapped in the targeting philosophy of thirty five years ago. ➡

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Joris van Boven and Alex van Noije visit...

The International Fleet Review and MILAN 2026

Visakhapatnam, India; 18–19 February 2026



United through oceans

The Indian Ocean has become one of the world's most critical strategic theaters. In February 2026, the coastal city of Visakhapatnam served as the stage for a massive display of naval diplomacy with the start of the International Fleet Review (IFR) and Exercise MILAN. With 74 nations and 85 warships gathered, the event was a powerful statement of India's multi-aligned foreign policy and its rise as a 'Builder's Navy.' Through the scope of the 'Aatmanirbhar Bharat' initiative, the assembly showcased indigenous giants like the destroyer INS Mormugao and the carrier INS Vikrant. However, the maritime world is defined by a thin line between ceremony and conflict. While the 'United through Oceans' theme fostered cooperation in the Bay of Bengal, the reality of modern naval warfare waited just over the horizon. The subsequent loss of the Iranian frigate IRIS Dena, a participant in the review, shook the international community and underscored the 'No War No Peace' paradox of the region. This report analyses the operational synergy of MILAN 2026, the technical leap of India's domestic defence industry, and the sobering transition from diplomatic parades to way forward to 'Viksit Bharat 2047' which is the road to full self-reliance.

The strategic Indian anchor

In February 2026, the Bay of Bengal became the centre of the naval world for a few days. The Indian Navy (IN) hosted its largest maritime event since the country gained independence. This assembly consisted of two main parts; the International Fleet Review (IFR) 2026 and the Exercise MILAN 2026. From February 15 until 25, the city of Visakhapatnam turned into a hub for naval diplomacy and military power. These events took place during a time of high tension in the region. Even so, India acted as a neutral host. The chosen theme for the event was 'United through Oceans.' The scale of this 2026 edition was much larger than previous years. In 2016, the IFR hosted 50 countries. By 2026, that number grew to 74 participating nations. The total fleet included 85 warships in this edition. Out of these, 18 ships belonged to foreign navies. The entire programme rested on three main strategic pillars. First was the ceremonial IFR, where the President of India inspected the fleet. Second was the operational sea phase of the exercise MILAN. Third was the Indian Ocean Naval Symposium (IONS) Conclave of Chiefs, where top naval leaders met. Captain (OF-5) Geordie Klein of the Royal Netherlands Navy provided a professional perspective on these events. He serves as the Dutch Defence Attaché for

India, Sri Lanka and Bangladesh. In this role, Captain Klein is the main military link between the Dutch Ministry of Defence and the Indian region. He lives and works in the area. This allows him to monitor security shifts and build maritime ties between these nations. He attended the 2026 events as an official observer. His presence allowed for a clear assessment of how India's naval plans were changing. Geography is the main reason for this massive assembly. Captain Klein notes that India is located at a vital spot. "The Indian Ocean is the main highway for global trade. It affects the economy of both Asia and the West. Keeping these sea routes safe is a goal for many countries," Klein stated.



The Indian Navy used these events to show off the 'Aatmanirbhar Bharat' initiative. This term stands for a 'Self-Reliant India'. The Navy wants to design and build its own ships. This is part of a bigger plan called 'Viksit Bharat 2047'. The goal is to make India a fully developed and independent power by the year 2047. Captain Klein observed that this ambition draws other countries to India. He calls it a 'confining power.' Many nations want to stay in contact with India through these big meetings. The fleet in Visakhapatnam was very diverse. It included ships from NATO countries, but also from Russia and Iran. This not only shows India's 'multi-aligned' foreign policy. India does not join formal military blocs like NATO for example. Instead, it works with many different powers at once. This lets India act as a guardian of the Indian Ocean Region (IOR). However, the 2026 event also had a dark side. The Iranian frigate IRIS Dena was a guest at the review. Soon after the exercise MILAN ended, this ship became part of a real conflict. The vessel was lost in a fatal attack just days later when it was attacked by a submarine from the United States. This event showed the thin line between a peaceful parade and a real war. It reminded everyone that maritime security is often fragile, even after a display of unity.

The Presidential International Fleet Review

The morning of 18 February 2026, was a highlight in the ceremonial programme. The Presidential Fleet Review

(PFR) is a rare and significant event in India. It happens only once during the term of the President of India in general. This tradition allows the Supreme Commander of the Armed Forces to inspect the nation's maritime strength. In the calm waters off Visakhapatnam, the Indian Navy displayed a massive line of warships. The review served as a bridge between the Navy and the people of India. The review officially began when President Droupadi Murmu arrived at the naval dockyard. She embarked on the Presidential vessel, the INS Sumedha (P58). This vessel is a Saryu class patrol ship built in India. For this special day, it was decorated with the President's Standard. The vessel was flanked by a guard of honour. As it moved out of the harbour, the sound of a 21-gun salute echoed across the coastline of India. This traditional greeting signaled the start of the inspection.

The formation in the Bay of Bengal was a display of perfect geometry. A total of 52 ships were anchored in six long columns. These rows of vessels stretched for miles. Each ship was 'dressed overall' with colourful flags from bow to stern. The crews stood in straight lines along the decks in their typical white naval uniforms; this practice is known as 'Manning the Ship' or 'Dressing the Ship.' As the INS Sumedha sailed past, the sailors gave three cheers on each vessel. Their voices carried over the



water, showing loyalty to the Supreme Commander and the President. Directly behind the Presidential vessel, a small group of media and observer vessels followed the procession. Captain Geordie Klein onboard one of these vessels. As the Dutch Defence Attaché, he had a front row seat to the entire ceremony. From this vantage point, he could see the precise movements of the fleet and the scale of the international presence. Captain Klein emphasised that India's geography was the main reason why so many nations attended. "Well, actually India is the gateway to multiple parts of the world. The most important thing is that India is geographically very important in the Indian Ocean as every vessel needs to sail along this vast country," Klein stated. He explained that this region was a vital highway for global trade. It affected the economy of both Asia and the West. Seeing the fleet from the water confirmed the strategic weight of the region.

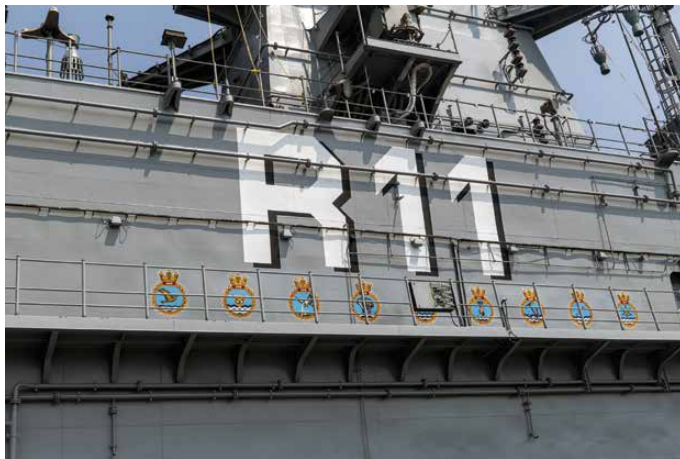


The fleet was not limited to the Navy alone. The Indian Coast Guard (ICG) played a major role in the formation. Their patrol vessels were alongside the larger warships. This showed the close bond between the two services in protecting India's long coastline. Merchant marine ships and survey vessels also joined the lines. Their presence highlighted the importance of the 'Blue Economy.' It reminded observers that naval power exists to protect



trade and sea resources. Among the 52 ships, 19 came from foreign nations. These guests were placed within the columns to show international friendship. It was a unique sight to see varied naval designs in one place. Despite the different origins of the ships, the review was perfectly synchronised. Every flag dip and every salute happened at exactly the right moment. This precision is a trademark of the Indian Navy's ceremonial skills. Captain Klein noted that the event acted as a magnet for global powers. "Many countries around the world would like to establish a link with India, precisely to ensure that the dialogue continues within all those different multilateral partnerships," he observed. From his position on the observer vessel, the confining power of India was visible. Navies from the West and the East shared the same patch of ocean in peace. The most modern ships of the Indian Navy occupied the central columns. These included the newest guided missile destroyers of the Visakhapatnam class and the Kolkata class. These ships represent the sharp end of India's naval spear. Even while anchored, they looked powerful and ready. The INS Vikrant (R11) served as a primary focal point during the International Fleet Review 2026 off the coast of Visakhapatnam. It was positioned prominently within the central columns of the 52 ship formation inspected by the President of India.

The presence of this indigenously built aircraft carrier anchored the fleet, symbolising India’s transition toward a self-reliant “Builder’s Navy.”



At the end of the inspection some of submarines also participated. Only their black hulls were visible above the waterline. These ‘silent killers’ of the Sindhughosh class and Shishumar class added a sense of mystery and strength to the parade. They moved slowly past the Presidential Yacht, showing that India’s power extended deep below the surface. As the INS Sumedha completed its circuit, the ‘steam past’ began. Several smaller vessels suited for Special Forces operations moved along at high speed. They cruised past the President in a dynamic display of maneuverability. It was a reminder that these vessels were not just for show; they are operational tools of war. The review concluded as the sun reached its peak at noon. The President returned to shore, but the ships remained in their positions.



They prepared for the next phase of the gathering. The transition from the colourful flags of the PFR to the grey reality of combat exercises was about to begin. The pomp and precision of the morning had set the stage. Now, the crews shifted their focus from ceremony to the hard work of naval warfare. This day proved that India could host the world with grace while standing firm as a major sea power.

The indigenous ‘Builder’s Navy’ concept

The Indian Navy follows a clear motto: “Combat Ready, Credible, Cohesive and Future Proof.” A major part of this objective is the shift from a ‘Buyer’s Navy’ to a ‘Builder’s Navy.’ During the 2026 fleet review, this change was visible in every column of ships. India no longer wants to rely on foreign shipyards. Instead, the country is pushing for a ‘Self-Reliant India.’ This policy ensures that the majority of new warships are designed and built within Indian borders. The stars of this indigenous display were the Visakhapatnam class destroyers. These ships are also known as Project 15B. They represent a massive leap in local engineering. The class includes four ships; Visakhapatnam, Mormugao, Imphal and Surat. During the review, their sleek stealthy shapes stood out. These destroyers are packed with advanced sensors and weapon systems. Most of these components are now made in India. This reduces the need for outside help and speeds up the construction process. Standing alongside the destroyers were the Nilgiri class frigates. These are part of Project 17A. They are the most advanced stealth frigates ever built in India. The design focuses on a low radar signature. This makes the ships harder for enemies to detect. They use a high level of automation and modern modular construction. By building these ships in sections, Indian yards like Mazagon Dock and Garden Reach can deliver them faster. The Nilgiri class shows that India can build world class combat ships that compete with any Western design.



Building a modern navy requires more than just steel and hulls. It needs advanced technology and research. This is where international cooperation plays a quiet but vital role. Even as India builds its own ships, it looks to experts for specific high tech needs. The Netherlands has been a key partner in this journey for many years. Dutch expertise in naval architecture and sensor technology is woven

into the fabric of the Indian fleet. Captain Geordie Klein explained the depth of this partnership. He highlighted the work of the Maritime Research Institute Netherlands (MARIN). “In the Netherlands we have MARIN, of course, which also does a lot for the Indian Navy, for the designs and onboard testing on their ships,” Klein stated. MARIN helps the Indian Navy test and refine ship designs. They use advanced basins to simulate how a hull moves through the water. This ensures that Indian built ships are stable and efficient in heavy seas. The collaboration goes beyond hull shapes. It also includes the “eyes and ears” of the ships. Dutch companies are famous for their naval radar and sensor systems. Many Indian warships use technology that originated in the Netherlands or was co-developed with Dutch engineers. This partnership allows India to integrate top-tier technology into its own platforms. It is a win-win situation. India gets the expertise it needs, and the Netherlands maintains a strong link with a rising global power.



sophisticated electronic warfare (EW) suites designed to jam enemy signals and protect the fleet. The precision work done in these cleanrooms ensures that electronics can survive the harsh, salty conditions of the open ocean. By mastering these technologies locally, BEL reduces India's dependence on foreign defence contractors for mission critical hardware.



Captain Klein noted that the ambition of the Indian Navy was impressive. The goal of ‘Viksit Bharat 2047’ means the Navy must be fully independent by the 100th anniversary of independence. This is a massive task. It requires a strong industrial base and thousands of skilled workers. “Actually all countries in the world want to make a link with India due to this,” Klein added. This interest, also from the West, shows that India is no longer just a customer. It is now a partner in innovation. The ‘Builder’s Navy’ concept also has a significant economic impact. When India builds a ship at home, the money stays in the

Also next to international cooperation the Indians developed their own vital systems. Bharat Electronics Limited (BEL) is a prominent state owned electronics and defence company headquartered in Bangalore. It plays a critical role in the ‘Aatmanirbhar Bharat’ initiative by designing and manufacturing advanced electronic systems for the Indian Navy. One of its most vital facilities is the high tech cleanroom environment located at its Bangalore complex. Within these controlled environments, engineers assemble sensitive components like microchips and high frequency microwave modules. These cleanrooms are essential for building the ‘eyes and ears’ of modern warships, such as the Visakhapatnam class destroyers. BEL produces the Combat Management Systems (CMS) that integrate all sensors and weapons on a ship into one interface. They also manufacture advanced radar systems, including the naval versions of the Revathi and 3D surveillance radars. In Bangalore, the company develops

local economy. It creates jobs in steel mills, electronics factories and software firms. Over 50 Indian companies were involved in building the Nilgiri class frigates. This ecosystem of suppliers is growing every year. It makes the Indian Navy more resilient. If a global crisis happens, India will not be left waiting for spare parts from overseas. During the review, the presence of the INS Vikrant (R11) served as the ultimate proof of this success. Its presence anchored the ‘Builder’s Navy’ theme. It proved that Indian shipyards can handle the most complex naval projects in the world. The Indian Navy’s path to self-reliance is not finished, but the 2026 fleet review showed how far they have come. The ships in Visakhapatnam were a clear message to the world. India is now capable of defending its interests with its own technology. By combining local labour with strategic partnerships like those with the Netherlands, the Indian Navy is well on its way to becoming a true blue water power.

Maritime domain awareness

The International Fleet Review (IFR) 2026 was not limited to the surface of the water. High above the fleet, the Indian Navy (IN) showcased its impressive air arm. Modern naval warfare depends on the ability to control the airspace above the sea. This is known as Maritime Domain Awareness (MDA). During the review and the following City Parade, the aviation branches of the Navy took center stage. A massive flypast of 60 aircraft demonstrated the reach and power of India's naval pilots. The aerial display began shortly after the Presidential Yacht finished its inspection. The timing had to be perfect. Sixty aircraft took off from various naval air stations to meet at a specific point over the Bay of Bengal. The lead formation was a spectacular sight. It featured heavy maritime patrol aircraft and nimble fighter jets. One of the most important aircraft in the flypast was the P-8I Neptune. This aircraft is the 'eye in the sky' for the Indian Navy. It is a long range maritime patrol aircraft built by Boeing. The P-8I is used for anti-submarine warfare and electronic signals intelligence. Its presence in the flypast reminded everyone of India's ability to monitor vast areas of the Indian Ocean. The Neptune can fly for many hours and carry a heavy load of sensors and weapons. It is the backbone of India's airborne surveillance.



The flypast also had an international part. The French Navy participated with an Atlantique 2 (ATL2) maritime patrol aircraft. This was a significant moment. The ATL2 is a specialised aircraft used for long range missions and submarine hunting. Its inclusion showed the deep cooperation between India and France. Both nations share a strong interest in keeping the Indo-Pacific region safe. Seeing the French aircraft fly alongside Indian assets was a visual proof of maritime unity. The fighter jet component was led by the Mikoyan MiG-29K. These jets are the primary strike force of the Navy's aircraft carriers. During the display, they flew in tight formations, showing the high level of training of the pilots. They provide the airpower that protects the fleet from aerial threats and allows for power projection far from Indian shores. Helicopters played a major role in the City Parade along the beach. The HAL Dhruv, an Advanced Light Helicopter (ALH) built in India, performed several maneuvers. These helicopters are used for search and rescue (SAR), transport and anti-submarine missions. Their agility was on full display as they hovered low over the water near the shoreline. They represent another success story for the 'Aatmanirbhar Bharat' initiative. The review also featured the Hawk trainer jets. These aircraft are used to train the next generation of naval

fighter pilots. Their participation showed the full cycle of naval aviation, from training to frontline combat. Even smaller utility helicopters, like the Chetak and the Kamov, were part of the formation. These older machines still play a vital role in daily operations and ship-to-shore logistics.

The complexity of managing 60 aircraft in a small piece of airspace is immense. Naval air traffic controllers worked closely with shipborne radar teams to ensure safety. Every aircraft had a specific slot and altitude to maintain. The precision of the flypast reflected the high standards of the Indian Navy's aviation wing. It was a flawless execution of timing and skill. Captain Geordie Klein, observing the maneuvers, understood the strategic value of this air power. Naval aviation assets allows a country to see over the horizon. It provides early warning of incoming threats. "Geographically seen, India plays a vital role in the Indian Ocean area," Klein noted. This geographic advantage is only useful if you have the aircraft to cover the distances. The 60 aircraft in the sky proved that India has that capability. The aerial review concluded with a high-speed 'vertical charlie' maneuver by a MiG-29K. The jet pulled up into a steep climb, disappearing into the clouds. It was a fitting end to a display of strength and technology. They had shown that the Indian Navy is not just a fleet of ships. It is a multi-dimensional force that owns the sea, the sub-surface and the sky.

Deep Submergence Rescue Vehicle demonstration

The Indian Navy executed a demonstration of its Deep Submergence Rescue Vehicle (DSRV) capability

at the multinational Exercise MILAN 2026, conducted from Visakhapatnam (Eastern Naval Command). The showcase, carried out from INS Nistar, India's first indigenously built Diving Support Vessel, underscored the Navy's commitment to submarine safety and maritime cooperation across the Indian Ocean Region. The rescue system comprises five major components: an intervention system, a rescue vehicle, a launch and recovery system, deck decompression chambers and independent power generators. The submarine rescue vehicle, operating under the call sign "Tiger 10," is a third generation system rated for depths of up to 650 metres, with a personnel extraction capacity of up to 14 submariners per dive. It is supported by a work-class Remotely Operated Vehicle (ROV) capable of operating at depths of up to 1,000 metres to survey and prepare a distressed submarine for rescue operations.



The launch and recovery system is cleared for launch operations up to sea state four and recovery operations up to sea state six. Three deck decompression chambers, each accommodating 30 personnel, provide post rescue decompression capability. The DSRV system is modular, containerised and fully air-transportable, enabling swift deployment across multiple theatres of operation. In an optimal scenario, the system can be mobilised and commence rescue operations within 72 to 96 hours, depending on coordination and infrastructure availability. The Indian Navy inducted two DSRV systems between 2018 and 2019, positioning one on each seaboard to ensure rapid response coverage across both the eastern and western maritime approaches.



The DSRV capability has been validated through 11 successful submarine rendezvous and participation in major international exercises, enhancing interoperability and operational confidence. Through its membership of the International Submarine Escape and Rescue Liaison Office (ISMERLO) of which the Netherlands is also a member, the Indian Navy has signalled readiness to extend assistance beyond national waters, particularly within the Indian Ocean Region.

