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Aerospace & Defence Review

VI/2024

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Cover : Indian Air Force Sukhoi Su-30MKIs during various exercises in 2024 including IAF Day and Tarang Shakti. Photo by Angad Singh (Twitter @zone5aviation)

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Admiral Arun Prakash says...

...At strategic crossroads

Even as the 31st meeting of the diplomatic Working Mechanism on India–China Border Affairs concluded infructuously in end August, our gallant jawans prepare for yet another winter in eyeball–to–eyeball confrontation with the Chinese PLA on frigid Himalayan heights. While the man on the street believes that by significant army redeployment, we have been able to checkmate China's nefarious designs, Beijing–playing its own deceitful game–has been busy fortifying military positions in Ladakh and creating "border defence" villages across the Arunachal border.

Apart from propping up "iron brother" Pakistan economically and militarily to function as its effective South Asian catspaw, China launched multiple other enterprises, aimed at undermining India's position in the Indian Ocean Region. Schemes like the Belt and Road Initiative and Maritime Silk Road touted by Beijing as geo–economic initiatives served to arouse fears of "strategic encirclement" in India. While these fears were not unfounded, straws in the wind were, regrettably, ignored.

The Maldives had, as far back as 2012, cancelled a major airport modernisation contract with an Indian firm in favour of a Chinese company. Over the next decade, the "India First" spirit in Male steadily transmuted into a vociferous "India Out" campaign that brought current President Mohamed Muizzu to power. Similarly, in August, it was an egregious misreading of popular Bangladeshi sentiment that saw the fall of PM Sheikh Hasina's India friendly regime, catching New Delhi by surprise. Today, our eastern neighbour teeters between rule by theocratic and anarchic forces.

These events, juxtaposed with India's prickly relationships with Nepal and Sri Lanka, raise two pertinent questions about the reasons for this loss of influence in our neighbourhood. One, why is India, despite its self–image of a sagacious and benign "Vishwaguru/ Vishwamitra", still perceived as a "big brother/bully" by its neighbours? Two, are we underestimating the adverse impact in neighbouring capitals of divisive domestic politics and unchecked provocative utterances, both aimed at swaying the Indian electorate?

A stable and cooperative neighbourhood is indispensable for India to realise what many see as its "manifest destiny" of achieving great power status. The outlines of a Viksit Bharat are already visible. The world's most populous nation and a nuclear armed military power, India is poised to become among the largest economies by 2047. A technological leap could turn it into a manufacturing powerhouse. Hopefully, by 2047, prudent economic management will have overcome the challenges of mass poverty and jobless growth, while improving healthcare and education.

This rosy picture, however, assumes that the ship of state is being manoeuvered with adroit statecraft and strategic wisdom through security minefields. Statecraft is the art of governing and managing a state using a toolbox of political, economic, military, and diplomatic instruments to safeguard national interests. At the core of statecraft lies the concept of national security; a nation's ability to protect itself from internal and external threats impinging on the state's integrity and survival.

Modern statecraft is predicated on comprehensive strategic agendas that serve as roadmaps for diplomats, soldiers and economists. Succinct strategies, preferably committed to writing, enable the evolution of contingency plans, allocation of resources and implementation of responses to emerging threats while

advancing national objectives. The capacity to anticipate change and adapt strategies is paramount. For instance, novel security challenges such as hybrid, cyber, and low–intensity, terrorist warfare necessitate innovative approaches leveraging technologies like AI, robotics and unmanned/space– based systems.