Exercise MILAN 2026: Operational synergy

After the visual display of the Fleet Review, the focus shifted to the practical side of naval warfare. Exercise MILAN 2026 is a bi-annual multilateral exercise. It began in 1995 with only four nations. By 2026, it had grown into a massive operation involving 74 countries. The transition from ceremonial symbol to operational synergy is the core of MILAN. The exercise was divided into two distinct parts; the Harbour Phase and the Sea Phase. Each phase served a specific purpose in building trust and cooperation



between diverse navies. The Harbour Phase took place from February 15 to 21. This was a time for intellectual exchange and detailed planning. Naval officers from across the globe gathered at the Maritime Warfare Centre in Visakhapatnam. They participated in specialised seminars and subject matter expert exchanges. The goal was to share 'best practices' on topics like maritime piracy, humanitarian aid and disaster relief. These discussions are vital because they allow sailors from different backgrounds to speak the same operational language.



One of the highlights of the Harbour Phase was the Table Top Exercise (TTX). During this session, commanders faced simulated crisis scenarios. They had to coordinate their responses using a common set of rules. This built the foundation for what would happen later at sea. It allowed participants to understand each other's capabilities and limitations before moving into live fire zones. The phase also included social and cultural events. These interactions helped build personal bonds between crews, which is essential for maritime diplomacy. On 22 February, the ships weighed anchor for the Sea Phase. This was the most demanding part of MILAN 2026. Over several days, the Bay of Bengal became a massive training ground. The 85 warships were divided into several task groups. These groups were purposely mixed. For example, a Russian destroyer might work alongside an Indian frigate and a Southeast Asian corvette. This forced the crews to overcome communication barriers and technical differences.



The operational programme was intense. It began with basic tactical maneuvers. Ships practiced moving in close formations at varying speeds. This requires high levels of seamanship and trust. From there, the complexity



increased. The task groups moved into surface firing exercises. Using designated 'kill boxes' in the open ocean, ships engaged floating targets with their main guns. This tested the accuracy of their weapon systems and the speed of their fire control teams. Anti-Submarine Warfare (ASW) was a major focus of the 2026 Sea Phase. With the increasing number of submarines operating in the Indian Ocean, this skill is more important than ever. Indian P-8I Neptune aircraft and various ship-borne helicopters worked together to track 'underwater intruders.' They used sonar buoys and dipping sonars to create a clear picture of what was happening below the surface. These drills were realistic and required constant communication between the air and the sea. Air defence drills were another critical component. Fighter jets, including Indian MiG-29Ks, performed simulated attacks on the task groups. The ships had to coordinate their radar tracking and simulate the launch of surface-to-air missiles. These exercises were designed to test the layered defence of the fleet. It showed how different nations could contribute to a shared air defence umbrella to protect high value assets like tankers or aircraft carriers.



Interoperability was the main buzzword during these maneuvers. This means the ability of different systems and people to work together effectively. Cross-deck helicopter operations were a key part of this. Indian helicopters landed on foreign decks and foreign helicopters visited Indian ships. This allowed crews to practice refueling and maintenance on unfamiliar platforms. It is a vital skill for real world missions, such as searching for a missing vessel or delivering aid after a storm. The ability of multiple nations to operate in the same area without incident is a victory for maritime safety. The integration of so many diverse navies is not easy. Different countries use different radio frequencies, codes and tactics.

However, India acted as the central hub. By using standardised procedures, they managed to synchronise the movements of dozens of ships. This confirmed India's role as a 'Net Security Provider' in the region. They proved they could lead a large, complex coalition in a high pressure environment. The Sea Phase concluded with a 'War at Sea' scenario. This was a large scale mock battle between two opposing forces. It tested everything the crews had





practiced over the previous week. It required rapid decision making from commanders and flawless execution from the sailors. As the exercise ended, the ships performed a final sail past to salute the lead vessel.

Exercise MILAN 2026 was more than just a training event. It was a demonstration of collective will. By bringing together 74 nations, India showed that the ocean is a shared space that requires shared protection. The operational synergy achieved in the Bay of Bengal sent a clear message. Despite geopolitical differences, navies can and will work together to ensure the freedom of the seas. The lessons learned in Visakhapatnam will now be carried back to home ports across the globe, strengthening maritime security for years to come.

The IONS Conclave and multi-alignment

While warships maneuvered in the Bay of Bengal, a different kind of power was on display ashore. The Indian Ocean Naval Symposium (IONS) Conclave of Chiefs took place in the heart of Visakhapatnam. This gathering brought together the highest ranking naval officers from 34 member and observer nations. The goal of IONS is to increase maritime cooperation among the countries that touch the Indian Ocean. In 2026, this meeting was more important than ever. It provided a neutral space for leaders to discuss security without the pressure of formal military alliances. The Conclave focused on the concept of collective maritime security. The Indian Navy acted as the lead coordinator. Discussions covered a wide range of topics, from maritime territorial disputes to the safety of global trade routes. The presence of 74 nations

at the wider MILAN event made this specific conclave a unique diplomatic tool. India used the meeting to promote its vision of a 'Free and Open Indo-Pacific'. This vision relies on all nations following international laws, such as the United Nations Convention on the Law of the Sea (UNCLOS). India's foreign policy is often described as multi-aligned. This means India does not take sides in global power struggles. Instead, it maintains strong ties with many different countries at the same time. The 2026 assembly was a perfect example of this strategy. Representatives from America and Europe sat in the same rooms as officers from Russia and Iran. Very few countries in the world have the diplomatic weight to host such a diverse group. This ability to bring rivals together is a key part of India's growing influence.



The Conclave also addressed the 'Blue Economy.' This term refers to the sustainable use of ocean resources for economic growth. Naval leaders discussed how to protect underwater cables, offshore energy platforms and fishing



grounds. The safety of these assets is vital for the earning capacity of many nations. By hosting these talks, India showed that its Navy is not just a fighting force. It is also a guardian of the economic stability that the entire region depends on. Another important theme was 'Humanitarian Assistance and Disaster Relief' (HADR). The Indian Ocean is prone to natural disasters like cyclones and tsunamis. The IONS members agreed on new protocols for sharing information during a crisis. This ensures that if a disaster strikes, the nearest available navy can provide help quickly. This first responder mentality is a core part of the Indian Navy's regional doctrine. As the Conclave ended, the Chiefs issued a joint statement. They reaffirmed their commitment to a rules based maritime order. While the document was diplomatic, the message was clear. India is no longer a silent player in global maritime affairs. It is now a central regulator. By hosting both the IFR and the IONS Conclave, India proved it could manage the complex politics of the modern world. The convergence in Visakhapatnam showed that through dialogue and multi-alignment, India is shaping the future of the Indian Ocean.

The Shadow of Conflict – The fate of IRIS Dena

The success of MILAN 2026 was meant to be a story of maritime unity. However, the fragile nature of global security was soon exposed. Just days after the final 'sail past' in Visakhapatnam, the atmosphere changed from

celebration to crisis. On 4 March 2026, the international community was shocked by an engagement in the Indian Ocean. The Iranian Moudge class frigate IRIS Dena, which had been a visible participant in the fleet review, was sunk. The incident occurred as the IRIS Dena was transiting through the Laccadive Sea. According to operational reports, the vessel was intercepted by the USS Charlotte, a Los Angeles class nuclear powered attack submarine. The engagement was swift. The USS Charlotte fired a torpedo that struck the Iranian frigate with devastating precision. The IRIS Dena suffered massive structural damage and sank rapidly. This event marked a sharp departure from the cooperative spirit seen during the exercises in the Bay of Bengal.

India acted quickly to fulfill its role as a regional first responder for SAR duties. The Maritime Rescue and Coordination Centre (MRCC) in Colombo in Sri Lanka received a distress call in the early hours of the morning. Because this deliberate attack took place in waters near Sri Lanka and India, the Indian Navy launched a major Search and Rescue (SAR) operation. The primary asset deployed for the search was the P-8I Neptune long range maritime patrol aircraft. Having just performed in the ceremonial flypast, the P-8I was now tasked with a grim real world mission. It took off at 10:00 IST to locate survivors and wreckage. Another aircraft followed shortly after, carrying air droppable life rafts. The sensors that had been demonstrated during the MILAN war games

were now used to scan the waves for Iranian sailors. At sea, the Indian Navy redirected the INS Tarangini and the INS Ikshak toward the search zone. The INS Tarangini, a sail training ship, reached the designated area by 16:00 IST. These vessels worked alongside with the Sri Lanka Navy to recover those lost at sea. The conditions were challenging, but the coordination between the regional navies remained professional. The SAR operation continued for several days under intense international media scrutiny.

The human cost of the attack was high. The Sri Lanka Navy eventually recovered 87 bodies of Iranian sailors. These remains were taken to Galle National Hospital for identification. For the residents of Visakhapatnam, who had hosted the Iranian crew just weeks earlier, the news brought a sense of deep anguish. The sailors who had marched in the City Parade were now casualties of a silent underwater war. This deliberate attack highlighted the 'No War No Peace' reality of modern maritime operations. One week, navies can share bread and practice maneuvers together. The next week, they can be involved in a real conflict. The loss of the IRIS Dena cast a long shadow over the achievements of MILAN 2026. It served as a cold reminder that while diplomacy is vital, the threat of real world engagement is always present. For India, the incident was a test of its diplomatic and operational maturity. By leading the SAR efforts, India proved it could maintain its humanitarian duties even in the middle of a geopolitical firestorm. The Indian Navy demonstrated that its commitment to 'United through Oceans' was more than just a slogan. It was a promise to act when lives were at

risk, regardless of the political complications. The fate of the IRIS Dena will remain a dark chapter in the history of the 2026 assembly. It proved that the peace of the Indian Ocean is never guaranteed.

The Future Vision of Horizon 2047

The events of February 2026 provided a clear look at the current strength of the Indian Navy. However, the leadership in New Delhi is already looking much further ahead. The long term goal is 'Viksit Bharat 2047.' This plan aims to transform India into a fully developed nation by the 100th anniversary of its independence. For the Navy, this means becoming a true blue water power. A blue water navy can operate globally and maintain control over vast areas of the open ocean for long periods. Strategic independence is the foundation of this future vision. India wants to ensure that its maritime security does not depend on the political whims of other nations. This requires a fleet that is not only large but also technologically advanced. By 2047, the Indian Navy aims to operate a force of over 170 to 200 ships. This fleet will be anchored by multiple aircraft carrier battle groups, ensuring that India can project power far beyond its own shores. The transition to this future state involves a shift in naval doctrine. India is moving away from being a coastal defence force. It is now positioning itself as a 'Net Security Provider' for the entire Indian Ocean Region (IOR). This means India takes responsibility for the safety of all regional maritime traffic. Whether it is fighting piracy, providing aid after a storm, or protecting underwater data cables, the Indian Navy intends to be the first to respond.





Technology will play a massive role in this evolution. The Navy is investing heavily in unmanned systems.

This includes autonomous underwater vehicles (AUVs) and long endurance drones. These tools allow the Navy to monitor the sea constantly without risking human lives. Combined with advanced satellite surveillance, these systems will create a transparent ocean. It will become nearly impossible for any threat to move through the Indian Ocean without being detected by Indian sensors. The Multi-Aligned approach remains a key part of the 2047 horizon. India will continue to build bridges with different global powers. The collaboration with the Netherlands is a prime example of this strategy. By working with partners who offer specialised expertise in areas like radar and hull design, India can accelerate its own development. These partnerships are no longer about buying products. They are about sharing knowledge and co-creating the next generation of



skilled workforce to manage complex systems. However, the 2026 assembly proved that the momentum is already

there. The 'Builder's Navy' concept has taken root. The domestic shipyards are busy, and the naval air arm is expanding its reach. India's response to these challenges will define its status on the world stage. The goal is to create a maritime environment where international law is respected and trade can flow freely. As the ships left Visakhapatnam in late February 2026, they left behind a city that had seen the future. The IFR and MILAN 2026 were more than just events as they were a roadmap to the future. They showed a nation that is confident in its abilities and clear about its goals. By 2047, the Indian Navy does not just want to be a participant in global maritime affairs. It intends to be the force that ensures the 'United through Oceans' theme becomes a lasting reality for the entire Indo-Pacific region. ➡

Text and Photos: Joris van Boven and Alex van Noije

Interview with Captain Geordie Klein, Netherlands Defence Attaché for India, Sri Lanka and Bangladesh



Geordie Klein was born on 25 February 1970 in Heemskerk, the Netherlands. His military career commenced at the Royal Netherlands Naval College in Den Helder in 1988. In 1991, the submarine service was joined, where an almost uninterrupted posting was maintained until 2003. During that period, command was held for three years over a Dutch diesel electric Walrus class submarine. An MSc degree in navigation technology was also obtained from the University of Nottingham (UK) in 1997.

Two foreign postings followed. The first was conducted in Scotland at the UK's submarine training facility; the second was carried out in London at the NATO Maritime Headquarters (HQ). In between, in 2011, the Advanced Military Studies Course at the Netherlands Defence Academy was completed, and the role of 'Teacher' for the Netherlands Submarine Command Course (NLSMCC) was assumed. For three years, both Dutch and foreign students seeking to qualify as commanding officers of conventional submarines were trained and assessed.

After the London posting, a transition was made toward military diplomacy. Based at the Directorate of International Military Cooperation at the Netherlands Ministry of Defence in The Hague, the function of Desk Officer for Asia and Oceania was fulfilled. In that capacity, a pivotal liaison role was performed between the Dutch Defence Attachés in the Indo-Pacific region and the Defence Attachés from that region accredited to the Netherlands.

Multiple short and longer courses were followed to deepen knowledge of international relations (IR), including a three month programme at the Netherlands Clingendael Institute – an independent think tank and diplomatic academy.

From 2022 to 2025, the appointment as Netherlands Defence Attaché for Suriname and Guyana was held, with Paramaribo as the place of residence. The personal and professional enrichment gained during those years is now being brought to bear in the function of Netherlands Defence Attaché for India, Sri Lanka and Bangladesh — a role in which bilateral military relationships are sought to be strengthened and deepened in a respectful manner.



India on the World Stage. Can you tell us more about Vksit Bharat 2047 – India's ambition to be self-supporting, including militarily, by 2047? And about India's growing role in the Asian region and globally, both economically and militarily? What about India's desire to connect with Europe and the Netherlands?

India's vision is essentially about becoming a fully developed nation by 2047 – one where its people have been

able to develop themselves and where the country plays a powerful role in the world. It is somewhat comparable to the objectives China has set for 2049. Both are looking ahead to roughly 100 years after independence, at which point they aim to be modern, strong nations. On the military side, India seeks to be strategically autonomous by then and to give full shape to the role it is already beginning to assume. It is emphasised that this vision extends well beyond the military domain. It is not just military – it really concerns Indian society as a whole.

India is described as having grown increasingly significant in the Asian region. India sees itself as the major nation in the Indian Ocean region – the Indo–Pacific, specifically the western Indo–Pacific. It genuinely regards itself as the guardian of security there, not so much as the great enforcer, but rather as a facilitator of rules–based cooperation – ensuring that dialogue takes place, that parties can address each other and share information.



Maritime security is identified as a primary area of concern, alongside economic dimensions. Together, we need to manage the resources of the sea — whether fish or subsea oil — in accordance with agreed rules. At the same time, India’s northern borders with Pakistan and China, which have never been formally demarcated, continue to demand sustained military attention.

On the question of alignment with Europe and the Netherlands, a clear economic driver is identified. You see it everywhere in the world — the diversification all countries are seeking in order to be less dependent on a single supply or export line. This fits within India’s longstanding policy of first being non–aligned — no attachment to the then Western bloc, the North Atlantic Treaty Organisation (NATO), the United States or the Eastern bloc, i.e. the Soviet Union — and now being multi–aligned. India has many friends, some partners through strategic partnerships, but no formal allies. They are not bound to each other the way NATO allies are. They look for links wherever a mutual benefit is seen.

Maritime Power in the Indian Ocean. Can you tell us more about India’s strategic position in relation to international shipping lanes? About the expected growth of the Indian Navy? About the role the Royal Netherlands Navy might play in this region? And about the International Fleet Review (IFR) and the Raisina Dialogue?

India’s geographic importance is described in clear operational terms. For the wider world, India’s geography is simply critical. The Indian Ocean is of major geo–economic importance due to the international trade routes that run through it — routes that are vital to the economic output of Asia, the West and in fact the entire world. Because you literally have to navigate around India in that ocean, India holds a key position — flanked to the west, in what they call West Asia, by the Red Sea and the Suez Canal, and to the east by the Strait of Malacca, over which India also maintains good situational awareness via the Andaman and Nicobar Islands.

The Indian Navy’s growth trajectory is described as being heavily focused on indigenous production. Their aim is to build as much as possible in India, using as many Indian sourced components as possible. This remains a significant challenge in certain areas, where foreign suppliers are still required — including, in some cases, niche Dutch capabilities: hull designs where Dutch companies can assist, certain radar systems, and other components in which the Netherlands excels. These are still being utilised by the Indian Navy. Ultimately, however, their goal is to develop, build and potentially export as much as possible domestically.



The Netherlands participates in exercises in the region, often in an observer capacity. We are invited to take part in exercises. The distance between India and the Netherlands is considerable, and a naval deployment to the Indo–Pacific is conducted once every two years. At the International Fleet Review (IFR), a Dutch delegation was present, even though a full unit could not be dispatched. The visit was highly successful. It demonstrated what you might call India’s convening power — its drawing power today. Many countries in the world want a link with India, to ensure that in all those different multilateral frameworks, the conversation keeps going and that the right of the strongest does not simply prevail.

Around 70 to 80 ships were reviewed, with approximately 70 nations represented – ranging from the United States, the Netherlands, Germany and France to Ethiopia, Bangladesh, Australia and Russia. That showed India’s attraction. And they had structured it beautifully around three concurrent activities: the International Fleet Review, conducted by their President; the MILAN exercise,

which has grown into a very large maritime exercise; and the Conclave of Chiefs – the gathering of naval commanders from the Indian Ocean Naval Symposium (IONS).



On the Raisina Dialogue – attended by a Dutch delegation led by Vice Admiral Jeanette Morang – the purpose is explained as follows: Countries with very different perspectives come together and engage in discussion, to build greater mutual understanding of each other's positions and, hopefully, to arrive at some form of cooperation or at least agreement on certain courses of action. It is comparable to the Munich Security Conference and the Shangri-La Dialogue.

Regarding the Iranian vessel DENA and its participation in MILAN 2026, only publicly confirmed information is shared. I can say nothing beyond what has already been reported in the press – that it was torpedoed by an American submarine, approximately ten days after having participated in MILAN, and that it has meanwhile become known that another Iranian vessel is berthed in Sri Lanka and a third in Kochi.

Regarding the Army and a limited but developing relationship. Can you tell us more about the role the Royal Netherlands Army might play in this region alongside the Indian Army? Are there any existing partnerships – for example in the area of Humanitarian Assistance and Disaster Relief (HADR)?

The current bilateral focus is clearly delineated. The focus of cooperation between India and the Netherlands lies predominantly with the navy. Why? Because that is where the greatest overlap of interests lies – namely the preservation of open sea routes for trade through the Indian Ocean. Land based cooperation is acknowledged

to be limited. Cooperation at the army level has not yet taken shape, and I do not see that changing rapidly. Humanitarian Assistance and Disaster Relief (HADR) cooperation is more likely to materialise – either on an ad hoc basis following a disaster in the region, or potentially in Europe or the Netherlands. For now, the focus is maritime security. There is currently no active outreach from the Indian Army toward the Royal Netherlands Army.



Can you tell us more about the potential role of the Royal Netherlands Air Force in cooperation with the Indian Air Force? Are there existing frameworks or exercise invitations? What about Indian defence industry initiatives targeting the Dutch market?

Cooperation between defence and security industries, research and development (R&D) centres and start-ups is identified as an area currently being shaped. India has for several years been increasingly focused on strategic autonomy – developing military systems domestically and also exporting them. And of course, the imperative to reinforce our own defence in Europe has brought a

great deal of attention to the defence industry as well. Both countries will primarily focus on development and production at home and for the Netherlands that means looking first toward the European Union (EU). But there is certainly mutual interest.

That too is an important component of the forthcoming strategic partnership between the Netherlands and India — which will hopefully be made public and signed when Prime Minister Modi visits the Netherlands in the first half of this year.



For the Netherlands, niche capabilities are seen as the primary avenue. I think the Dutch contribution will centre on high-value or sub-component products. The question is whether cooperation on that basis can be found on both sides. And to some extent the reverse applies as well. Concrete initiatives are underway. These include informing Indian companies about opportunities in the Netherlands, and particularly about the Netherlands Institute for Defence and Security (NIDV) — the Dutch defence industry association — which organises various activities, most notably the Netherlands Exhibition on Defence and Security (NEDS), scheduled for 18–19 November this year in Rotterdam. Dutch companies are also being informed through the Society of Indian Defence Manufacturers (SIDM) about key defence events in India, including Aero India in February 2027.

Are there any other topics you would like to raise?

The state of the bilateral military-diplomatic relationship is characterised as positive and grounded. The military-diplomatic relationship between India and the Netherlands is good. It is primarily a relationship at the diplomatic-military level — supporting each other's positions in the interest of maritime security and, by extension, the rules based order at sea, as enshrined in the United Nations Convention on the Law of the Sea (UNCLOS) and other treaties. That is where our greatest overlap has resided for many years.


A significant step in this relationship is noted. It is what has led to our becoming an official observer of IONS.

Looking ahead, further deepening is envisaged. The extensions you are seeing, driven by changing times, involve informing each other about potential opportunities for the defence industry, and perhaps establishing stronger lines for the exchange of personnel for training purposes. In that way, the military-diplomatic cooperation between the Netherlands and India can be given more structural substance.

Could you share a quote about India as a country?

In India, you are surprised every single day — from the small things, like cows on the road, to the large. On one side you see an aircraft carrier underway; on the other, people still living under a viaduct. Or you witness multi-alignment literally in the air: a Russian tanker aircraft simultaneously refuelling a Russian fighter jet, a French fighter jet and an indigenously developed fighter jet. That remains truly remarkable.

Could you share a quote about India's military capabilities?

Indian military capabilities are large and impressive — and they will become even more impressive as the transition is made from manpower to more extensive and sophisticated systems. On one side, there is a high level of technological development; on the other, there remains a requirement to deploy the individual soldier at high altitude in mountainous terrain. That duality defines where India stands today. 

Interview by Joris van Boven and Alex van Noije

Joris van Boven and Alex van Noije visit...



**...Exercise Agni Varsha 2026 at Jaisalmer,
...The Konark Corps, Jodhpur,
...Agra HADR and 50th (Independent) Parachute Brigade,
...Indian Army Aviation Corps,
...451 Army Aviation Squadron,
...“Defence Forces Vision 2047”**

The Indian Army: An Overview

The Indian Army stands as one of the world’s foremost land forces — a permanent, professional institution whose mandate extends well beyond the conventional defence of national borders. With approximately 1.45 million active duty personnel, it is ranked among the largest standing armies on the planet and operates under the overarching command of the Ministry of Defence, Government of India. The Army’s field force is structured around fifteen corps, comprising three armoured divisions, four Reorganised Army Plains Infantry Divisions (RAPIDa), eighteen infantry divisions, and ten mountain divisions, in addition to independent brigades and a range of combat-support and service-support formations.



At the strategic level, the Ministry of Defence declared 2025 the “Year of Reforms”, a designation intended to accelerate the integration of the three services under Integrated Theatre Commands (ITCs), streamline defence acquisition procedures, and foster greater collaboration between the military, state owned enterprises, and India’s fast growing private defence sector. The Defence Research and Development

Organisation (DRDO) has been central to these efforts, offering open access to its patent portfolio to incentivise private-sector and start-up participation in research and development.



The Aatmanirbhar Bharat (Self-Reliant India) initiative has been the doctrinal cornerstone of the Army's equipment modernisation programme. Under this framework, indigenous platforms have progressively replaced foreign-sourced systems across the armoured, artillery, aviation and unmanned systems domains. Concurrently, the Army has been restructuring its tactical formations toward a leaner, more agile model built around Integrated Battle Groups (IBGs) – self-contained combined arms formations designed for rapid deployment across the full spectrum of operational environments, from the high altitude Himalayan frontier to the arid expanse of the Thar Desert.



The modernisation roadmap outlined an ambitious, multi-domain vision. At its core is the development of ultra-fast, highly manoeuvrable weapon systems – including hypersonic glide vehicles and advanced fourth, fifth, and sixth generation missiles – alongside a comprehensive programme of soldier-centric modernisation. Future infantry personnel are envisaged to operate with exoskeletons, human augmentation systems, smart body armour, and augmented reality based battlefield management systems, transforming the individual soldier into an empowered, network enabled warfighter.



Cyber and electronic warfare have emerged as equally critical domains. The Army is pursuing spectrum dominance through a combination of offensive and defensive cyber operations, next-generation electronic warfare solutions, and resilient satellite-communications systems. These efforts are complemented by a substantial expansion of unmanned aerial systems (UAS) and loitering munitions, with ongoing development of directed energy weapons for counter Unmanned Aerial System (counter-UAS) missions. The Pinaka multi-barrel rocket launcher (MBRL) system – a flagship indigenous fire-support platform – saw two additional regiments made operational in June 2025, and a long range guided variant successfully achieved a range of approximately 120 km in trials conducted in December 2025.

Exercise Agni Varsha 2026 – integrated fire and manoeuvre in the Thar Desert



In a first, India's MoD invited about 30 foreign defence journalists from 25 countries (including Joris van Boven and Alex van Noije from The Netherlands) to witness the Army demonstration.

On 24 February 2026, the Southern Command of the Indian Army conducted the large scale Integrated Fire and Manoeuvre Exercise (IFME) codenamed Agni Varsha "Fire Rain" at the Pokhran Field Firing Range (PFFR), located in the Jaisalmer district of Rajasthan.



The Pokhran Field Firing Range occupies a historically significant position in India's defence landscape. Situated in the heart of the Thar Desert, it has long served as the primary testing ground for the country's most advanced systems – including India's nuclear tests in 1974 and 1998. Agni Varsha thus carries symbolic as well as operational weight: conducted in desert and semi-desert terrain near the India-Pakistan border, it signals strategic resolve as much as it validates tactical readiness.



The exercise was designed to validate the following operational objectives: Validation of offensive operations under near battlefield conditions, including the rapid seizure of key terrain in a high-intensity desert environment; Synchronised manoeuvre of combined arms formations across multiple domains simultaneously –



ground, air, and the electromagnetic spectrum; Precision long-range firepower delivered through a diverse mix of artillery, rocket, and aviation platforms operating in a networked, data-linked command environment and finally assessment of network enabled command and control (C2) systems, including real time surveillance feeds from UAS, to support rapid decision making cycles at all echelons.

Participating platforms and systems

The Integrated Manoeuvre Force assembled for Agni Varsha represented a cross-section of the Army's current and emerging order of battle, with an emphasis on indigenous platforms consistent with Aatmanirbhar Bharat objectives. The force comprised the following elements:

- Armoured and Mechanised Forces: T-90 Main Battle Tanks (MBTs) and Infantry Combat Vehicles (ICVs), operating in combined arms teams to demonstrate integrated ground assault capability.
- Artillery: K-9 Vajra self-propelled howitzers, Sharang artillery systems and the legacy Bofors 155 mm/39 calibre guns, supplemented by precision strike rocket platforms – including elements of the Pinaka MBRL system.
- Aviation: Indigenous Advanced Light Helicopters (ALH) Dhruv in their Weapon System Integrated (WSI) configuration and AH-64 Apache attack helicopters, providing close air support and anti-armour fires.
- Unmanned Systems: A range of surveillance and strike drones employed for multi-domain reconnaissance, target acquisition, and direct attack missions, alongside dedicated counter UAS systems to replicate the contested airspace environment.



Technology infusion and network-centric warfare

A defining feature of Agni Varsha was its emphasis on network-centric warfare – the doctrine through which digitised data links enable real time situational awareness and compressed decision making cycles. Surveillance data from UAS was fused with fire control systems, allowing artillery and aviation elements to engage targets with high precision on timelines that would have been operationally

impossible under legacy command and control (C2) architectures. Counter drone measures were also exercised in earnest, reflecting lessons assimilated from recent conflicts in Ukraine and the Middle East, where low-cost UAS have reshaped tactical engagements.



The Konark Corps, Jodhpur – Formation and capabilities

Formation Background

The Indian Army's XII Corps (more widely known as the Konark Corps or Desert Corps) is headquartered in Jodhpur, Rajasthan, and is the primary formation tasked with protecting India's desert sector along the Rajasthan and Gujarat borders. The Corps was raised in 1987 and Jodhpur was chosen as headquarters for its geographical centrality and role as a communications hub. The Corps is one of two corps operating under the Pune based Southern Command, and comprises two combat divisions including the 4th Armoured Brigade, 34th Infantry Brigade, 11th Infantry Division, and 12th Infantry Division. Its formation insignia is drawn from the Konark Sun Temple of Puri, symbolising the radiation of the sun across all eight cardinal directions – a reference to the Corps' mandate to dominate its operational sector in every direction.



Indigenous systems and next generation platforms

The Konark Corps has inducted a wide range of indigenous weapon systems and next generation platforms over the past decade. These include the Dhanush 155 mm/45 calibre towed howitzer – India's first fully indigenous artillery gun – as well as upgraded T-90 tanks, the Pinaka MBRL system and a growing fleet of domestically developed unmanned systems. The Konark Corps Technology Centre has developed advanced technical infrastructure employing robotics and cobotics to enhance engineering support capabilities, and has established an in-house ecosystem for the mass production and maintenance of UAS and counter-UAS (CUAS) systems.



Military–Civil fusion and border area development

The Konark Corps has played a material role in infrastructure development, road construction, and the provision of basic services to remote communities in western Rajasthan, where civilian infrastructure remains sparse and the nearest administrative centres are often hundreds of kilometres from forward deployments. This civil engagement is not incidental to the Corps' operational mission – it is integral to it. A population that perceives the Army as a partner in development is more likely to provide the human intelligence and community cooperation on which border security ultimately depends.



The Corps has also been called upon repeatedly for Humanitarian Assistance and Disaster Relief (HADR) operations during monsoon flooding in Rajasthan and Gujarat, including the 2017 operations in Barmer, Pali and Jalore, where rescue teams evacuated more than 500 schoolgirls and teachers from a flooded hostel in Baiswada – a mission subsequently cited as a benchmark for civil-military humanitarian response.



Agra – Humanitarian Assistance and Disaster Relief Capabilities (HADR)

50th (Independent) Parachute Brigade

The Indian Army’s principal HADR formation in Agra is the 50th (Independent) Parachute Brigade – known by its battle honour “Shatrujeet” – which is permanently garrisoned in Agra and comes directly under the Directorate General of Military Operations (DGMO).

The Parachute Regiment Training Centre has been based in Agra since 1952, and the city has remained the institutional home of India’s airborne and special-forces training establishment. The Brigade’s defining operational characteristic is speed: it is designed to be deployable in under two hours, making it the natural nucleus of any rapid-response HADR task force. This compressed mobilisation timeline – achieved through pre-positioned equipment, standing operating procedures, and a culture of immediate readiness – is what renders the Agra formation

so valuable for disaster response, where the first 72 hours are decisive.

Operational readiness and rapid response architecture

The formation’s dedicated HADR Task Force is designed around compressed mobilisation timelines, with an emphasis on autonomous action during the critical first 72 hours of any disaster – the period in which the majority of preventable casualties occur. Structured coordination protocols have been established with civil administration at state and district levels within India, as well as with host governments for overseas deployments.

The institutional framework underpinning these deployments is the Annual Joint Humanitarian Exercise (AJHE) known as Operation Chakravat, instituted by Prime Minister Narendra Modi in 2015 and conducted in rotation by the Indian Army, the Indian Navy and the Indian Air Force since 2016. Agra’s Air Force Station (ICAO: VIAG) has hosted joint tri-service HADR exercises under the Samanvay series, with participation from the National Disaster Management Authority (NDMA), the National Disaster Response Force (NDRF), the Defence Research and Development Organisation (DRDO), the Border Roads Organisation (BRO), the Indian Meteorological Department (IMD), civil administration and representatives from Association of Southeast Asian Nations (ASEAN) partner countries. Eight Indian Ocean Region nations – including the Maldives, Mauritius, Sri Lanka, the Seychelles, Madagascar, Comoros, Mozambique and Tanzania – have also participated in the exercises.

Specialised equipment and capabilities

The Army’s HADR arsenal at Agra includes: Advanced rescue tools and watercraft configured for flood relief operations across inundated terrain; Portable bridging systems capable of restoring access to cut-off communities within hours of deployment; Specialised medical kits – including field deployable surgical equipment and mass casualty management systems – designed for use in austere conditions without access to established medical infrastructure; unmanned aerial system (UAS) equipped reconnaissance teams providing real time aerial surveillance of disaster zones to direct rescue priorities and finally communications infrastructure enabling seamless coordination across Army units, civil authorities, the National Disaster Response Force (NDRF) and international partner organisations.

Operational track record – domestic operations

The Army’s HADR capabilities are grounded in a very substantial real world operational record. In 2025 alone, Indian Army formations deployed 141 columns across more than 80 locations in ten states, rescuing 28,293 civilians, providing medical assistance to 7,318 people and delivering relief supplies to 2,617 individuals. This scale of

domestic HADR activity – sustained year after year across the breadth of India’s geographically and climatically diverse territory – is what gives the formation’s rapid deployment claims their credibility.

Operational track record – international operations

The Indian Army’s HADR credentials extend equally across the broader Indian Ocean Region (IOR). The following operations, all executed under the Government of India’s SAGAR (Security and Growth for All in the Region) framework, are among the most significant recent examples:

Operation Brahma – Myanmar Earthquake (March 2025)

Following a severe earthquake in Myanmar in March 2025, the Indian Army deployed a 60 bed field hospital that treated over 2,500 injured earthquake victims within two weeks of arrival. Six aircraft and five Indian Naval ships delivered 750 metric tonnes of HADR material, in what represented one of the most substantial bilateral humanitarian assistance operations conducted by India in recent years.

Operation Sagar Bandhu – Sri Lanka, Cyclone Ditwah (2025)

Operation Sagar Bandhu was launched following Cyclone Ditwah’s impact on Sri Lanka in 2025. Indian forces restored critical connectivity, evacuated over 2,500 people from affected areas and delivered 1,058 tonnes of relief material – cementing India’s position as the first responder of choice for its island neighbour.

Operation Karuna – Myanmar, Cyclone Mocha (May 2023)

Operation Karuna was launched on 18 May 2023 in response to Cyclone Mocha’s devastating landfall on Myanmar’s Rakhine coast. Indian Navy ships delivered approximately 40 tonnes of relief materials to the affected population, conducting the operation under compressed timelines consistent with India’s HADR rapid response doctrine.

Operation Dost – Türkiye and Syria Earthquake (February 2023)

Operation Dost was launched in response to the catastrophic February 2023 earthquake in Türkiye and Syria, in which more than 40,000 lives were lost and entire cities were destroyed.

India deployed search and rescue teams, medical personnel and relief supplies, demonstrating that India’s HADR reach extends well beyond its immediate neighbourhood into the broader international arena.

Operation Rahat – Yemen Evacuation (2015)

Operation Rahat in 2015 evacuated more than 4,000 Indian nationals – as well as a number of foreign nationals stranded by the conflict – from the war torn port of Aden, Yemen. Though primarily a Non-Combatant Evacuation Operation (NEO), it demonstrated the seamless integration of military logistics, naval power and civil coordination that underpins India’s broader HADR architecture.

Strategic Significance

The Indian Army is not solely a warfighting institution. It is a multi-role national instrument, simultaneously capable of prosecuting high intensity combined arms operations in the Thar Desert and providing life-saving assistance to disaster-affected populations across South Asia and beyond. This dual character – credible deterrence paired with humanitarian commitment – has become central to India’s strategic narrative and its engagement with partner nations across the Indian Ocean Region.

Defence Forces Vision 2047 – A blueprint for strategic self-reliance

On 10 March 2026, Defence Minister Rajnath Singh unveiled the document titled “Defence Forces Vision 2047: A Roadmap for a Future-Ready Indian Military” at a formal ceremony at South Block, New Delhi. Prepared by the Headquarters Integrated Defence Staff (IDS), the document provides the overarching strategic framework within which ongoing modernisation efforts must be understood. It is, in effect, the doctrinal architecture that gives coherence to all current capability development programmes.



The document was released in the context of the Viksit Bharat – “Developed India” – national programme, India’s overarching ambition to achieve fully developed nation status by 2047, coinciding with the centenary of independence. Defence self-reliance is a central pillar of that programme, and the Vision 2047 document is its military expression. Present at the unveiling were Chief of Defence Staff General Anil Chauhan, Chief of the Naval Staff Admiral Dinesh K. Tripathi, Chief of the Air Staff

Air Chief Marshal A.P. Singh, and Defence Secretary Rajesh Kumar Singh – a gathering that underscored the document’s authority across all three services.

Strategic objectives

The Vision 2047 document envisages transforming India’s armed forces into an integrated, multi-domain and agile force across the following strategic lines:

- Aatmanirbharta in defence production: indigenisation of technologies tailored to India’s specific security needs, reduced import dependency, and the development of domestic manufacturing ecosystems including defence corridors and private sector partnerships.
- Multi-domain warfare capability: established dominance across land, sea, air, cyber, space and the electromagnetic spectrum, recognising that future conflicts will be resolved as much in the information and cognitive domains as on the physical battlefield.
- New strategic institutions: creation of a dedicated Drone Force, a Data Force, a Geo-Spatial Agency and cognitive warfare units – formations that did not exist in the legacy order of battle.
- Space and Cyber Commands: independent operational commands to ensure freedom of action in space and cyberspace, including both defensive and offensive capabilities.
- Strengthened air and ballistic missile defence: layered active-defence systems protecting critical national infrastructure and forward military concentrations from aerial and missile threats.
- Human resource reforms: higher educational standards for military recruits, further development of the Agnipath Short Service Commission Scheme, and a revamped training framework designed to produce personnel capable of operating in high speed, information dominated environments.
- Technology infusion: mainstreaming of artificial intelligence (AI), quantum computing, directed energy weapons and hypersonic systems across all services.
- Whole-of-Nation approach: structured integration of military strength with diplomatic, economic and technological instruments of national power to address complex, multi-layered security challenges.



The three-phase implementation roadmap

The transformation outlined in Defence Forces Vision 2047 is to be executed in three distinct phases, each building on the preceding one and each with clearly defined capability targets.

Phase 1 – Transition (until 2030)

The first phase focuses on organisational restructuring for multi-domain operations. Priority tasks include the exercise of positive control over borders, the Line of Control (LoC), and the Line of Actual Control (LAC) through the optimal integration of human resources and technology; the securing of air and maritime spaces against aerial threats to citizens and critical infrastructure; and the establishment of the foundational command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) architecture on which subsequent phases depend.