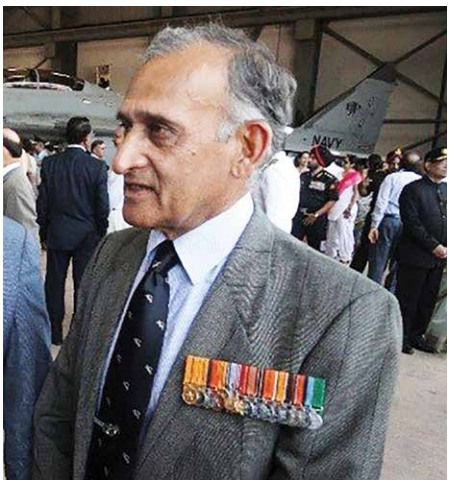
India's nuclear armed neighbours, China and Pakistan, harbour territorial ambitions and have been repeatedly instigating provocations that divert national resources from developmental priorities. Despite claims to a rich heritage of "strategic culture", India's statecraft and military posture have thus far failed to deter these adversaries from seeking their revanchist goals. This "deterrence failure" can be attributed to the absence of a coherent strategy as well as a dearth of resolute statecraft. No ambiguity should exist in the minds of decision makers that the onus of responsibility for national security and strategic decision making rests on the politician's shoulders, and must receive priority.

As our "strategic elite" grapples with the complexities of our security environment, three areas of serious concern deserve early attention. First, even as the spectre of Chinese military and technological dominance looms large, a far greater, economic and strategic vulnerability lies hidden in our ballooning trade deficit (currently $ 85 billion). India's growing dependence on vital imports of electronics, machinery, pharmaceuticals, and rare earths is significantly curtailing its strategic room for manoeuvre vis–a vis China.

Second, our continuing reliance on defence imports is a serious constraint on our cherished "strategic autonomy" as well as military capabilities. While Russia and Ukraine have been long standing suppliers of aircraft, warships, submarines, tanks and artillery, Israel has become a source of military electronics and guided weapons. All three are embroiled in serious conflicts and must not remain the fulcrum of our national defence. Initiatives like Atmanirbharta, though highly laudable, involve significant gestational delays and we must forge partnerships with like–minded nations to establish alternative supply chains.

Third, in the rarely mentioned domain of nuclear deterrence, both our adversaries have gained qualitative and quantitative advantages. China has enhanced the numbers, yield and accuracy of its arsenal and Pakistan's claims have gone from "credible minimum deterrence" to "full spectrum deterrence". If India intends to stand by the tenets of its 2003 nuclear doctrine, it must strategise to stand up to possible nuclear blackmail by neighbours: with threats ranging from Pakistan's sub–kiloton tactical weapons to China's megaton yield multi warhead missiles.

Strategic alliances are an important tool of statecraft, which can significantly reinforce national security. India needs insurance against hegemony and domination to create space in which to nurture its economy and bridge technology gaps while boosting its military muscle. As it prepares to fight its own battles, India needs to seek external balancing. If realpolitik so demands, it must break old shibboleths and strike new partnerships–keeping national interest supreme.



In the photo above is Admiral (Retd) Arun Prakash

Lt Gen Kamal Davar says...

...Military diplomacy: A critical element of statecraft

The recent events in neighbouring Bangladesh, leading to the sudden ouster of four times Bangladesh PM Sheikh Hasina, caught the world by surprise. The fact that a student's protest against reservation in governmental jobs for the children of the nation's freedom fighters would assume such violent and communal proportions was shockingly unpredictable. India's surprise over these events cannot be over emphasised. Did this take place due to the lack of intelligence in reading the political situation in the neighbourhood or was it a failure of India's diplomacy in not being able to influence events in a friendly country? Sheikh Hasina's hasty departure also resulted in gross mindless violence against the Hindu community in Bangladesh and large scale vandalism against Hindu temples. Had India supplemented the nation's diplomatic efforts with military diplomacy with the friendly Bangladesh Army, we may have been able to influence, even if marginally, the Bangladesh Army in controlling anti–Hasina and anti–India activities. Since our independence, unlike many emerging powers, India has not fully employed the art of military diplomacy. Down the decades, successive Indian political leadership and largely our bureaucrats have kept its armed forces away from such pursuits.

Diplomacy is the employment and conduct of international relations, bilateral or multilateral, by peaceful engagement and efforts to establish cordial relations between negotiating nations.