Phase 2 – Consolidation (2030–2040)

The second phase shifts focus to the deepening of technological capabilities and the progressive integration of the three services under the Integrated Theatre Command (ITC) structure. Capability accretion in cyber, space and the electromagnetic spectrum accelerates, and domestic defence production is expected to have reached a level of maturity that materially reduces dependence on foreign suppliers for the majority of the military’s frontline equipment requirements.



Phase 3 – Excellence (2040–2047)

The final phase is intended to transform the Indian Defence Forces into a world class military leading in all aspects of technology and tactics, techniques and procedures (TTPs). The objective is a force capable of meeting any future threat by ensuring freedom of operations across all domains in all areas of India’s strategic interest.

Decision superiority through data-centric operations is identified as the decisive enabler, alongside assured operational control over space, the electromagnetic spectrum and cyberspace. In the maritime domain, the phase envisions sustained presence in the Indian Ocean Region (IOR) underpinned by robust Maritime Domain Awareness (MDA), Underwater Domain Awareness (UDA), and Air Domain Awareness (ADA).



Post-conflict dimension

Importantly, the Vision 2047 document was released in the aftermath of Operation Sindoor – the May 2026 military conflict between India and Pakistan – and explicitly draws on lessons learnt from that operation. This post conflict dimension gives the document a credibility and urgency that peacetime planning documents often lack: the reforms it proposes are not merely theoretical projections, but direct responses to operational gaps and strategic imperatives identified under fire.

Indian Army Aviation Corps– A fleet in transition

The Indian Army Aviation Corps operates a rotary wing fleet that spans six decades of aviation history, from 1960s vintage light helicopters still performing liaison duties, through the indigenous Dhruv family in both transport and attack configurations, to the brand new Boeing AH-64E Apache that achieved full operational status in December 2025.

The five principal types in service illustrate both the scale of India’s modernisation challenge and the significant progress already achieved under the Aatmanirbhar Bharat framework.



Boeing AH-64E Apache: Advanced attack helicopter

The Boeing AH-64E Apache is the most capable and most recently inducted rotary wing platform in the Indian Army’s inventory. India procured six AH-64Es under a United States Foreign Military Sale (FMS) agreement signed in 2020. The final three aircraft were delivered on 16 December 2025 and assigned to the 451 Army Aviation Squadron in Jodhpur, the headquarters of the Konark Corps’ operational sector.

The AH-64E is regarded as one of the most sophisticated multirole combat helicopters in service globally. Its weapons suite encompasses AGM-114 Hellfire anti-armour missiles, 70 mm Hydra unguided rockets and an M230 30 mm chain gun mounted in a 360-degree traversing turret. The aircraft is equipped with a Target Acquisition and Designation System (TADS) and Pilot Night Vision System (PNVS), enabling precise engagement in complete darkness. Networked warfare systems allow the Apache to receive and relay targeting data from ground forces and other aircraft in real time, compressing the kill chain to seconds.

India’s total Apache fleet stands at 28 aircraft – 22 operated by the Indian Air Force (IAF) and six by the Army. The Army Apaches are assigned to Jodhpur in desert sector camouflage and are primarily tasked with anti-armour operations in support of armoured and mechanised formations in the Thar Desert. The AH-64E made its operational debut at Exercise Maru Jwala in November 2025 and was subsequently demonstrated at Exercise Agni Varsha in February 2026.





HAL Advanced Light Helicopter Dhruv Mk.III: Utility transport

The HAL Advanced Light Helicopter (ALH) Dhruv – from the Sanskrit for “Unshakeable” – is the flagship product of India’s indigenous rotary wing programme and the most numerous military helicopter in service with the Indian armed forces. Development was initiated in November 1984 and the first flight took place on 20 August 1992; the type entered operational service in 2002. As of early 2024, more than 400 Dhruvs had been produced, accumulating over 340,000 flying hours across all operators.

The Dhruv exists in four principal variants. The Mk.I is the baseline utility version. The Mk.II introduced an Integrated Architecture Display System (IADS) glass cockpit. The Mk.III, the most common current-production transport variant, is powered by two HAL/Turbomeca Shakti turboshaft engines optimised for hot and high performance. The Mk.IV is the armed Rudra/Weapon System Integrated (WSI) configuration. The Dhruv Mk.III has a maximum takeoff weight of 5,500 kg, a fuselage length of 15.9 m and a main rotor diameter of 13.2 m. It can accommodate up to 12–14 fully equipped troops or equivalent cargo. Primary roles include troop transport, logistics support, casualty evacuation (CASEVAC) and reconnaissance.



HAL Rudra ALH Mk.IV WSI: Armed attack helicopter

The HAL Rudra – from the Sanskrit for “Roaring” – is the armed derivative of the Dhruv, also designated ALH-WSI (Weapon System Integrated). It was developed by HAL deliberately avoiding major airframe modifications to the Dhruv base in order to accelerate induction. HAL delivered the first Rudra to the Indian Army in February 2013, and a contract for approximately 76 aircraft for the Army and IAF was subsequently placed. The Indian Army plans to equip its Aviation Corps with 60 Rudras organised into six attack squadrons.

The Rudra’s weapons suite comprises a 20 mm M621 autocannon turret, 70 mm rocket pods, anti-tank guided missiles (ATGMs) and provision for air-to-air missiles. The aircraft is equipped with a forward looking infrared (FLIR) sensor, day and night optical cameras, and a Thermal Imaging Sights Interface (TISI) for target acquisition in all visibility conditions. The Rudra is the primary indigenous rotary wing fire-support asset of the Army Aviation Corps and was prominently featured in the Agni Varsha exercise in its close air support and anti-armour roles, flying alongside the AH-64E Apaches.



HAL Chetak (Aérospatiale Alouette III): Light utility helicopter

The HAL Chetak is the Indian licence built version of the French Aérospatiale Alouette III – one of the most successful light helicopter designs of the 20th century, with over 2,000 units produced across a production run spanning six decades. The original French Alouette IIIs entered service with the Indian Air Force in 1962, and HAL signed a licence agreement to manufacture the type domestically, delivering its first Chetak in 1965. The name Chetak honours the legendary warhorse of the Rajput warrior-king Maharana Pratap, killed carrying its rider to safety at the Battle of Haldighati in 1576.

The Indian Army Aviation Corps was formally constituted on 1 November 1986, at which point most Chetak aircraft operating in the Artillery Observation Post (AOP) role were transferred from the IAF. The Chetak has since performed training, liaison, communications,

casualty evacuation and reconnaissance duties across the full range of India's operational environments – from the plains of Rajasthan to the Siachen Glacier at altitudes in excess of 6,000 m. It is powered by an Artouste IIIB turboshaft engine and seats seven occupants including the pilot. The oldest batch of in-service HAL Chetaks has a Total Technical Life (TTL) ending in 2027, and the type is being progressively replaced by the Dhruv.



HAL Cheetah (Aérospatiale SA 315B Lama): High altitude light helicopter

The HAL Cheetah is the Indian licence built version of the Aérospatiale SA 315B Lama – a unique hybrid design that combines the lightweight Alouette II airframe with the Alouette III's more powerful Artouste IIIB engine and dynamic components. The Lama was specifically developed in response to an Indian Army and IAF requirement for a rotorcraft capable of sustained operations in the extreme hot and high conditions of the Himalayan theatre. The licence agreement with Aérospatiale was signed in September 1970; HAL delivered its first Cheetah manufactured entirely from raw materials in 1976–77.

The Cheetah holds a distinction unique in aviation history: a modified SA 315B Lama set the absolute world altitude record for helicopters on 21 June 1972, reaching 12,442 m (40,820 ft) – a record that has never been broken and remains in the Fédération Aéronautique Internationale (FAI) record books to this day. Operationally, the Cheetah has proved indispensable in the Siachen Glacier sector – the world's highest battlefield – and along the Line of Actual Control (LAC) with China, ferrying troops, supplies and casualties at altitudes that no other in-service helicopter

can consistently match. It seats five occupants including the pilot and is equipped with skid type undercarriage suited to improvised mountain landing sites.

Replacing the combined legacy fleet of approximately 186 Chetaks and 200 Cheetahs represents the single largest rotary wing procurement challenge facing the Army Aviation Corps. The HAL Light Utility Helicopter (LUH) – a purpose designed 3 tonne class replacement – is in the process of being certified and inducted. Until LUH numbers increase substantially, the Cheetah will continue to hold the high altitude frontier.



Fleet assessment – Modernisation in progress

The five helicopter types in service encapsulate the Indian Army's modernisation trajectory. The AH-64E Apache represents the high end, foreign sourced capability purchased to address an immediate operational gap while indigenous alternatives mature. The Dhruv family – in both its transport and Rudra attack variants – represents the success story of Aatmanirbhar Bharat: an indigenous platform that has reached full operational maturity and is progressively displacing the legacy fleet. The Chetak and Cheetah represent the weight of history – platforms that have served with extraordinary distinction across six decades of demanding operations, and whose eventual replacement will mark a genuine generational turning point for the Corps.

Within the timeframe of Defence Forces Vision 2047, the Indian Army Aviation Corps is expected to operate an almost entirely indigenous fleet – centred on the Dhruv, Rudra, LUH and the Light Combat Helicopter (LCH) Prachand – supported at the high end by the AH-64E Apache until a next generation indigenous attack helicopter can be developed. ➡



Text and Photos: Joris van Boven and Alex van Noije

Bell completes SPINE upgrades on H-1

Bell Textron Inc has announced the completion of the first BAH-1Z and UH-1Y aircraft to receive full upgrades to their structure and power delivery mechanisms under the US Marine Corps' SPINE programme. The programme was recently renamed from Structural Improvement and Electrical Power Upgrade (SIEPU) to the Structural and Power Improvements for NextGen Effects (SPINE) programme to emphasise the importance of this essential modernisation effort and to highlight the increased survivability and lethality SPINE will enable throughout the lifetime of the H-1 fleet.



Atlas Air orders 40 Trent XWB-97's

Rolls-Royce announced Atlas Air Worldwide had agreed to place an order for 40 Trent XWB-97 engines that will power 20 Airbus A350F freighter aircraft. The fleet will be covered by Rolls-Royce's comprehensive TotalCare service that will cover the health and maintenance of the engines.



Avation for 5 ATR 72-600s

ATR has announced that Singapore based lessor Avation has exercised purchase rights for five ATR 72-600 aircraft under its long term framework agreement signed in 2011. Deliveries are scheduled for 2028 and 2029.



GA-ASI and USAF demo autonomy

General Atomics Aeronautical Systems and the US Air Force held another autonomy flight exercise yielding new and important developments in the operation of Collaborative Combat Aircraft (CCA). The demonstration featured the latest government Autonomy Start Kit (ASK) and a GA-ASI MQ-20 Avenger uncrewed jet was used as a testbed CCA.



BAE to modernise USAF U-2's

BAE Systems was awarded a contract by Robins Air Force Base in Georgia to support and sustain the AN/ALQ-221 Advanced Defensive System (ADS) for the US Air



Force's U-2 Dragon Lady surveillance and reconnaissance aircraft. Under the contract, BAE Systems will provide continuous field service support for the aircraft's electronic warfare (EW) system, complete repairs to maintain system availability, and provide software updates so it can detect and engage new threats.

Kongsberg order for F-35s

Kongsberg Defence & Aerospace has signed an agreement with Lockheed Martin with an expected total value of NOK 2 billion for deliveries of components to the F-35 fighter aircraft. The agreement extends the ongoing production of F-35 components through 2030, supporting all three variants of the aircraft.



AerCap for 100 Airbus A320neo

AerCap Holdings has signed a firm order with Airbus for 23 A320neo and 77 A321neo aircraft. This transaction “underscores AerCap’s strategy of investing in the world’s most in-demand, fuel-efficient technology to meet the long term requirements of its global airline customer base”.



NASA's X-59 makes 2nd flight

NASA's quiet supersonic X-59 aircraft made its second flight kicking off a series of dozens of test flights in 2026. The X-59 is designed to fly supersonic – or faster

than the speed of sound – while generating only a quiet thump instead of a loud sonic boom. The X-59 is the centerpiece of NASA's Quesst mission, which is working to make commercial supersonic flight over land a reality.



Finnair for 46 Embraer E195-E2

Embraer and Finnair have signed an agreement for up to 46 E195-E2 aircraft, comprising 18 firm orders, 16 options and 12 purchase rights. The E195-E2 will replace Finnair's older aircraft, supporting the “airline's strategy for profitable growth”.



Sikorsky offers new armed Black Hawk kits

Sikorsky announced its new armed Black Hawk helicopter kits, expanding the capabilities of this workhorse. The kits extend the role of the Black Hawk into new mission sets including airmobile assault, close



support, medical evacuation, ISR and tactical lift, in a single, battle tested airframe, giving commanders greater flexibility and eliminating the need for separate fleet types.

US Army for 6 CH-47F Block II Chinooks

The US Army awarded Boeing a contract for six CH-47F Block II Chinook helicopters. The \$324 million contract builds on the Army's acquisition strategy to get critical equipment in the hands of the warfighter sooner and increases the number of CH-47F Block II aircraft under contract to 24.



FLRAA named MV-75 Cheyenne II

Bell Textron Inc announced that the US Army has officially designated the MV-75 as the Cheyenne II. Consistent with the US Army tradition of honouring Native American tribes, the MV-75 honours the heritage of the Cheyenne Tribes, two federally recognised nations: the Northern Cheyenne Tribe in Montana and the Cheyenne and Arapaho Tribes in Oklahoma.



Airbus and Lakota partnership

Airbus US Space & Defense, in partnership with Shield AAI, L3Harris Technologies and Parry Labs, completed its fourth autonomous flight test period on the H145 Airbus helicopter and successfully integrated all four company's technologies into a single aircraft together for the first time.



Vista's 1st Global 8000

Bombardier celebrated fleet operator Vista, a longtime Bombardier customer, taking possession of its first Global 8000 aircraft at the company's London Biggin Hill Service Centre. This introduction marks the beginning of upgrades to Vista's current Global 7500 aircraft, with two per month planned – leading to the full fleet of 18 being operational as Global 8000 jets by year end and in turn marking the largest subscription fleet available of this jet.



Gulfstream delivers 10th G700 to Qatar Executive

Gulfstream Aerospace Corp delivered the 10th G700 aircraft to Qatar Executive, the private jet charter division of Qatar Airways Group. This delivery completes the order announced in October 2019 and marks the 25th Gulfstream aircraft delivered to Qatar Executive since the partnership commenced in 2015.



Gulfstream completes 200th G600 delivery

Gulfstream Aerospace Corp announced the 200th customer delivery of the Gulfstream G600. This aircraft was outfitted at Gulfstream's facility in St. Louis and delivered to a North America based customer. To date, the G600 fleet has logged more than 197,000 flight hours and completed over 87,000 landings.



CFM LEAP-1B for 60 Copa Airlines Boeing 737 Max's

At a ceremony with Panamanian President José Raúl Mulino, Copa Airlines and CFM International finalised an agreement for CFM LEAP-1B engines to power 40 firm and 20 option Boeing 737 MAX aircraft.



Boeing, US Navy in MQ-25A test flight

Boeing and the US Navy have successfully completed the first test flight of an operational MQ-25A Stingray. The milestone advances the Stingray closer to aircraft carrier operations and marks the beginning of a new era in naval aviation.



Thales to deliver 100s of Bushmasters to Australia

Thales Australia has welcomed an investment of AU\$750 million from the Australian Government in sovereign defence capability and will work hand in glove with the Australian Government to deliver an additional 268 next generation Bushmaster PMVs.



Airbus leads launch of Spain's new ITS-C

An Airbus led group of Spanish companies have presented the industrial programme of the Spanish Air and Space Force's new Integrated Combat Training System (ITS-C). The programme, for which a contract was awarded in December 2025, will replace the current fleet of F-5 aircraft and will include a 60% participation of national industry. The ITS-C programme, based on a co-development agreement between Airbus, as the prime contractor, and Turkish Aerospace (TA), as the manufacturer of the Hurjet training aircraft, covers the entire advanced training process for Spanish fighter pilots.



Embraer, Saab and the Brazilian Air Force unveil first Gripen E



Embraer, Saab and the Brazilian Air Force (FAB) officially presented the first supersonic fighter aircraft produced in Brazil, during a ceremony held at Embraer’s industrial complex in Gavião Peixoto, São Paulo State on 25 March 2026.

Among the Brazilian authorities present at the event were the President of the Republic, Luiz Inácio Lula da Silva; the Ambassador of Sweden to Brazil, Karin Wallensteen; the Minister of Defense, José Mucio Monteiro Filho; the Commander of the Brazilian Air Force, Lieutenant Brigadier Marcelo Kanitz Damasceno; as well as executives from the companies involved in the programme, including Francisco Gomes Neto, President and CEO of Embraer, Bosco da Costa Junior, President and CEO of Embraer Defense & Security, and Micael Johansson, President and CEO of Saab.


“We take great pride in supporting the Brazilian Air Force in this project and in developing, within Brazil, the capability to produce a high tech supersonic fighter aircraft – fully capable of executing air superiority missions and contributing to the defence of our territorial sovereignty. The unveiling of the first Gripen produced in Brazil represents yet another significant milestone in the strategic collaboration between Brazil and Sweden. We are confident that this partnership generates value for both countries and holds great potential to open up new business opportunities,” stated Bosco da Costa Junior, President and CEO of Embraer Defense & Security.

“The delivery of the first Gripen produced in Brazil represents far more than the completion of an aircraft; it symbolises the strength of a partnership built on trust, long term vision, and true cooperation. We are extremely proud of what we have achieved side by side with our Brazilian

partners. Saab remains fully committed to expanding, and deepening our presence in Brazil, strengthening the country industrially and technologically, and as an export hub to the world,” stated Micael Johansson, President and CEO of Saab.

Embraer’s industrial site in Gavião Peixoto produces Gripen E fighter jets using a Brazilian and international supply chain, including aerostructures manufactured at Saab’s facility in São Bernardo do Campo. Another 14 aircraft under the current contract with the Brazilian Air Force will follow this same production model. Before final delivery to the customer, the aircraft will undergo functional testing and production flight tests. After this stage, the fighter will join the other ten units already delivered to the First Defense Group (1st GDA) at the Anápolis Air Force Base.

“Gripen E is the world’s most modern fighter aircraft, designed for multi-mission roles such as air defence, reconnaissance and strike. Gripen E integrates modern avionics, sensors, weapons and missions’ systems to improve performance in complex environments. Its network centric architecture and sensor-fusion capabilities enable information sharing across a tactical formation, supporting coordinated decision making and enhancing situational awareness and threat response”, stated company officials.

The 2014 contract with the Brazilian government includes the development and production of 36 Gripen fighters — 28 single-seat Gripen E and 8 two-seat Gripen F. Deliveries began in 2020, and 10 aircraft have been handed over to date. Since February, the fighter has been operating in Quick Reaction Alert (QRA) missions from Anápolis Air Force Base, safeguarding the airspace over the federal government district. 