Military diplomacy: An overview

On the face of it, military and diplomacy belong to distinctly different realms. Diplomacy is the employment and conduct of international relations, bilateral or multilateral, by peaceful engagement and efforts to establish cordial relations between negotiating nations. If diplomacy fails, subsequent actions may result in efforts to settle matters by the use of force. On the face of it, military diplomacy, like the term military intelligence, may appear to be an oxymoron. Although there is no standard definition of the term 'military diplomacy', it connotes the peaceful, non–kinetic employment of military capabilities and military resources in the pursuit of national foreign policy objectives. Noted Strategic Analyst Anton Du Plessis, summarises military diplomacy as "the use of Armed Forces in operations in other wars, building on their trained expertise and discipline to achieve national and foreign objectives abroad." However, it is also pertinent to note that powerful nations also, if the need arises, display their coercive powers by threatening to use force. This was known as 'gun–boat diplomacy'—a term which was popular in the 18th and 19th centuries. Overall, military diplomacy enhances defence cooperation and promotes cordial relations between nations; it is an extension of a nation's soft power. The Indian Navy's efforts in freeing the hostages of other nations from the clutches of Somalian and Houthi pirates, operating in the West Asian waterways, is a good example of effective military diplomacy. Military interventions by India such as the operation in the Maldives in 1988 (Operation Cactus) or dispatching the Indian Peace Keeping Force to Sri Lanka, on the latter's request, do not fall under the purview of military diplomacy. India's frequent forays in numerous UN Peacekeeping Missions across the globe since the mid–1950s can be categorised as part of its military diplomacy endeavours.

Goals

In today's strife–torn world, beset by unforeseen transformational geopolitical challenges, a nation's security preparedness has to be of a high order. This imperative is primarily based on the strengthening of its Comprehensive National Power (CNP). CNP is a collective and judicious amalgamation of a nation's economic strength, military power and inter–societal harmony which ensures domestic political

stability, availability of natural resources, standards of education and high technology, population and demographic dividends, availability and progress in infrastructural architecture, availability of adequate medical resources and, importantly, the respect it enjoys in the comity of nations where its diplomacy is seen as altruistic and fair.

Military diplomacy aims at achieving national security and foreign policy objectives as part of the overall national strategy. Over the last couple of decades or so, military diplomacy has improved in its scope and content in India but for an emerging global power like India, greater efforts are required. Dr Marc Faber, the well–known author of the best–seller, 'Gloom, Boom and Doom' had also opined some years ago that "India continues to be ambivalent about power and it has failed to develop a strategic agenda commensurate with its growing economic capabilities. Throughout history, India has failed to master the creation, deployment, and uses of its military instruments in support of national objectives."

Over the last couple of decades or so, military diplomacy has improved in its scope and content in India but for an emerging global power like India, greater efforts are required.

Military diplomacy does not replace the country's foreign or security policies but supplements them to obtain greater and diverse dividends for the nation. It works to enhance better cooperation including in matters of defence with nations, resulting in the overall development of economic ties and mutual confidence building. Better cooperation with technologically advanced countries leads to access to hi–tech, state of the art weaponry and ultra–modern platforms. Intelligence cooperation with friendly foreign countries and timely sharing of vital intelligence inputs could prevent catastrophic damage to a nation's interest including cooperation in counter–terrorist operations. In addition, cooperation in non–traditional security areas which leads to better and speedier disaster management response, anti–piracy standard operating procedures (SOPs), anti–pandemic endeavours and mass evacuations of own personnel, if the need arises, are all part of military diplomacy.

The current status

India, under its first Prime Minister, Jawaharlal Nehru, followed a pacifist, non–aligned orientation in its foreign policies—a policy emulated in varying degrees by successive governments.

Former Army Chief, Gen Ved Malik, has succinctly summarised India's tryst with military diplomacy stating that "India started poorly in making use of military diplomacy as a national security and foreign policy tool. Nehruvian India was distrustful of the armed forces and kept them out of the Ministry of Defence and important decision making." However, Nehru with his worldview and a global vision did chair the UN Neutral Nations Repatriation Commission in 1953 and sent a big contingent and a field ambulance to South Korea. He also encouraged sending some troops on UN missions to troubled areas abroad—a practice which is continuing to date in greater numbers and accords India much respect globally.

During the past decades, India has opened up its military training institutions to many Western and Afro–Asian nations, a step much appreciated across the world. India has around 52 military/defence attaches (MA/DA) abroad and hosts around 102 from foreign nations in New Delhi. All these appointments contribute substantially to better relationships even beyond the realm of defence between India and foreign nations.

Conclusion

With its establishment in March 2002, India's Defence Intelligence Agency (DIA) manages India's DAs and MAs posted abroad and coordinates with the DAs and MAs from foreign nations posted in New Delhi. It must be given extra powers and resources to substantially augment India's military diplomacy endeavours, both at home and abroad, greatly serving the nation's strategic interests. Military diplomacy yet remains a vastly untapped constituent of India's CNP and thus needs a holistic and solid push for the attainment of national objectives.

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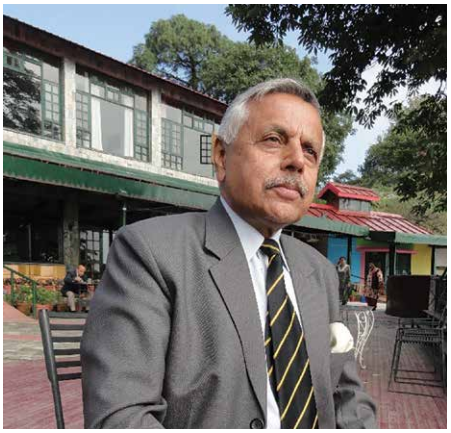


The writer, a retired lieutenant–general, was the first head of India's Defence Intelligence Agency, is a long–time Pakistan watcher and has been involved in Track–2 diplomacy.

DRDO/IN in 2nd test of VLSRSAM

Defence Research & Development Organisation (DRDO) and the Indian Navy conducted back–to–back successful flight tests of the Vertical Launch Short Range Surface to Air Missile (VLSRSAM). The second consecutive test was conducted on 13 September 2024, from the Integrated Test Range (ITR), Chandipur, Odisha. The missile intercepted a high speed aerial target, flying at a very low altitude and simulating a sea skimming threat, which showcased its precision and capability to neutralise targets.

DRDO tests VSHORADS

DRDO successfully conducted three flight tests of the 4th Generation, technically advanced miniaturised Very Short Range Air Defence System (VSHORADS) at the Pokhran Field Firing Ranges in Rajasthan on 3 and 4 October 2024. The tests were carried out against high speed target, demonstrating very critical parameters of maximum range and maximum altitude interception.

MQ–9B contract signed

Ministry of Defence, on 15 October 2024, signed a contract with the US Government for Tri–Service procurement of 31 MQ–9B Sky/Sea Guardian High Altitude Long Endurance (HALE) Remotely Piloted Aircraft System (RPAS). Another contract was signed with General Atomics Global India Pvt Ltd for performance based logistics for these RPAS through depot level maintenance, repair and overhaul in India.

GE's LM2500 for Indian Navy's NGMV

GE Aerospace's LM2500 has been selected to power the Indian Navy's Next Generation Missile Vessels (NGMV) being built by Cochin Shipyard Limited located in Kochi, India. Six LM2500 marine gas turbine engine kits will be delivered by GE Aerospace for assembly and test by Hindustan Aeronautics Limited (HAL) Industrial and Marine Gas Turbine Division in Bangalore, India. Additionally, GE Aerospace will be supplying its composite base and enclosure, and full complement of gas turbine auxiliary systems.

BEL in multiple orders

Bharat Electronics Limited (BEL) has secured an order worth Rs. 850 cr from Cochin Shipyard Limited (CSL) for the supply of indigenous Multi–Function Radar in X Band. This fully indigenous radar, designed by DRDO and manufactured by BEL, is capable of detecting, acquiring and tracking

airborne targets to provide protection for naval ships. Bharat Electronics Limited (BEL) also secured additional orders of more than Rs. 500 crores and includes EMI shelters, AMC for Integrated Air Command and Control System nodes, upgrade/spares for gun systems, spares for radars, communication system, etc.