MBDA: Europe steps up missile production

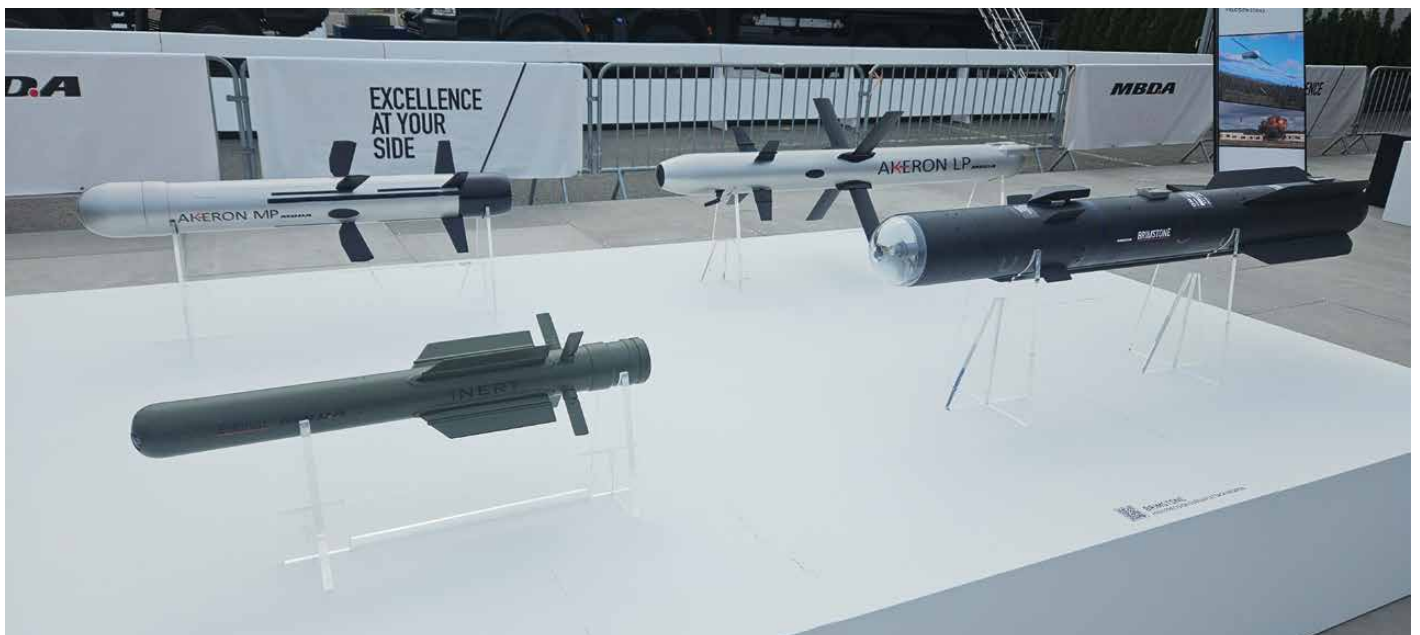
Richard Gardner reports from Paris

The twin threats from Russia and Iran have brought about a long awaited shift in Europe's defence posture highlighting its vulnerability in the new era of ballistic missile and drone attacks and the urgent need to counter them. The over reliance on US military capabilities and highly volatile foreign policy coming from Washington has given a new impetus in Europe to home grown advanced weapons development and production, and evidence of this was forthcoming at the MBDA Annual Press Conference held in Paris on 26 March 2026.

The scale of the ramping up of activity on a wide spectrum of weapons systems programmes across the multi-national group was emphasised by CEO Eric Beranger when he said that between 2023 and the end of 2025 missile production had doubled and a further 40% production rise was also planned in 2026. The order backlog at year end 2025 was over 44.4 billion Euros following an order intake of 13% Euros. Alongside this massive boost in business the company's planned investment over the next five years is planned to double to 5 billion Euros. The close of 2025 saw revenues reach 5.8 billion Euros. This reflected the completion of major contracts with partners in Europe and beyond and increased adoption of advanced technologies which addressed the continuous evolution of global threats. He stated, "This is a major achievement for MBDA in 2025 and underscores the pressing realities we face. MBDA is now more essential than ever in Europe, serving as a key asset for the continent's resilience and collective defence, offering our armed forces the best means to protect what we hold dear: our freedoms, our democratic model and our values."



Looking forward and to the planned increases in investment he said that in 2026 he expected to be hiring 2,800 new people. During the conference he told journalists that the company had been working hard to over-produce production, to meet new levels of demand, and in some cases even ahead of contract signing, such is the urgency in building up stocks. Details must remain confidential, he said, but in some programmes to meet urgent operational requirements production deliveries had been severely speeded up, in weeks not years, as had often been the normal pattern. Some weapons deliveries were increasing four fold, and there was great agility in responding to new needs. Mass matters and some new initiatives have been self-funded to exploit company capabilities so deliveries can be made at an appropriate scale and get results quickly.





One important new effector product had been taken from “a blank sheet proposal” to initial testing in just 10 months. New anti-drone missiles were an example from a full spectrum of advanced weapons available or under rapid development. He mentioned the UK’s Dragonfire laser weapon, produced by a consortium including MBDA which has been brought forward to enter Royal Navy service next year instead of the original planned 2030 timescale.

Each country within the MBDA partnership had a lead on at least one programme and the company was becoming more efficient as well as more capable and resilient as activity ramps up. All new missiles such as Stratus were capable of adaption for different tasks and would be produced in different versions offering great value and

flexibility in deep strike and recent conflicts had led to adopting many new solutions emerging. An important feature was having European sovereignty in the capability to develop, deliver and enhance new weapons and associated systems. For example, air launched weapons adapted and ready in just a few weeks to be operated by Ukraine on Soviet era combat aircraft. Beranger said that Europe can’t have a voice without investing more in its own defence. This must be done collectively and among individual nations as well, and this means having a full range of defence capabilities. More joint projects and procurements expand experience of bringing forward new capabilities. He said they know how to engineer adaptations and share responsibilities integrating systems so MBDA weapons have a widespread and growing global market helping nations to defend themselves against all types of threat.

Stockpiles of completed weapons also need to be backed up by a resilient supply chain and stockpiling key components are also essential. Production of the MBDA family of air defence missiles for land based and sea defence against hypersonic missiles and aircraft and counter drone weapons are all being ramped up in production. Vertical launch has operational advantages whether for ground based air defence or at sea and MBDA is well placed for this growing market where mass attacks also require appropriate responses. Laser effectors are part of this. Value for money remains part of the defence solution but joint development and production helps deliver the right solutions and the company has made enormous progress and will continue to meet new demands as they arise. ➡



Article by Richard Gardner

BAE Systems HERNE – Autonomous underwater vehicles to patrol and deter



as it could carry effectors such as small rover vehicles, allowing it to disable explosives, remove eavesdropping devices or disable mines.

“We have an incredible team who took the demonstrator vessel from whiteboard to water in just 11 months. Not only did we bring our own decades of experience in submarine design and engineering, but we teamed up with specialist Canadian company Cellula Robotics to reach this demonstration phase. In what was

How do you protect thousands of miles of critical underwater infrastructure, such as gas or electricity pipelines?

Meet Herne, our new autonomous underwater vehicle, designed to patrol silently beneath the waves for weeks at a time. Herne has a large mission bay designed to support a number of missions, from surveillance through to anti-submarine warfare and more.


The demonstrator vessel has now sailed in both Canada and the UK, proving it can operate autonomously in the depths accurately, while making its own decisions on how best to complete the mission safely and responsibly. With further planned improvements, the intention is for the production vessel to be capable of ranges of thousands of kilometres, including periods of ‘hibernation’ on the sea floor while it waits for further instructions or scans for enemy vessels.

As a BAE System Spokesperson, explained: “Herne is designed to operate entirely on its own, but also to raise the alarm to humans on the loop if it finds a threat. We’re fitting it with advanced AI identification so that it can accurately predict whether an object it detects is a threat, along with over the horizon communication systems so that it can tell commanders what it’s found and ask for direction. The large mission bay makes it even more useful,

a highly accelerated programme, we worked alongside Cellula to bring the whole capability to life.”

Putting together the first demonstrator vehicle was a rapid process, as BAE Systems spokesperson told us: “In order to move quickly, we designed everything in a digital engineering environment, making it much easier to collaborate with Cellula Robotics. The first time we integrated the systems and the platform was just a few weeks before the first trial and customer demonstrations, so it really put our design to the test and I’m glad to say everything worked! It is a credit to our team and Cellula’s that we were successful.”

The autonomous ‘brain’ on Herne is called Nautomate and is already proven on our Pacific 24 autonomous surface boat, which was the first uncrewed military vessel to achieve the Lloyd’s Register Unmanned Marine Systems Certification. Nautomate is an advanced and highly configurable autonomy solution, which can be enhanced through plugins. Examples of plugins are remote weapons systems, surveillance sensors and vessel arrest systems.

The team is working hard to make further enhancements to Herne to ensure it is tuned to deliver a wide range of tasks for customers around the world. 

By: BAE Systems Spokesperson

Turkish Naval Drone Carrier



Port visit of TCG Anadolu to Rotterdam, The Netherlands for NATO exercise ‘Steadfast Dart 2026’

From 27 February till 1 March 2026, the Turkish Navy/Türk Deniz Kuvvetleri visited the port of Rotterdam, The Netherlands, after completion of its first participation in exercise Steadfast Dart held of the Baltic Coast and Northern Germany running from 15 January–18 March. Steadfast Dart 2026 is a NATO joint deployment exercise hosted by Germany under NATO’s Joint Force Command Brunssum. The exercise involved approximately 10,000 personnel from 11 member states.

The Putlos Training Area (Baltic coast Germany) served as the final exercise for the maritime phase and certification of the Allied Reaction Force (ARF). The amphibious demonstration on 18 February has been an integrated rehearsal with the UCAV TB3, fixed wing fighters, special operations forces, amphibious forces and AH-1W close air support.

The TB3 demonstrated its capabilities as a Medium Altitude High Endurance (MAHE) class maritime surveillance strike drone and, for the first time, an UCAV

conducting a live fire exercise when the Baykar TB3 launched MAM–L guided munitions on a floating target.

A second major milestone was reported on 20 February after the TB3 conducted a day earlier a joint exercise with Luftwaffe (German Air Force) Eurofighter Typhoons, during an eight hour flight to the Baltic coastline. The patrol over the Baltic Sea was described as a “joint exercise with Eurofighters.” The Baltic Sea region sees frequent Russian Navy drills with units based out of the exclave of Kaliningrad, while fighter–bomber, intelligence and other aircraft are also routinely intercepted by Allied fighters.

NATO’s Allied Reaction Force (ARF) was established in 2024 to replace the NATO Reaction Force (NRF). With the ARF, NATO aims to further enhance the availability and deploy ability of NATO member states. The goal is to organise and designate a larger pool of ready units across multiple domains (land, sea, air, cyber and space) for rapid deployment. The ARF is therefore designed as a multinational highly ready force, ready to deploy at

very short notice. In recent years, the units have been commanded by Great Britain, Italy, Spain and now Türkiye, for the first time, has assumed command of the Allied Reaction Force Amphibious Task Force and the Landing Force Command.

On 21 February 2022, the first four of a total of ten AH-1W Super Cobra attack helicopters from the Turkish Land Forces were handed over to the Naval Air Command at Topel Naval Station. The transfer enables the Turkish Navy to close down a gap in naval aviation capabilities with the first trails onboard Anadolu held in November 2022. The ten Super Cobras are part of 353 squadron and specifically procured for operations onboard TCG Anadolu. The AH-1W fleet is a temporary solution until the arrival of the T929 ATAK II, Türkiye's first indigenous heavy-class attack helicopter, developed by Turkish Aerospace Industries (TAI).

“We have been training for the Super Cobra at Topel, thus not within the Turkish Army at Guvercinlik” according to junior Lieutenant Mert Erdogan, one of the new Cobra pilots currently deployed on the Anadolu. He flew S-70s before the transition to the Super Cobra “We started off with training on the Bell 212 for about 200hrs; afterwards an extra 300 hrs of training on the AH-1W. This completed the training course”. Most of the Super Cobra pilots previously flew S-70s. Currently 3 crews are onboard TCG Anadolu to support operations with three Super Cobras (TCB-81, TCB-84 and TCB-86).

The Turkish Navy deployment to the Baltic Sea marked a significant milestone in the participation of Turkey and the operational deployment of the Bayraktar TB3 carrier based combat drone (UCAV). Stead Fast Dart 2026 marked the first operational usage of an armed drones concept





operating from an amphibious assault ship (LHD), as the Anadolu. Sea trials started during 2024–2025 with Baykar conducting ramp tests and sea trials. By June 2025, the TB3 had completed over 100 successful sorties.

The TB3s can be equipped with Roketsan made MAM–L and MAM–T (maritime and long range strike) munitions as was shown during Steadfast Dart. The MAM–L is a laser–guided “glide bomb” developed by Roketsan. It is the primary weapon for Turkish drones like the Bayraktar TB2 and TB3 due to its low weight and high precision; it weighs 22 kilo and has a range of 15kms or +25kms with GPS/INS support. The operation, control and weapons engagement were carried out by Baykar personnel present onboard the TCG Anadolu. Prototype PT–4 was used in this test.

TCG Anadolu is the largest ship of the Turkish Navy; the 27,000 ton, 232 meters amphibious assault ship (L400) served as flagship and command and control hub during the exercise. While the ship was originally built to house the F–35B VSTOL version, Anadolu currently operates as a unique drone carrier. With support of Baykar company the Anadolu is now the sole operational drone carrier in NATO. The Anadolu features command facilities supported by the GENESIS–ADVENT combat management system for UCAV operations.

HAVELSAN completed the integration of GENESIS and ADVENT systems to ensure the TB3 functions as an organic arm of the ship’s command center. ADVENT calculates the ship’s pitch, roll, and relative wind speed in real–time, feeding this data to the TB3’s flight computer for autonomous recovery on the Anadolu’s short runway. The



information gathered by a TB3 can be transmitted through ADVENT to other ships in the task force via tactical data links (Link 16/22), even if those ships have no visibility of the TB3.

Embarked on the Anadolu are an 800 men strong amphibious marine infantry battalion, “ZAHA” amphibious armoured assault vehicles, naval special warfare elements as SAT and SAS teams. Besides three TB3 Bayraktars, which are part of 313 Filo/313, the task force has additionally three AH–1W Cobras (353 squadron), three AS.532 Turkish Army and a single S–70 from squadron onboard.

“The TB–3 is very easy to fly, forgiving and can operate in circumstances where our helicopters would not be able to operate” according to junior Lieutenant Batuhan Çakır one of the six TB–3 pilots deployed on the Anadolu. “Compared to for example training on the AH–1W which can take about 500 hrs over a 2 year period, we are able to perform training on operating the TB3 over a three to four months period. Even in bad weather conditions like low clouds, high winds, icy and cold conditions we have been able to perform our flights during the exercise.

The TB3 is purpose built for operations from short–deck ships; the TB3 has folding wings, reinforced landing gear, and low stall speed which enables launch and recovery without catapults or arresting wires compared to the Kizilelma UCAV which requires arrestor cables for landing and thus only operates currently out of runways till arrestor cables are available on Anadolu which will also allow future TAI Hurjet operations out of Anadolu. According to Baykar, TB3 drones carried out 232 sorties from TCG Anadolu during Steadfast Dart 2026.

The transformation of TCG Anadolu from a standard amphibious assault ship (LHD) into the world’s first dedicated UCAV (Unmanned Combat Aerial Vehicle) has created a new naval doctrine for Turkiye operating a fleet of Bayraktar TB3s and future operations with the Kizilelma unmanned fighter and Anka–3 drones for deep penetration missions and Electronic Warfare (EW) on the Anadolu. The drone carrier concept of Turkey has attracted interest to Navy’s around the Globe. ➡

Article and photos: Carlo Kuit and Paul Kievit / Bronco Aviation

Exercise Orion 2026

Multi-national live exercise during Phase 4



The area of the Champagne region provides the only cover for a high stakes tactical assembly. Under the clear skies of eastern France, the silence is broken by the synchronised sounds of multiple helicopters. This is Orion 2026 Phase 4, the ‘Operation within NATO’ LIVEX. It represents the final validation of the 1er Corps d’Armée (1st Army Corps, French Army) as a warfighting entity. At the centre of this 12,500 persons strong maneuver is the 4e Brigade d’AéroCombat (4th Air Combat Brigade, 4 BAC), acting as the mobile punch for the division. On the flight line, 26 helicopters are dispersed in field conditions. The fleet is a mix of French Aviation Légère de l’Armée de Terre (ALAT, French Army Aviation) NH90 Caiman, Gazelle and Tigre helicopters, and a detachment of Spanish Tigre and Chinook helicopters. This isn’t a routine training flight; it is a complex, multi-domain test involving deep strikes, electronic warfare and the integration of Unmanned Aerial Vehicles into rotary-wing patrols. The objective of this final phase is clear; testing the ability of NATO partners to plug into a unified command and deliver assets in contested airspace. From drone launched strikes to multinational escort dynamics, Orion 2026 defines the current standard of European helicopter combat. Two years of preparation have led to this high intensity scenario, where the reality of the flight line meets the demands of modern warfare.

The four phases of Orion

The path to a major military exercise is never short. For the 4 BAC, the road to Orion 2026 began long before the actual execution of the exercise. ORION 2026 is France’s largest military exercise since the Cold War, held between January and April 2026 to prepare for high intensity, multi-domain conflict against a near peer adversary. Led by France with 24 allied nations (including the US, UK, Italy and others). The 4 BAC part of the exercise was executed from Chaumont–Semoutiers Airport (ICAO: LFJA) in the department Haute–Marne. Major Guillaume, the Officer of Primary Responsibility (OPR) for the 4th



BAC, has spent two years preparing for this moment. “The exercise is not just a training event; it is a full-scale validation of France’s ability to lead in a high intensity conflict. Orion is built on a two year cycle. It is designed to test every level of the French military, from the individual soldier to the highest command structures”. To reach the complexity of Phase 4, the units had to prove themselves through a series of increasingly difficult steps. These steps, or phases, ensure that every asset, whether a ship, a tank, or a helicopter, can work together under a single NATO command. The first major milestone was Phase 1. This phase focused on maritime operations and initial entry. It involved the French Navy (Marine Nationale) and tested the ability to project power from the sea. For the aviation units, this meant coordinating with naval assets to secure a foothold. It was about opening the door to a contested environment. Following the maritime success, Phase 2 transitioned into a joint live exercise (LIVEX) with the Army. This phase brought the troops onto the ground. It focused on the friction of real world movement and the logistics of keeping a force mobile. Units learned to operate in a multi-domain environment where space, cyber and electronic warfare began to play a role.

Phase 3 took a different approach. This was a Command Post Exercise (CPX). There were no boots on the ground or helicopters in the air. Instead, the ‘troops’ were simulated. This phase was purely for the commanders and their staff. It tested the decision making process of the 1st French Army Corps. They had to plan and execute complex maneuvers on a digital map, preparing for the chaos of a real battlefield. Currently, the exercise has reached its peak during Phase 4. This is the final LIVEX, where simulation ends and reality begins. Major Guillaume oversees a massive force of 26 helicopters. This includes

twenty French Gazelles, Caiman’s and Tigres and six Spanish Tigres and Chinooks. All are deployed in the field, living and fighting in a realistic scenario. “Orion is a very big exercise with four different steps,” Major Guillaume explains. “We are in the last phase right now called Orion 42. It is a LIVEX, which means all the troops are on the ground. They are deployed for a big simultaneous maneuver.” The objective is clear; readiness for future deployments. By moving through these four phases, the French forces have built a foundation of trust and technical skill. They have moved from basic maneuvers to a point where they can lead a multinational force in a high stakes environment. Phase 4 is the ultimate test of that preparation. It is the moment where two years of planning meet the reality of the fighting in the field.

The Final Live Exercise

The transition from Phase 3 to Phase 4 of Orion 2026 marks a shift from theory to reality. While the previous steps focused on preparation and simulation, Phase 4, known as ‘Operation within NATO’ or O42, is the final





achievement of the exercise. It is a massive, high intensity Live Exercise (LIVEX) that tests the French military's ability to act as a leading nation within the NATO alliance. For the 1st Army Corps, based in Lille, this is the moment they prove they can function as a 'warfighting corps' on the modern battlefield. The scale of Orion Phase 4 is staggering. It spans eleven different French departments, primarily in the east and north of the country. Over 12,500 personnel are deployed, supported by 2,150 vehicles and 50 aircraft and helicopters. This isn't just about moving troops; it is about managing the friction of a large scale conflict across a vast geographic area. The exercise simulates a peer-to-peer conflict, where the enemy is just as technologically advanced as the NATO forces.

Strategic communication and logistics are also at the heart of Phase 4. The 1er Corps d'Armée must manage the flow of information across different domains; land, air, sea, space and cyber. In the Champagne region, this is visualised through the movement of mobile command posts. These units must pack up, move, and redeploy constantly to avoid being targeted by long range enemy artillery. It is a game of cat and mouse where speed and agility are the only ways to survive. Major Guillaume explains that the integration of foreign units, like the Spanish Tigre detachment, is a primary objective. "The aim is the training of our troops with also foreign units," he says. In Phase 4, the Spanish pilots are not just guests; they are fully integrated into the French mission sets. They receive the same orders, follow the same tactical procedures, and fly in the same formations. This interoperability is the buzzword of the exercise, but in Phase 4, it becomes a practical reality. "The complexity of Phase 4 also extends to how the air assets

support the ground troops. The 4th BAC doesn't work in a vacuum. Every helicopter mission is synchronised with the 1st Army Corps' overall strategy. Whether it is an air assault to seize a bridgehead or a deep strike against an enemy command centre, the timing must be perfect". Phase 4 of Orion proves that the French military can plan and execute these multi-domain operations at a pace that keeps the enemy off balance. It is the ultimate validation of two years of hard work, proving that NATO's southern flank is manned by a force that is ready for the worst-case scenario.

NH90 Caiman and the Digital Wingman

The modern battlefield is no longer a place for solitary platforms. In a high intensity environment, survival depends on the ability to share data and extend the reach of sensors. This is the core focus for Captain Sébastien, an NH90 Caiman squadron leader from the 1er Régiment d'Hélicoptères de Combat (1st Combat Helicopter Regiment, 1 RHC). During Orion Phase 4, his unit is demonstrating a leap forward in tactical aviation; the seamless integration of Manned-Un-Manned Teaming (MUM-T). Captain Sébastien is an experienced pilot with over 500 flight hours, all of them on the NH90. He currently leads the UAV helicopter squadron for the exercise. His mission is to show how the NH90, which is a heavy capable transport helicopter, can act as a mother ship for smaller expendable drones. This combination changes how the French Army approaches contested airspace. "Today is a demonstration of our capability to work with a UAV for laser designation or as an attack platform," Sébastien explains. The concept is simple but deadly. The NH90 carries drones to the



hours of experience, who is operating his HA.28 Tigre HAD alongside his French counterparts. The Spanish presence is significant. Out of the 26 helicopters involved in the 4th Air Combat Brigade's maneuvers, six are Spanish Tigres and Chinooks. Their mission is not just to participate, but to be fully interchangeable with French assets. This level of cooperation is what NATO calls interoperability. For Lieutenant Ampuero, the exercise is a rare chance to see how similar the two nations truly are in the cockpit. "Tigre pilots work very similarly to us," he observes. "We fly more or less the same, we have the same moves of attack." The Tigre

edge of the combat zone and drops them into flight from the helicopter. These drones then move ahead of the helicopter. They can find targets, orbit sensitive areas, or use lasers to guide missiles fired from other platforms like the Tigre. This 'digital wingman' approach solves a major problem for transport helicopters. The NH90 Caiman is a large target. While it is fast and highly maneuverable, it is primarily a utility and transport asset. "We have really great endurance and great capability to have a lot of people on board," Sébastien notes. The Caiman can carry up to twenty fully equipped troops. Losing such a helicopter to an unseen enemy air defence system would be catastrophic. By using drones, the crew can see around the next hill or behind a tree line without putting the helicopter at risk of enemy activity.

The integration of UAVs also allows for more precise strikes. During the exercise, the NH90 crew works in tandem with the drones to identify enemy vehicles. Once a target is found, the drone can provide the laser spot for an attack. This means the strike happens faster and with less risk of collateral damage. It turns the transport heavy NH90 into a vital node in the 'kill web' of the 4th Air Combat Brigade. However, the NH90 does not operate alone. Even with drones, the threat from enemy aircraft and ground fire is too high for a solo mission. The objective is to make drone integration a standard part of every mission. By the end of Phase 4, the 1 RHC wants to prove that the NH90 is more than just a bus for soldiers. It is a high tech command center that uses drones to own the sky. The combination of human experience and robotic persistence is the new standard for the 4th BAC.

The Spanish Guard, Tigre interoperability

In high-intensity warfare, no nation fights alone. A key pillar of Orion Phase 4 is the seamless integration of allied forces into the French command structure. Representing this multinational effort is a Spanish detachment from the Batallón de Helicópteros de Ataque I (BHELA I). Among them is Lieutenant Ampuero, a Tigre pilot with 500 flight

HAD (Hélicoptère d'Appui Destruction) is a formidable platform. It is designed for multi-role combat, and in Phase 4, its versatility is being pushed to the limit. The Spanish pilots are tasked with a wide range of missions, from anti-tank warfare to deep strikes against high value targets. "We attack any sensitive point of the enemy, such as a radar installation or a convoy," Ampuero explains.

When the NH90s go in for a landing, the Tigre pilots shift their focus to the ground. Using advanced thermal cameras, they peer through the canopy of the forests surrounding the landing zones. They look for the heat signatures of enemy soldiers or vehicles that might be waiting to strike. "If the helicopter is landing in the terrain, I can look between the trees to see if somebody is close enough to be a threat," Ampuero notes. This protective 'eye in the sky' is what allows the air assault troops to disembark safely in a contested zone. The technical performance of the Tigre is also a highlight of the Spanish contribution. The HAD version features an uprated engine compared to older models, which is vital when flying in heavy combat configurations during a high tempo exercise like Orion. The helicopter's agility allows it to pop up from behind cover, fire its 30mm turret or 70mm rockets, and disappear back into the terrain before the enemy can react. Beyond the hardware, the human interoperability is the real success story of Phase 4. The Spanish pilots use the same tactical procedures and communication protocols as the French. This means a French commander can give an order to a Spanish patrol without worrying about a loss in translation or a difference in tactics. During one specific mission in Phase 4, a French Tigre led the first wave of an attack, followed by an NH90 drone strike, and finally, a Spanish Tigre patrol delivered the necessary cover.

Tactical performance and escort dynamics

The effectiveness of the 4th Air Combat Brigade during Orion Phase 4 is not just about the number of aircraft involved. It is about how those aircraft are utilised in a mixed fleet environment. In the sloped and dense forests of

the Champagne region, the French and Spanish forces are proving that the synergy between different helicopter types is a force multiplier. A standard mission profile during Phase 4 often involves a large formation, sometimes up to ten helicopters, moving as a single tactical unit. Major Guillaume and his team utilise a tiered escort system. At the front, the Gazelle helicopters, venerable but still vital, act as the scouts of the maneuver formation. Their small profile and agility allow them to mask behind terrain, popping up briefly to relay target data to the heavier assets. Following the scouts are the Tigres. Whether it is the French HAD or the Spanish HA.28, the Tigre's role is to provide a protective bubble. During O42, the Tigre pilots use their 30mm turreted guns and 70mm rockets to suppress enemy air defences and clear landing zones. The Tigre's performance in these maneuvers is characterised by pop-up attacks. The helicopter hovers out of sight, then rises rapidly to engage a target before diving back into the safety of the terrain. This minimises the time the helicopter is exposed to enemy radar and man portable air defence systems (MANPADS). In the centre of this formation is the NH90 Caiman. As Captain Sébastien noted, the NH90's strength lies in its endurance and



capacity. In the field conditions of Phase 4, the NH90 has demonstrated its ability to operate from improvised 'Forward Arming and Refueling Points' (FARPs) for days at a time. Its high-tech composite airframe and fly-by-wire controls make it surprisingly agile for a transport helicopter, allowing it to follow the Tigres into tight valleys or low altitude corridors. The tactical 'dance' between these types is most visible during an air assault. As the NH90s approach the Landing Zone (LZ), the Tigres move into a circular escort pattern. The helicopters orbit the LZ, using their thermal sensors to scan for heat signatures in the brush. "I can look between the trees with a thermal camera," explained the Spanish Ampuero. This is a critical technical advantage; even if an enemy is camouflaged, their body heat or the heat from a vehicle engine will give them away on the Tigre's display.

Ready for the worst case scenario

As the dust settles over the training grounds of the

Champagne region, the importance of Orion Phase 4 becomes clear. This was not just another exercise; it was a demonstration of a shift in military thinking. For two years, the French 1er Corps d'Armée and the 4 BAC prepared for a high intensity conflict. By the end of Phase 4, they have proven that they can operate as a single, cohesive unit under a NATO command structure. Major Guillaume, who has overseen the project from the start, views the result as a validation of the brigade's hard work. The goal was to move beyond simple training and into the realm of warfighting. This required every pilot, technician and commander to function in a contested environment where the enemy is just as strong as they are. In today's world, those deployments are increasingly likely to involve complex, multinational coalitions. The success of the 4 BAC during Phase 4 was built on three pillars; technology, interoperability and momentum. The technical leap was visible in the NH90's ability to act as a drone mother ship. Captain Sébastien's squadron showed that UAV integration is no longer a future concept, it is a current capability. By using drones to find and designate targets, the brigade has increased its lethality while keeping its crews safer. This 'digital wingman' approach will be the foundation of all future air combat operations.

Interoperability was tested through the integration of the Spanish Tigre detachment. Lieutenant Ampuero and his team proved that there is no 'language barrier' when it comes to tactical excellence. By flying the same missions and following the same procedures as their French counterparts, they showed that NATO's rotary wing force is truly interchangeable. This 'solidarity and complementarity,' as highlighted in the official Orion documentation, is what makes the alliance a credible deterrent against any threat. Finally, there is the grit of the troops on the ground. Operating 26

helicopters from field sites in eleven different departments is a logistical nightmare, yet the 4 BAC maintained a high tempo throughout the exercise. From 'hot' refueling in the middle of a forest to maintaining complex aircraft like the Tigre and NH90 in the rain and mud, the personnel proved they are ready for the physical demands of high intensity warfare. The conclusion of Phase 4 marks the end of the Orion 2026 cycle, but it is also a beginning. The lessons learned here, about drone integration, multi-domain command and allied cooperation, will be written into the manuals for the next series of exercises and deployments. Major Guillaume's vision of a ready and capable warfighting corps has been realised. Orion 2026 has shown that when the 'hammer' of the 4th BAC falls, it falls with the full weight and precision of a unified NATO force as all units are prepared for the worst case scenario.

Text by Joris van Boven and Alex van Noije

Photos by Alex van Noije

Airbus H145 D3 with Forces Aériennes de la Gendarmerie Nationale



The first Airbus H145 D3 has entered service with the Forces Aériennes de la Gendarmerie Nationale and at Lille-Lesquin, the F-MJAB has been deployed since March 2026.

Six H145 helicopters were ordered for the Gendarmerie in January 2024. To date, two aircraft have been delivered: the first, the F-MJAA, is based in Cazaux for crew training, while the second, the F-MJAB, is now in operational service at the Lille-Lesquin base.

Changes compared to EC145: In operations at Lille-Lesquin, the H145 D3 presents several improvements over the EC145s in service with the Gendarmerie. These include the five-bladed rotor and the fenestron, an omnidirectional searchlight on the left side and a Safran Euroflir 410





optronic turret under the nose of the helicopter, capable of providing observation capabilities day and night, in all conditions.

For the rest – loudspeaker, electromechanical winch – the equipment remains in line with the twin turbine winches already in service within the National Gendarmerie. ➡

Text and images: Roelof-Jan Gort
www.Flyhighaeromedia.com



French Navy 34F at BAN Lanveoc-Poulmic



At the edge of the Crozon Peninsula, where the land sharply extends into the Atlantic, and the weather changes quickly and harshly, sits the French naval air station of Lanvéoc-Poulmic. It is here that Escadrille 34F/ESHE (Ecole de Spécialisation sur Hélicoptères Embarqués) carries out some of the most challenging missions in Europe and abroad.

This article looks behind the hangar doors at the people who lead, fly, and plunge into the water to keep the Atlantic safe.

For this interview, Roelof-Jan Gort spoke with Lieutenant Commandant Vallerie, Lieutenant David (pilot), Petty Officer Eva (System Operator) and Second Master Delon (helicopter diver).

Escadrille 34F-ESHE – Mission, history and organisation

Established in 1974, the Flottille 34F is one of the French Navy's most storied helicopter squadrons. Originally part of the naval aviation corps under the Aéronautique Navale, it traditionally focused on anti-submarine warfare (ASW), liaison and maritime patrol. Operating out of Base d'Aéronautique Navale Lanvéoc-Poulmic, 34F

has been instrumental in linking naval air support with surface fleet operations. Over time, the unit has adapted to emerging threats and new mission profiles, reflecting France's broader maritime strategy. Throughout most of the Cold War and beyond, the flotilla's identity was closely tied to the Alouette III—a light, agile helicopter known for its versatility that served both on land and aboard ships. However, by the early 2000s, the aging airframe was no longer suitable for the demanding roles required in modern naval operations.

Introduced into French naval service in the 1960s, the Sud Aviation Alouette III was a light utility helicopter widely recognised for its reliability and adaptability. The aircraft was a staple across French military branches and proved particularly useful for maritime operations due to its compact size and robust design. Initially known for its long service operating the Alouette III, the squadron has evolved over decades from traditional naval missions to become a key part of national SAR coverage. When the venerable Alouette III retired, a new chapter began. The Ministry of Armed Forces contracted several AS365N3 Dauphin helicopters, which NHV Group, based in Belgium, would maintain and support, to ensure readiness remained uninterrupted.

The ESHE detachment at Lanvéoc–Poulmic embodies this evolution. While it forms part of Escadrille 34F, it operates with a hybrid structure: military crews work with aircraft managed under a state leasing model. The

detachment is relatively small— a close-knit community of pilots, hoist operators, technicians and the renowned nageurs-sauveteurs (helicopter divers). Despite its size, it bears significant responsibility. Each year, the crews handle dozens of missions ranging from minor assistance to daring nighttime rescues in rough seas.

The Commanding Officer – Leadership on the edge of the Atlantic

The heart of 34F–ESHE is the commanding officer, Lieutenant Commandant Vallerie, a naval aviator with years of operational experience and about 400 flight hours on the Dauphin, but having logged most of his total flight hours on the Lynx (2,000 hours in total). He joined École Navale in 2008 and completed his studies with the Jeanne d'Arc mission in 2011. After passing the Cap 10 aircraft selection, he transferred in 2012 to the Army's Initial Helicopter Pilot Training School in Dax. Following his instrument flight training in 2013 at Le Luc, he joined Squadron 22S at the Lanvéoc–Poulmic Naval Air Station, where he advanced his naval aviation career and assumed increasing leadership responsibilities.

Since June 2015, he has served in Flotilla 34F, operating Lynx helicopters on anti-submarine frigates such as Lamotte–Picquet and Primauguet. As the detachment commander, he led helicopter operations and managed a team of 12 sailors, demonstrating strong leadership and management skills.





After years at sea—during which the Lynx was retired—he was assigned in 2020 to the training division at ALFAN Headquarters in Toulon, where he helped prepare crews for operations. In 2022, he rejoined Flotilla 34F in Lanvéoc, now with Dauphin helicopters. He served as Deputy Operations Commander, Executive Officer, and Commanding Officer, demonstrating his professional growth and dedication.

His office overlooks the ramp where the Dauphins rest, though he rarely stays seated for long. His leadership philosophy is based on three pillars: competence, trust and calm. Competence is maintained through rigorous training and strict adherence to procedures; trust develops from transparency and shared operational experience; calm is what keeps a mission together when weather and sea seem determined to break it apart.

Lieutenant Commandant Vallerie discusses his duties as Commander, “The Flotilla 34F/ESHE is a unit with multiple missions, which makes it both complex and fascinating. As Commander, I am responsible for ensuring the maritime training of future French Navy helicopter pilots before they are assigned to operational forces. We also provide functional support to three (soon four) overseas detachments (Tahiti, Réunion and Nouméa). This is why we like to say that the sun never sets on 34F! Finally, we maintain two detachments that embark on French Navy vessels and help protect the oceanic component of our nuclear deterrent, a critical element of France’s strategic defence”.

École de Spécialisation sur Hélicoptères Embarqués (ESHE)

At the 34F at Lanvéoc–Poulmic, they also operate the Embarked Helicopter School (ESHE). This school is the final stage of training for French Naval Aviation helicopter pilots before they join operational squadrons. The programme includes IFR navigation, low altitude navigation, night navigation using night–vision goggles, maritime overflights (day and night), hoisting exercises (rescuing shipwrecked persons or persons aboard ships) and deck–landing exercises.

The school also trains Army, Air Force, and National Gendarmerie helicopter pilots in deck–landing through



“deck–landing qualification” courses. Occasionally, foreign trainees attend to obtain this certification and bring our aviation culture back to their home countries.

The first phase focuses on basic flying, allowing trainees to become familiar with the Dauphin N3’s routine and emergency procedures. Next, students train for maritime missions (radar navigation, hoisting, and deck landings), followed by night navigation using night vision goggles. Finally, they complete a military instrument flight qualification.

The Pilot – Mastering the machine and the sea

Lieutenant David, who has been a pilot on the Dauphin helicopter since 2025 and has more than 100 flight hours on this type of helicopter, explains his work as a pilot and his experiences.

Pilot training in the French Navy takes about three years. All French Navy pilots undergo flight selection tests in an aerobatic aircraft, the CAP10. These tests determine the pilot’s future specialty: fighter aviation, maritime patrol, or helicopter operations. Helicopter pilot training begins in Dax at an Army Aviation base, where all French armed forces helicopter pilots receive their initial training for approximately 1.5 years. The next phase takes place at HUTC in Angoulême, where pilots earn their instrument flight qualification. Training concludes in Lanvéoc on the Dauphin helicopter over about ten months, with a focus on French Navy missions.

Regarding his role as a pilot, Lieutenant David explains, “My primary role as a pilot is to fly the aircraft. The captain is also a pilot, but his role is to lead the mission. This gives him the perspective needed to manage the operational environment and places him in the best position to ensure overall safety. At sea, we fly with a fixed crew, meaning the crew composition remains the same. However, at the squadron in Lanvéoc, crews rotate frequently. This rotation allows us to combine each pilot’s experience and enhance overall safety”.

He goes further: “Most of the time, we fly the Dauphin with a three person crew: one captain, one pilot and one crew member responsible for the cargo bay and the winch.



and how to evacuate personnel who have fallen overboard. The diver course provides diving training equivalent to Level 3 in French civilian diving. Finally, the VOL module focuses on personnel rescue, from shore operations to helicopter evacuations.”