CAE/USN contract to support IN's MH–60R

CAE announced that CAE Defence & Security USA had been awarded a contract by the United States Navy under a US Foreign Military Sales (FMS) programme to provide two training devices and support of training MH–60R Seahawk helicopter pilots and mission crew to the Indian Navy. The FMS contract valued at US$57M enables CAE to develop and deliver two training devices, an MH–60R Tactical Operational Flight Trainer (TOFT) and an Avionics Maintenance and Weapons Load Trainer (AMWLT), configured for the Indian Navy.

53 Raytheon MK 54 MOD 0 torpedoes for MH–60R's

India has requested to buy fifty three (53) MK 54 MOD 0 Lightweight Torpedo all up rounds. The following non–MDE items will also be included: Recoverable Exercise Torpedoes (REXTORP); air launch accessories; classified and unclassified torpedo spare parts; torpedo containers; torpedo support equipment, including test equipment and tools; torpedo support services, etc. The estimated total cost is $175 million.

Contract for 6 ACVS

Ministry of Defence (MoD) signed a major contract with Chowgule & Company Pvt. Ltd (CCPL), entering into an agreement for acquisition of 6 Air Cushion Vehicles on 24 October 2024. These amphibious vessels, also called "Hovercrafts", will be indigenously manufactured in India for the first time in lines of Aatmanirbhar Bharat, representing "a pivotal step in the nation's shipping landscape".

Reliance Defence to set up ammo/arms facility

Reliance Infrastructure promoted Reliance Defence Limited is to set up an integrated project for manufacturing of explosives, ammunition and small arms under Dhirubhai Ambani Defence City (DADC). DADC, spread over 1000

acres, is to come up in Watad Industrial Area of Ratnagiri, Maharashtra. Projected investment is Rs.10,000 crore spread over the next 10 years and the project envisages potential joint ventures with upto six leading global defence companies.

Delivery of Yard 3026 (Nirdeshak)

Nirdeshak (Yard 3026), second of four Survey Vessel (Large) ships, steered by the Indian Navy's Warship Design Bureau and being built at Garden Reach Shipbuilders & Engineers (GRSE), Kolkata was delivered to the Indian Navy on 8 October 2024. The first ship of the class, INS Sandhayak, was commissioned on 3 February 2024. The contract for four Survey Vessels (SVL) was signed on 30 October 2018.

Launch of seventh ship of ASW SWC

'Abhay', the seventh Anti–Submarine Warfare Shallow Water Craft (ASW SWC) being built by GRSE for Indian Navy, was launched on 25 October 2024 at L&T, Kattupalli. The contract for building eight ASW SWC ships was signed between MoD and Garden Reach Shipbuilders & Engineers (GRSE), Kolkata in April 2019. Arnala class of ships will replace the in–service Abhay class ASW corvettes of Indian Navy and are designed to undertake anti–submarine operations in coastal waters, low intensity maritime operations (LIMO) and mine laying operations. The ASW SWC ships are approximately 77 m long, with a maximum speed of 25 knots and endurance of 1800 NM.

Launching of 2 Fast Patrol Vessels

Goa Shipyard Ltd (GSL) is constructing eight Fast Patrol Vessels for Indian Coast Guard (ICG); the contract was concluded on 28 March 2022 for Rs 473 Cr. These vessels are being designed and constructed with over 60% indigenous content and these ships have been designed and constructed in–house by GSL to meet the specific requirements of the ICG under stringent dual class certification of ABS and IRS. The ship has a length of 52m, breadth of 8m, max speed of 27 knots, CPP–based propulsion system and displacement of 320 tons.

Submarine escape training facility Vinetra commissioned

The Kalvari Submarine Escape Training Facility (Vinetra) was commissioned on 13 September 2024. The facility, aims to enhance the escape capabilities of crew from a distressed Kalvari class submarine, and has been indigenously designed and developed, keeping in line with the Aatmanirbhar Bharat initiative, highlighting India's focus on self–reliance in defence capabilities. Constructed by L&T Defence as a turnkey project, the Kalvari Submarine Escape Training Facility is equipped with a five metre escape tower integrated with an adjacent diving basin.

Very Low Frequency Station in Vikarabad

Raksha Mantri Rajnath Singh laid the foundation stone of a new Very Low Frequency (VLF) Station of the Indian Navy at the Damagundam Reserve Forest site, Pudur Mandal in Vikarabad, Telangana on 15 October 2024. The facility, built at a cost of Rs 3,200 crore, will be spread across 2,900 acres. It will bolster the Indian Navy's operational readiness, ensuring effective command and control capabilities in challenging maritime environments.

Bikar Aerospace Metals expands in India

Bikar Aerospace Metals, one of the leading suppliers of aerospace aluminium, is expanding its capacities with two new production facilities in Bristol, United Kingdom and Belagavi, India. With these strategic investments, the company "is consistently continuing its expansion in aerospace markets and strengthening its global presence".

Airbus inaugurates India and South Asia headquarters at New Delhi

Airbus has inaugurated its new India and South Asia Headquarters located at Delhi's Indira Gandhi International Airport. The state–of–art facility was inaugurated by Kinjarapu Rammohan Naidu, Minister of Civil Aviation, Government of India, in the presence of Michael Schoellhorn, CEO of Airbus Defence and Space, and Rémi Maillard, President and Managing Director of Airbus in India and South Asia. The headquarters will be the heart of Airbus' industrial mission in India, which is to develop a comprehensive aerospace ecosystem across all dimensions: assembly, manufacturing, design, innovation and training. It will also serve as a pilot and maintenance training centre that will accommodate four A320neo Full Flight Simulators (FFS).

Zen Technologies in AMC

Zen Technologies Limited has signed an Annual Maintenance Contract (AMC) worth Rs. 46 crores for simulators with the Ministry of Defence. The contract, effective for a period of five years, ensures the continued maintenance of simulators designed and developed by Zen. The agreement highlights Zen's ability "to meet the demanding operational needs of India's defence forces through advanced simulator technology".

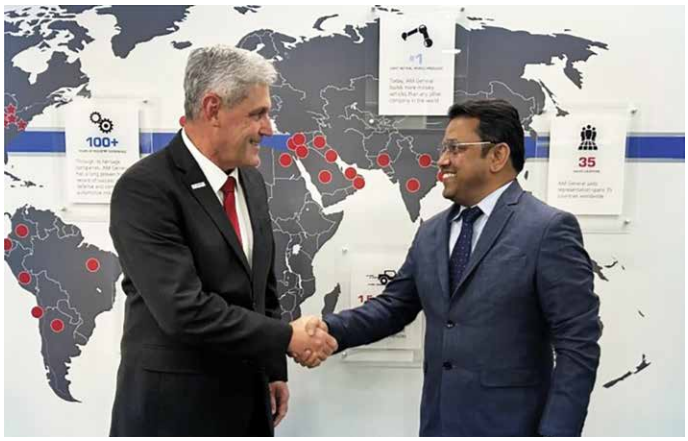
BEL's 100th Akashteer

BEL completed delivery of 100 Control Centres for Air Defence Control & Reporting System (Akashteer). BEL, through its DCCS SBU, started roll out of Akashteer in March 2024 and had committed to deliver 100 Control Centres of Akashteer by 30 September 2024.

The swift deployment of the 100 Control Centres, enabled by the guidance of Army Air Defence, Indian Army, highlights BEL's "capability to cater to critical national security requirements and deliver strategic defence equipment on time".