NHV Dauphin N3s strengthen 34F embedded helicopter training

On 24 December 2025, the DMAé (Direction de la Maintenance Aéronautique) notified NHV Group of a contract to rent helicopter flight hours for the benefit of the 34F flotilla, particularly the School of Specialisation on Embedded Helicopters (ESHE). This contract was awarded following a public procurement procedure launched by DMAé in early 2025. It

During maritime patrol missions, the crew members help assess the tactical situation, assist with landings in confined areas, and manage checklists. If required, a diver may also be on board to rescue individuals from a shipwreck. If necessary, we can either put a machine gun on board or take a sniper on board.”

When asked by Lieutenant David about the most challenging aspect of a night mission for a pilot, he explains: “Procedures allow us to manage risks and hazards. Winching operations over a boat are the most dangerous because of the high risk of collision. Hovering above the sea without a landmark requires a lot of experience.” He goes further: “But during a training flight, when the weather is too poor, we do not take the risk of flying. However, when a mission requires it, we can afford to push the limits.”

The helicopter diver – The last link between life and death

If the pilot guides the aircraft, the helicopter diver carries the emotional and physical burden of the mission. The nageur-sauveteur is the one who leaves the safety of the cabin, harnessed to a steel cable, and descends into cold, turbulent water to reach a person who may be injured, hypothermic, or panicking.

Second Master Delon, 34 years old, has been serving at the 34F as a helicopter diver since March 2025. He shares his job and experiences as a helicopter diver at the 34F.

He describes what the training as a helicopter diver entails: “First of all, it is important to know that in the French Navy, you must be at least 30 years old to enter the selection. Training to become a helicopter diver takes three years. The 3 year training begins with medical and physical selection. After that, there are two modules at CESSAN, the Naval Aviation Survival and Rescue Training Center, based at BAN Lanvéoc-Poulmic. At this training centre, we have a six week shipboard diver course, followed by a VOL module. At CESSAN, trainees learn survival at sea

covers the daily provision of three to four airworthy AS365N3 helicopters to 34F/ESHE. Under this contract, NHV is responsible for helicopter supply, maintenance, logistics support, and fleet airworthiness management. Operations are conducted by the Marine française 34F/ESHE. To ensure the required daily availability, NHV will deploy five AS365N3 helicopters to perform 2,500 flight hours per year. This additional capacity allows us to maintain operational availability during scheduled and unscheduled maintenance periods. NHV employs a local team of approximately 15 personnel in Lanvéoc, supported by our headquarters in Ostend. The contract duration is 78 months, ending in 2032.

Conclusion – The enduring role of 34F–ESHE

As long as sailors venture into the Atlantic, units like 34F–ESHE will remain indispensable. Their mission demands a rare blend of discipline, courage, and technical mastery. While equipment may evolve and procedures may refine, the essence of their work remains unchanged: saving lives when the sea becomes unforgiving.

Lanvéoc–Poulmic, perched on the rugged Breton coast, may appear quiet at a distance. But inside its hangars, crews are always ready, knowing that the next call could come at any moment – and that someone, somewhere offshore, may be waiting for the sound of a Dauphin approaching through the wind.

Roelof-Jan Gort thanks Ms. Chelbi from SIRPA MARINE, Ms. Canévet and Ms. Le Roux from the communication section at BAN Lanvéoc–Poulmic, and Lieutenant Commandant Vallerie, Lieutenant David (pilot), Petty Officer Eva (system operator), and Second Master Delon (helicopter diver) for making this article possible. ➡

**Article and photos: Roelof-Jan Gort
FlyHighAeromedia.com**

International Anatolian Phoenix Exercise



The International Anatolian Phoenix – 2026 Exercise was conducted between 6–17 April 2026 at the Anadolu Kartalı Egitim Merkezi Komutanligi, hosted by the 3rd Main Jet Base Command, with the participation of national and international elements.



Since 2009, the Anatolian Phoenix Exercises have been carried out at the 3rd Main Jet Base Command in Konya in order to train Personnel Recovery Task Force elements in a realistic operational environment and to enhance the level

of experience required by todays and future battlefields. Since 2012, they have been conducted in a national and international manner.

To date, 365 aircraft and 8795 personnel from 15 different countries have participated in the Anatolian Phoenix Exercise. A total of 1816 sorties have been conducted.

Anatolian Phoenix 2026

The distinguished observer (DV) and press day of the exercise was held on 14 April. The activity started with a briefing by Colonel Hakan Girgin from the Personnel Recovery and FAC Group Commander at the 3rd Main Jet Base. Around fifty local and foreign press members attended the briefing.

The International Anatolian Phoenix 2026 aims to test and develop the command control process as part of the Personnel Recovery (PR) Operation, improve the interoperability of the PR Task Force elements (Helicopters, JTAC, PR and CSAR teams) with the Air Force elements (Fighter jets, Airborne Early Warning & Control (AEW&C) Aircraft, Transport Aircraft and UAVs), develop the “Survival and Escape and Evasion” methods and increase the training level of the pilots. The exercise



also aims to reveal the needs of Personnel Recovery Operations (such as doctrine, organisation, training, material, leadership, personnel and infrastructure), test new methods, weapons, and equipment by conducting Joint and/or Combined Personnel Recovery (PR), Close Air Support (CAS), Dynamic Targeting (DT) and Time-Sensitive Targeting (TST) missions in the exercise scenarios and improve/identify the level of interoperability and areas of cooperation with other countries.

The exercise area is so vast that it is larger than the airspace of some countries. We can describe the training area to you as follows.

West Area is mostly mountainous and mid elevated about 5–7000 feet. This area use Infil/Exfil Missions and suitable for Parachute Jumping. Also we have Beysehir Lake for simulating Air-Sea Rescue operations in West area.

East Area is mostly flat and approximately has 4000 feet of altitude where we simulate desert missions. The Electronic Warfare Training Area and Firing Range are in this area.

And also there is Seydi Area which is on the South. The area gives opportunity to fly over in a really steep mountainous area with long and deep valleys with a height of more than 8000 feet. Suitable for conducting High Altitude CSAR/CAS Missions. All areas are within approximately 70 nautical miles from Base.



Konya firing range also hosts EHTEM (Elektronik Harp Test Merkezi – Electronic Warfare Test Centre). Thus, the tasks required in the International Anatolian Phoenix exercise can be carried out under the pressure of intense electronic warfare and simulated enemy air defence elements. The systems found in EHTES as representative enemy air defence elements are as follows; ZSU–23–4, SA–3, SA–6, SA–8, SA–11, SA–12, Skyguard and MTS (Multi-band Threat Simulator) for Pop-up threats. KORAL (Ground Based Stand-Off Jammer System) is used as an electronic warfare system. Thanks to this system produced by Aselsan, the radars of enemy aircraft and air defence systems can be jammed.

Distinguished Observer Day Scenario

Tensions between the Blue Country and the Red Country continue, and it has been reported that the Red Country has deployed Air Defence Systems and terrorist organisation elements to the LTD–9 firing range area. In response, the Blue Country has completed the necessary preparations against the threat posed by the Red Country and has initiated the operation.

As a first step, a cyberattack was carried out against the Red Country, resulting in a deceptive speech allegedly delivered by the Red Country’s president, declaring a ceasefire against the Blue Country, apologising to the Blue Country, stating that all elements had laid down their arms, and that they would no longer support the terrorist organisation within the country.

Shortly after the speech, JTAC teams were infiltrated into the area, and the radar of the SA–12 (S–300) air defence system—the most significant threat in the region—was detected and neutralised through METE missile strikes launched both from the ground and from UAVs. However, since the positions of the air defence system launchers could not be determined, an Aksungur UAV equipped with Super Simsek was deployed to the area. Launched without entering the SA–12’s engagement range, the Super Simsek acted like a fighter aircraft upon arrival, transmitting signals that triggered the SA–12 to lock on and fire. Following this, JTAC teams in the area, in coordination with HIK, determined the precise coordinates of the SA–12 system.



Additionally, the presence of SA-8 and ZSU-23-4 Shilka anti-aircraft systems in the area was identified. Consequently, the necessary coordinates were transmitted to F-16 formations conducting CAP missions in the safe zone, as well as to UAVs. Initially, F-16s that received the coordinates fired MK-82 munitions simulating SOM missiles from a distance of 90 NM and destroyed the SA-12 air defence system. Subsequently, with the reduction of the air defence threat, an Akinci UAV neutralised the SA-8 system using Teber munitions. Following this, F-16 formations targeted the ZSU-23-4 Shilka system with LGK-82 and established air superiority in the region.


In order to neutralise the Red terrorist organisation elements in the area, swarm kamikaze drones launched from the safe zone inflicted heavy damage on terrorist elements. A helicopter package arriving to capture the terrorist leader located in a tent deployed Blue forces into the area via fast rope, and following a close quarters engagement, Red elements were neutralised and the terrorist leader was captured and evacuated from the area.

Meanwhile, one of the F-16 aircraft conducting CAP was forced to eject due to an engine failure. The location of the downed pilot was determined by a UAV using QuickDraw identification and relayed to the CSAR package waiting in the safe zone. During this time, the downed pilot reported Red activity in the area, prompting F-16s to suppress enemy elements with cannon fire. Su-25 aircraft continued CAP missions with air-to-ground munitions



against potential threats. Upon confirmation that the area was secure, the CSAR package entered the region, rescued the pilot and conducted a rapid evacuation.

During the CSAR operation, an intense cyber offensive was launched against the Red Country, with widespread disinformation campaigns conducted via social media platforms to gain time and weaken the control of the Red local population and governing authorities.

Finally, the Anatolian Anka Exercise concluded with a parachute jump from a CASA aircraft carrying the flags of participating countries. 

Article and photos: Cem Dogut

Turkish Navy tours Europe



Making its first visit to The Netherlands last February was Turkish Navy helicopter carrier TCG Anadolu (L400). Together with frigates TCG Istanbul (F515) and TCG Oruçreis (F245) and the logistic supply ship TCG Derya (A1590) it spent 4 days in the harbour of Rotterdam before continuing its journey.

The ships arrived after participating in NATO's defensive exercise Steadfast Dart 2026, that was held in Northern Europe. Host was Germany under NATO's Joint Force Command Brunssum and some 10,000 troops from 13 countries participated. Notably the United States wasn't one of those countries, which according to some observers indicated that NATO was testing their independency from the USA. Goal of the exercise was validating the newly established Allied Reaction Force's (ARF) rapid reinforcement capabilities across land, sea, air, space and cyber domains. More specifically, aim was testing a rapid move of combat power from Southern Europe to the Baltic region by sea, land and air. Next to the 10,000 personnel over 1,500 vehicles and 17 ships were involved in this move plus multiple helicopters from Italy, Spain and Turkey. What made this exercise different from

others is that it was not based on a fictitious scenario; the rapid deployment of the Allied Reaction Force was exercised the same way it would be conducted in the event of an immediate threat to NATO's external borders.

A large part of the amphibious capability was provided by the Turkish Amphibious Task Group centred around TCG Anadolu. This amphibious assault ship, that was only commissioned in 2023, is 232 m long and has a ski-jump ramp for small aircraft and drones. It can take up to 30 helicopters or up to 50 unmanned combat aerial vehicles (UCAV) or combat drones plus a large amount of tracked amphibious assault vehicles. The two main helicopter types the Anadolu currently carries are the Sikorsky S-70B Sea Hawk and the Bell AH-1W Super Cobra, while the indigenous developed Bayraktar TB-3 drone is the UCAV of choice. And next to these naval assets, there is also cooperation with the Turkish Land Forces, who regularly deploy their AS.532 Cougar helicopters on the ship.

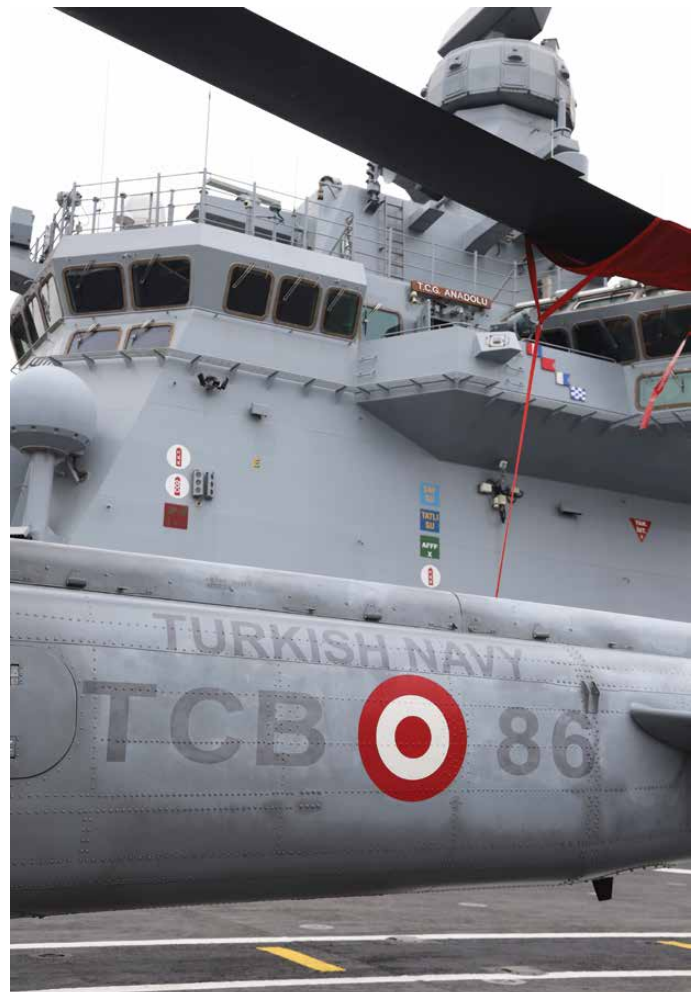
Interesting detail regarding the TCG Anadolu is that the original intention was to base F-35 Lightning II aircraft on the ship. But when the USA banned Turkey



from the F-35 programme (after Ankara bought Russian made S-400 air defence missiles) things had to change, and instead the Anadolu was built as Landing Helicopter Dock or LHD. And after the decision was made to also base UCAVs on it, the TCG Anadolu became the world's first operational drone carrier.

During Steadfast Dart the TCG Anadolu furthermore carried three AH-1W Super Cobras. These helicopters were delivered to the Turkish Army Aviation in 1990, but

The Sikorsky S-70B Sea Hawk, the maritime version of the well known UH-60 Black Hawk, has a multitude of roles, depending on the mission of the ship. It carries out anti-submarine missions, for which it is equipped with a dipping sonar, but can also do MEDEVAC and transport of Special Forces, including fastroping them down to other ships or land. It is also used for reconnaissance and Search and Rescue (SAR). The Türk Deniz Kuvvetleri (Turkish Navy) received 26 Sea Hawks starting in 2002, and the type forms the backbone of the helicopter part of the Turkish Navy Aviation Command. The fleet is operated by two squadrons, 351 and 352 Deniz Helikopter Filo Komutanlığı, who if not on board of a ship are based at respectively Topel and Dalaman naval bases. During its recent cruise the TCG Anadolu had one S-70 on board and both accompanying frigates each also carried one.





the remaining 10 were transferred to the Turkish Navy in 2022. Operator is 353 Deniz Taarruz Helikopter Filo at Topel naval base. The Super Cobras used for Close Air Support (CAS), giving cover during all kinds of operations with special forces including the amphibious landings that were done during Steadfast Dart. Plans are to replace the AH-1s in the near future with the Turkish Aerospace Industries (TAI) T-929 ATAK II helicopter that is currently being developed as successor of the TAI T-129 ATAK.

The Bayraktar TB-3 drone was developed by the Turkish Navy together with Baykar, the (especially since the war in the Ukraine) famous drone builder. It is based on the TB-2 but has been designed specifically for operating from the short runway of the Anadolu, requiring neither catapults nor arresting wires. In November 2024, for the first time, a TB-3 landed on the Anadolu, and by now it is a regular asset on the ship. Main roles of the TB-3 are reconnaissance and attack, for which it can be armed with rockets. It can fly non-stop for more than 24 hours and has a maximum speed of some 300 km/h. The drone control station is on board of the ship. The Navy and Baykar are also working on the Kızılelma, a jet propelled stealth



fighter drone that should be able to perform dogfights. Intention is to base these on the TCG Anadolu as well in the near future.

For Steadfast Dart 2026 also three AS.532UL Cougars of the Turkish Army deployed on the Anadolu. These were mainly used to transport and drop off large groups of Special Forces.

As part of the exercise a TB-3 drone flew an autonomous mission taking off and returning to the TCG Anadolu during which it successfully destroyed a floating target with two Roketsan MAM-L precision guided bombs, which was a first in NATO history. Also a long endurance mission was flown along the German, Danish and Polish coastline by a TB-3 while at some stages being accompanied by German Eurofighter EF.2000's, showing the concept of so-called Manned-Unmanned Teaming (MUM-T). Thanks to a Long Range Satellite Link (SATCOM) the drone could be controlled over vast distances beyond the direct radio line-of-sight of the mother ship. This mission demonstrated that the TCG Anadolu can monitor a massive maritime area without having to move the ship itself.

After visiting Rotterdam, the TCG Anadolu and its Task Group exercised a few days in the North Sea and the Channel before arriving in the harbour of Southampton, Great Britain next. After that NATO deployed the ship to the coast of Latvia as part of ongoing operation Eastern Sentry. This operation was started in 2025 under NATO AIRCOM, strengthening air surveillance and defence along the alliance's eastern frontier to counter military threats posed by Russia. How long the TCG Anadolu and its helicopters and drones will stay in the Baltic Sea is currently unknown. ➡



**Text and photographs:
Patrick Dirksen & Frank Mink
of Tristar Aviation**

Russian Aviation achievements 2025



The year 2025 marked the birth bicentenary of the pioneer admiral AF Mozhaysky who ventured into fixed wing aircraft designs and the centenary of UFA Engine Industrial Association and the near 90 years of Aircraft and Rockets of Lavochkin Aircraft Design Bureau.

Alexander Fedorovich Mozhaysky (21 March 1825 – 1 April 1890) was an admiral in the Imperial Russian Navy, an aviation pioneer, a researcher and designer of heavier-than-air aircraft. Mozhaysky was born in Rochensalm, in the Grand Duchy of Finland (present-day Kotka), southern Finland, then part of the Russian Empire. His father was an admiral in the Imperial Russian Navy and Mozhaysky graduated from the Sea Cadet Corps in 1841. He spent the next seven years on voyages in the Baltic Sea and in the White Sea on various vessels, and was commissioned as a lieutenant in 1849. He served with the Baltic Fleet from 1850 to 1852. In 1853 he was selected as a member of Vice Admiral Yevfimy Putyatin's expedition to the Far East. In August 1853, he demonstrated a working model of a steam engine to various Japanese dignitaries at Nagasaki, from which Japanese inventor Tanaka Hisashige was later able to reverse engineer a Japanese version. In December



1854, he was shipwrecked at Heda, Shizuoka when the frigate Diana sank in the 1854 Ansei–Tokai earthquake. Mozhaysky assisted in the construction of the schooner Heda in 1855, which enabled the Russian delegation negotiating the Treaty of Shimoda to return home. Later in 1855, during the Crimean War, he served in the Gulf of Finland on the brig Antenor.