KSSL and AM General & Mandus Group in partnership

Kalyani Strategic Systems Ltd, a 100% subsidiary of Bharat Forge Ltd, India, plans to enter into a multi–party agreement with leading United States defence companies, AM General and Mandus Group LLC, to explore the co–development and co–production of next generation artillery gun platforms. These next gen artillery platforms will feature disruptive technology, responsive and survivable fires, transportability, added lethality, and will optimise crew size due to less logistics requirements. The 105 mm and 155 mm howitzer to be offered will deliver firepower and mobility while remaining lightweight and modular.



MTAR in order for full–scale combustors

MTAR has received Rs. 15.4 crs order for manufacturing and supply of full–scale and sub–scale combustors for the development of "cutting–edge air–breathing engine technology for defence programmes". The company shall execute the order by September 2025 as per the contract terms. "This shall strengthen our capabilities further in the supply of systems for future generation engines related to various defence programmes". MTAR has seven strategically based manufacturing units including an export oriented unit each based in Hyderabad, Telangana.

Delivery of 5th missile/ammo barge

The delivery of 'Missile Cum Ammunition Barge, LSAM 13 (Yard 81)', the fifth Barge of 8 x Missile Cum Ammunition Barge project, built by MSME Shipyard, SECON Engineering Projects Pvt Ltd, Visakhapatnam for Indian Navy, was undertaken on 25 September 2024 at Naval Dockyards, Mumbai for INS Tunir.

Launch of 'Samarthak'

The first ship of the two multi–purpose vessel project, being built by L&T Shipyard for the Indian Navy, was launched on 14 October 2024 at L&T, Kattupalli. In keeping with the maritime traditions, the ship was launched by Mrs Shashi Tripathi President NWWA. The ceremony was presided over by Admiral Dinesh K Tripathi, Chief of the Naval Staff. The ship has been named 'Samarthak' which means 'Supporter' and "is synonymous to the multi–dimensional role envisaged from the platform".

Keel laying of 1st and 2nd NGOPV

Keel Laying ceremony of Yard 3037 and 3038, the 1st and 2nd Next Generation Offshore Patrol Vessels (NGOPV) (ex-GRSE) was held at Garden Reach Shipbuilders & Engineers Ltd, Kolkata on 5 November 2024. The ceremony was presided by the Governor of West Bengal Dr. CV Ananda Bose with senior officials from Indian Navy and GRSE in attendance. The contracts for indigenous

design and construction of 11 NGOPVs were concluded in March 2023 between MoD and GSL, Goa for seven ships and GRSE, Kolkata for four ships. The NGOPVs with an approximate tonnage of 3000T are envisaged for coastal defence and surveillance, search and rescue operations, protection of offshore assets and anti-piracy missions.

DRDO & IIT Delhi's ABHED Light Weight BPJs

Defence Research & Development Organisation (DRDO), along with researchers of Indian Institute of Technology (IIT) Delhi has developed Light Weight Bullet Proof Jackets named ABHED (Advanced Ballistics for High Energy Defeat). The jackets have been developed at the DRDO Industry Academia Centre of Excellence (DIA–CoE) at IIT, Delhi. These jackets have been created from polymers and indigenous boron carbide ceramic material.

HFCL and General Atomics in partnership

HFCL Limited (HFCL), an Indian technology enterprise has announced a strategic partnership with General Atomics Aeronautical Systems Incorporated (GA–ASI). In a significant development that "underscores HFCL's technical prowess and commitment, the company has been selected to develop and supply critical sub–systems for GA–ASI's advanced Unmanned Aircraft Systems (UAS)". This partnership marks "a milestone in HFCL's journey, as it becomes a key contributor to one of the world's most sophisticated unmanned aerial vehicles (UAVs)".

GE's GEnx milestone with South Asian airlines

GE Aerospace announced on 25 September 2024 that its GEnx commercial aviation engine family achieved a milestone of two million flight hours with South Asian airlines. The first GEnx was delivered in the region in 2012 with 90 GEnx engines now powering Air India, Vistara and Biman Bangladesh flights. "We are proud of our long relationships with the South Asian airlines, including most recently Air India as it plans expansion of operations with 20 new widebody aircraft that will be powered by 40 GEnx engines," stated Vikram Rai, South Asia Chief Executive Officer, GE Aerospace.