In 1858 Mozhaysky was selected to participate in an expedition to Khiva in Central Asia, and published an account of the Aral Sea and the Amu Darya River. He was awarded the Order of St Vladimir, 4th class, for his participation in this expedition. After his return he was made a lieutenant commander; however, he resigned his commission in 1863 with the downsizing of the Russian navy following the end (1856) of the Crimean War. From 1869 to 1876 he lived outside the city of Vinnytsia in what is now Ukraine.

Mozhaysky's aircraft patent

Mozhaysky began work on a project to develop a heavier-than-air aircraft from 1876. Mozhaysky re-enlisted in the navy in 1879 and was granted the rank of captain, 1st class. He became an instructor at the Sea Cadet Corps. He was promoted to rear admiral in July 1882, but resigned shortly thereafter due to domestic reasons. Approximately in 1884 Mozhaysky's airplane made its first flight. His design relied upon a ramp rather than on engine power to generate sufficient speed for lift. The wing design of his craft lacked the curvature necessary to generate lift. While it is possible that Mozhaysky's wings slowed his monoplane's descent after launch from the ramp, the wings were unlikely ever to have provided sufficient lift for sustained flight unless used at angles of attack that would have been impractical, given the engines available to Mozhaysky. He also experimented with different angles of attack. Mozhaysky died on 1 April 1890, from pneumonia; his tomb is at the Smolensk Cemetery in Saint Petersburg.

In 1909 a Russian newspaper claimed Mozhaysky's hop was the first powered flight. This claim was later repeated in many Soviet publications. In 1971–1981

Central Aerohydrodynamic Institute researched the topic and disproved the claim. Mozhaysky's original aircraft was found incapable of generating lift because of low engine capacity. It was also shown that with a more powerful engine, which Mozhaysky had planned shortly before his death, the aircraft might have been able to fly. Nevertheless, Mozhaysky's aviation achievements, particularly with regard to flight controls and propulsion, were considerable given the limits of the technology available to him, and have only recently received serious attention. The A.F. Mozhaysky Military–Space Academy in St. Petersburg and asteroid 2850 Mozhaiskij are named in his honour. The 63 Rubles postage stamp issued on 21 March 2025 depicts a portrait of Alexander Mozhaysky against the backdrop of a blueprint of a full-scale airplane.

UFA Engine Industrial Association

Ufa Engine Building Production Association (Ufa engine-building PO) is Russia's largest aircraft engine producer. Engines for tractors, gas pumping and power units, as well as cutlery, are among other products manufactured. It is located in Bashkortostan Republic, which has the second largest industrial potential in the Ural economic area. Within Russia, Bashkortostan is the sixth largest producer of industrial products. Ufa Engine Industrial Association (Ufa Motors) produces aircraft engines for fighters (Su and MiG families), spare parts as well as engines for automobiles, gas pumps and turbines and performs different maintenance and support services for its clients. In 1995 the company was granted export rights. Ufa Motors is one of the most profitable engine manufacturers with steadily growing sales.

The Ufa Engine Industrial Association (the UMPO in Russian) was founded in 1925. The association launched the production of the first Soviet jet engines such as RD–10, RD–45F, and VK–1A for the MiG and Yak fighters. Since the mid-fifties, the Ufa-based Engine Production Association has been manufacturing the Mikoyan MiG–19 RD–9B turbo-jet engines, as well as R11F–300 engines for the MiG–21 fighter. Later, the plant developed the production of the R11F2–300, R11F2S–300, R–13–300, R25–300



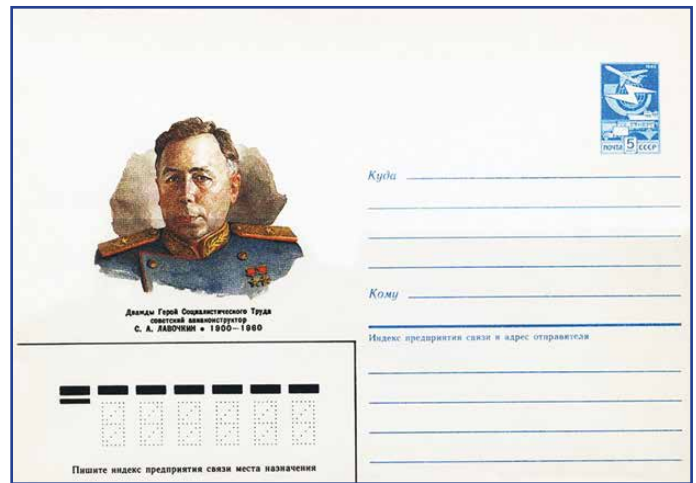


derivatives for various MiG-21 and Su-15 versions, as well as the production of the R-29B-300 and R29B9-300 third generation engines intended for the Mikoyan MiG-23B, MiG-27 and Sukhoi Su-22 fighter-bombers. It also produced the Su-25 R-95Sh non-afterburning turbojet engines as well as the improved R-195 version designed for the Su-39 attack aircraft. Since the late 1980s, the AL-31F fourth generation turbojet engines and their versions for the Su-27 and Su-30 fighters have been produced both for the Russian Air Force and air forces of other countries. The 65 rubles postage stamp issued on 17 April 2025 depicts an image of engine AL-41F-1S and Su-35 aircraft.

Aircraft and rockets of Lavochkin Aircraft Design Bureau

NPO Lavochkin (also called Lavochkin Research and Production Association or shortly Lavochkin Association, LA) is a Russian aerospace company. It is a major player in the Russian space programme, being the developer and manufacturer of the Fregat upper stage, as well as interplanetary probes such as Fobos-Grunt. The company develops and manufactures spacecraft such as the Fregat rocket upper stages, satellites and interplanetary probes. It is a contractor for a number of military programmes, such as the Oko early warning satellite, Prognoz and Araks programmes as well as the civilian programmes Kupon. One of the company's most notable projects was the participation in the failed Fobos-Grunt sample return mission. NPO Lavochkin has also developed the Elektro-L series of new-generation weather satellites, as well as the Navigator standardised satellite platform, which will serve as the basis for several future Russian satellites.

The company was founded in 1937 as OKB-301, a Soviet aircraft design bureau (OKB). The head designer was Vladimir P. Gorbunov, supported by Mikhail Gudkov and Semyon Lavochkin. In October 1945 Lavochkin was promoted to the head designer of the design bureau. The bureau gained distinction for its family of piston engined fighter aircraft during World War II, and later shifted to missile and jet fighter designs. Following the death of the head designer, the OKB-301 succumbed to the growing



power of Vladimir Chelomey and became OKB-52 Branch No. 3 on 18 December 1962. Later, it turned to work on interplanetary probe designs for the Luna sample return programme, the Lunokhod programme, Vega programme, Phobos programme, etc. The former OKB-301 became named NPO Lavochkin.

Semyon Alekseyevich Lavochkin (11 Sept 1900 – 9 June 1960) was a Soviet aerospace engineer, Soviet aircraft designer who founded the Lavochkin aircraft design bureau. Many of his fighter designs were produced in large numbers for Soviet forces during World War II.

Lavochkin was born to a Jewish family in Smolensk. His father, Alter Ilyich Lavochkin, was a melamed, his mother, Gita Savelyevna, was a housewife. In 1917 he graduated from the Kursk gymnasium. He enlisted in the Red Army and served in the infantry in the Russian Civil War. In 1920, he began studies at the Moscow State Technical University, from which he graduated in 1927. He then served for two years as an intern at the design department of the Central Aerohydrodynamic Institute under the direction of Andrei Tupolev, where he assisted in the design of the Tupolev TB-3 heavy bomber. While at TsAGI, his colleagues included the French seaplane designer Paul Richard, as well as Mikhail Gurevich and Nikolay Kamov.

In the early 1930s, he transferred to the Central Design Office, where he was assigned work on stratospheric aircraft, balloons and pressurised cockpits. However, as he became increasingly interested in the design of fighter aircraft, he moved to the design office of Dmitry Pavlovich Grigorovich, whom he assisted in the development of the Grigorovich I-Z fighter.

In 1938, after combat experiences in the Spanish Civil War and at the Battles of Khalkhin Gol against the Japanese, it became clear that the Soviet fighter designs were lagging behind international standards. Lavochkin established his own design bureau in 1939. Starting with the LaGG-1, he produced thousands of fighters which formed the backbone of the Soviet Air Force during the Second World War. He is especially known for the La-5 and La-7, which are among the best Soviet fighter aircraft

of World War II. The top Allied ace, Ivan Kozhedub shot down over 60 German airplanes, flying in fighters designed by Lavochkin. From 1941 to 1945 a total of over 22,000 Lavochkin fighters were produced.

However, Lavochkin's fortunes faded after the war. His La-9 and La-11 were the last piston engined fighters in Soviet service, and were replaced after a short time by jets. Although he continued pioneering work in this field (the La-176 was the first Soviet supersonic aircraft), his aircraft consistently placed second in competitions with other design bureaux, notably that of Artem Mikoyan. A notable exception was the Lavochkin La-15 jet fighter, a relative success.



At the end of WWII, forward thinking and competition in jet engine driven planes in the Soviet Union pushed Lavochkin to start development of rocket systems. The outcome of that decision was the SA-2 Guideline and a Burya. The LA-350 (Burya) is notable for the first in the world production use of titanium and a thruster cooling by use of reverse flow of propellant.

In 1944, Lavochkin was given the honorary rank of Major-General of Engineering/Technical Service. From 1950 to 1958, Lavochkin also served as a deputy of the Supreme Soviet of the USSR. He also became an Academician of the USSR Academy of Sciences in 1958. He died in 1960 due to a heart attack during a test of an air defence system in the Kazakh SSR at the age of 59 and was buried in the Novodevichy Cemetery. After his death the focus of the design office shifted to surface to air missiles (most notably the SA-2 Guideline), and to space projects.

The 60 Rubles x 5 postage stamps plus tab issued on 11 September 2025 depicts images of the most significant inventions of S. Lavochkin: fighter aircraft La-7 and La-15; missiles SAM 205 and Burya, and unmanned target aircraft La-17R; the coupon features a portrait of S. Lavochkin, a La-5 aircraft diagram, and a facsimile of the aircraft designer; the margins present the logo of JSC NPO named after S.A. Lavochkin, aircraft La-250, La-7, SAM 205, La-17, and La-15. ➡

**By Vijay Seth
Aerospace Heritage Trust**

25 Years Back

From Vayu Aerospace Review Issue III/2001

Royal Airways (Ex-ModiLuft) acquires first B-737

Focus Aviation, acting on behalf of Royal Airways, New Delhi, has acquired (under operating lease) the first of a number of B-737-400s which the airline requires in order to commence services in late May 2001. Royal Airways will commence scheduled services using the operating certificate of ModiLuft.

HAL/Ilyushin work on MTA

Hindustan Aeronautics (HAL), the Ilyushin Aviation Complex and Aviaexport have decided to jointly develop a twinjet multi-role transport (the MTA). The agreement calls for the design of a high winged, twin engined aircraft for passenger, cargo and tactical transport roles. Sources in Ilyushin state that the \$350 million development cost "will be met by India."

Defence sector opened to private equity investment

The Government has decided to allow investors to take equity of upto 26% in state run defence equipment production units and at the same time has cleared the way for the country's airports to come under 100% full foreign ownership. The Government has not specified which defence firms are to be privatised.

Growing Indo-Israeli defence

Co-production of a wide variety of military hardware, ranging from missiles to armoured vehicles, (and their sale to third countries) have reportedly figured in discussions between visiting Indian Defence Secretary Yogendra Narain and Israeli officials, during mid-May.

CAS visits Brazil and China

After attending a defence seminar in Brazil, and reportedly inspecting an AMX-T two-seat operational conversion trainer of this Italian-Brazilian ground attack aircraft, the Chief of Air Staff Air Marshal Anil Y Tipnis has visited China, the first ever visit by an IAF Chief to this country in over 50 years.

First HAL worked MiG-21-93s

After return of the two "prototype" MiG-21-93s from SOKOL at Nizhni Novgorod (Russia), HAL's Nasik Division has begun retro-modification of MiG-21bis fighters in India and the first of these are to be rolled out in

June 2001. Another two would follow by the year end, and by early 2002, at least 12 MiG-21-93s would be available for the IAF.

Joint Exercise "Poorna-Vijay"

The Army and the Indian Air Force (IAF) held an integrated exercise in the semi-desert terrain of Rajasthan and parts of the Punjab in early May, during scorching high temperature conditions. A strike corps (approx 60,000 troops) of the Army and another formation in a defensive role took part in these manoeuvres in the backdrop of a "nuclear threat".

Modified Mi-8s

Stemming from the operational requirements of off-shore flying, the Indian Air Force is modifying some of its Mi-8 medium lift helicopters to enable these to touch down on or take off from water. The project is being undertaken by No.3 Base Repair Depot at Chandigarh.

Reviewing DRDO's missile programmes

The Defence Research and Development Organisation which has been working on the Integrated Guided Missile Development Programme (IGMDP) now has 4 missile systems – the Akash, Nag, Prithvi and Trishul – along with the Agni technology demonstrator under development or production.


Naval Chief "opts out" of CDS

According to reliable sources in New Delhi, the Chief of Naval Staff, Admiral Sushil Kumar, who is also the Chairman of the Chiefs of Staff Committee, has opted out of the running for the proposed post of Chief of Defence Staff (CDS).

GSLV launch successful

Indian space scientists and engineers notched a great milestone when the biggest rocket, a GSLV, placed a satellite in a GTO on 8 April 2001. "The launch vehicle took off majestically at the appointed time and all its stages functioned nominally to inject the satellite into orbit," stated Dr Kasturirangan, Chairman, ISRO.

ISRO to launch test evaluation satellite

ISRO is preparing for the launch of its test evaluation satellite (TES) on the PSLV. The development of TES, which will offer one metre resolution images, is believed to have been prompted by the Kargil conflict and the failure to detect the Pakistani intrusion in time. 

Tale Spin

Artemis II crew sets distance record in historic Moon flyby

Launched 1 April 2026, from Kennedy Space Centre, Commander Reid Wiseman, Pilot Victor Glover, Mission Specialist Christina Koch and Jeremy Hansen flew Orion to 252,756 miles from Earth—farther than Apollo 13’s 1970 record. During a close 4,000 mile lunar flyby on 6 April, they captured stunning photos of the far side and shared live broadcasts amid a communications blackout. The mission tested systems for future Artemis landings followed by a Pacific splashdown. President Donald J. Trump called Artemis II astronauts after they broke the farthest distance record in human spaceflight. “HISTORIC! Your mission paves the way for America’s return to the lunar surface very soon”.



First two images: The far side of the moon—the Artemis II crew are the first to see the far side with human eyes. Right most photo captures the Moon’s near side (the side we see from Earth, identifiable by its dark splotches). All photos: NASA

We are everywhere!

Actually not! We came across some namesake trucks and buildings while travelling recently. We also received an email with a company selling apartments in Kolkata. All with the name Vayu. We like it!



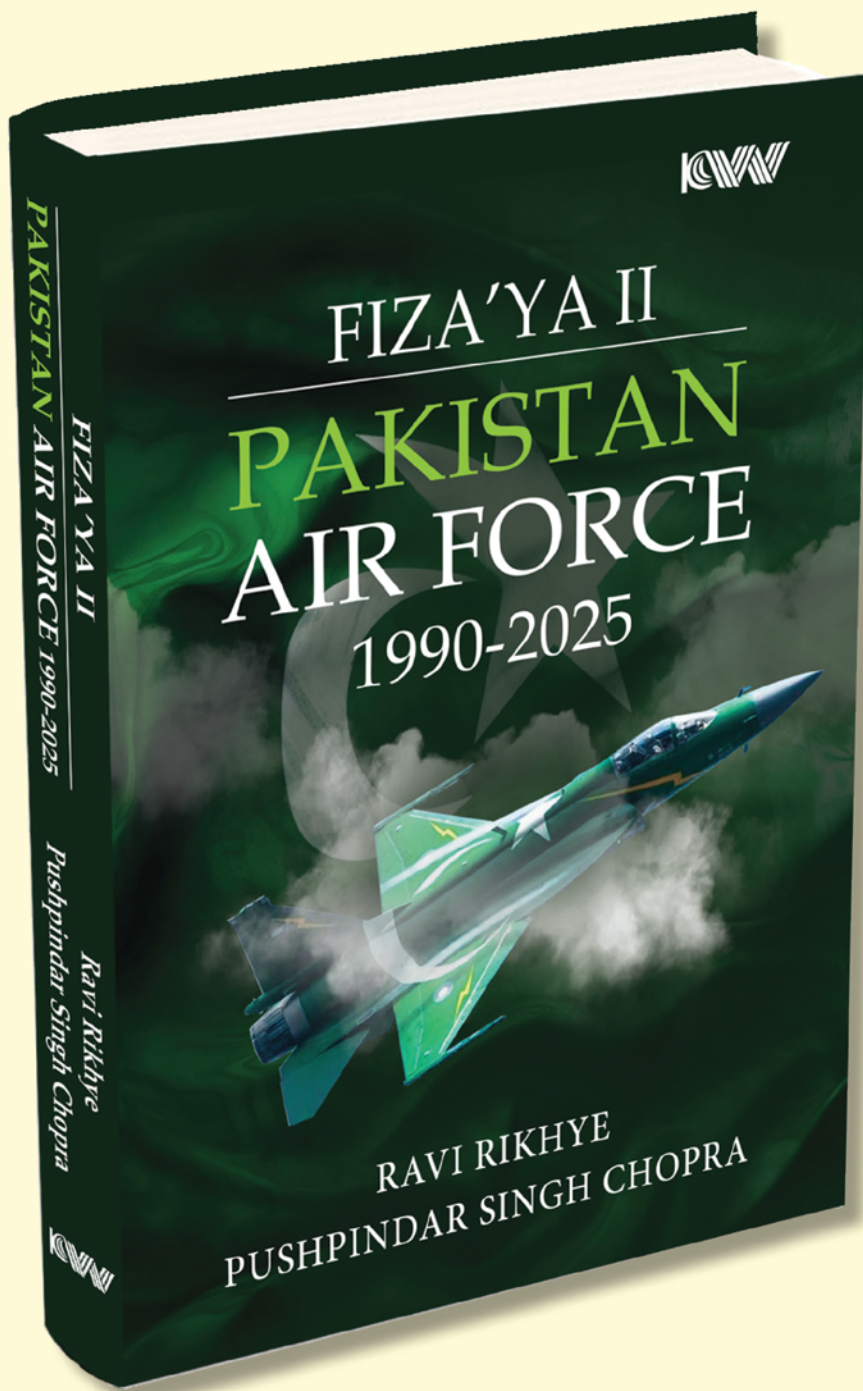
On the National Highway NH-1



Vayu office at Chandigarh—obviously not ours!



Vayu apartments at Kolkata



This is a long-delayed follow-up to Fiza'ya: The Pakistan Air Force 1947-1990, by Pushpindar Singh Chopra and Ravi Rikhye. The delay was occasioned by Ravi's departure in 1989 for home in the US, and then the unfortunate and much-too-early death of Pushpindar Singh.

The book covers the PAF 1990-2025; its successes and failures; and particularly its orders of battle during this period. It covers PAF operations, modernisation, and the growth of Pakistan Air Force co-operations with a variety of allies and like-minded nations. The book particularly emphasises the growth of Pakistan-China air nexus.

Though direct comparison with the Indian Air Force is avoided, it becomes clear meanwhile India has failed in its air modernisation to the point it is barely superior to the PAF as opposed to the former's historic 3-1 superiority. Factor in the rise of China as a co-belligerent against India, and the salient point of this book is India is totally outclassed in the air.




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