Sagar Defence and Liquid Robotics partner for USVs

Sagar Defence Engineering Private Limited announced a partnership with Liquid Robotics, a Boeing company, for the co–development and co–production of scaled Uncrewed Surface Vehicle (USV) systems. Salil Gupte, President, of Boeing India, and South Asia, stated, "This co–development and co–production of scaled USV systems with an Indian partner truly demonstrates our commitment and ability to help realise the Government's vision for an Aatmanirbhar Bharat in defence".

Honeywell Automation airfield ground lighting for NIA

Honeywell Automation India Limited has secured a contract to provide its Airfield Ground Lighting system for the Noida International Airport (NIA). These systems will provide visual guidance to aircraft, increasing safety and streamlining operations across the tarmac.

Turkish Technic Redelivery Check for IndiGo A320neo's

Turkish Technic, a provider of maintenance, repair and overhaul (MRO) services, and IndiGo have signed an agreement covering the Redelivery Checks of 7 Airbus A320neos. Under this agreement, Turkish Technic will provide Redelivery Check services for Airbus A320neo aircraft at Turkish Technic facilities in Istanbul Ataturk Airport as well as Sabiha Airport, with the first aircraft arriving in October 2024.

APPOINTMENTS

Air Chief Marshal AP Singh is new Chief of the Air Staff

Air Chief Marshal AP Singh took over as Chief of the Air Staff (CAS) at a ceremony at Air Headquarters (Vayu Bhawan) on 30 September 2024. The CAS was commissioned on 21 December 1984 in fighter stream of the IAF. He is an alumnus of the National Defence Academy, Defence Services Staff College and National Defence College. He is a Qualified Flying Instructor and an Experimental Test Pilot with more than 5000 hours of service flying on a variety of fixed wing and rotary wing aircraft.

Air Marshal AK Arora is Air Officer–in–Charge Maintenance, IAF

Air Marshal Ajay Kumar Arora has assumed the appointment of Air Officer–in–Charge Maintenance, Indian Air Force, at Air Headquarters (Vayu Bhawan). He has held key command and staff appointments in his illustrious career of 38 years. He was the Director General (Aircraft) before assuming the appointment of Air Officer–in–charge Maintenance.

DG Paramesh Sivamani is new DG of Indian Coast Guard

DG Paramesh Sivamani has taken over as the 26th Director General of the Indian Coast Guard (ICG). The Flag Officer, during his illustrious career spanning over three and a half decades, has served in various capacities in ashore and afloat appointments. DG Paramesh Sivamani specialises in Navigation & Direction and his sea commands include all major vessels of ICG which include Advanced Offshore Patrol Vessel 'Samar' & Offshore Patrol Vessel 'Vishwast'.

Mr. Rajesh Kumar Singh is new Defence Secretary

Mr. Rajesh Kumar Singh took over as Defence Secretary at South Block in New Delhi on 1 November 2024. He is a 1989 batch IAS officer from Kerala cadre, who had assumed the charge of the Officer on Special Duty (Defence Secretary–designate) on 20 August 2024. Earlier, he was holding the charge of Secretary, Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry. Prior to that, he held the post of Secretary, Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying.

Interview with Air Chief Marshal AP Singh, Chief of the Air Staff, Indian Air Force

***VAYU**: Could you update us on the status of LCH Prachand with respect to the ordered numbers and deliveries?*

CAS: IAF has inducted and operationalised ten Prachand Light Combat Helicopters (LCHs). The aircraft had participated in the recently concluded international exercise Tarang Shakti. A case for procurement of 156 LCH SP (IAF–66 and IA–90) is under progress.

The LCH Prachand at Aero India 2023

***VAYU**: What is the status of the Mi–26 helicopters: we hear they are being refurbished and modernised. Is that correct?*

CAS: Deliberations are underway with JSC Russian Helicopters on refurbishing of Mi–26 helicopters. JSC RH specialists had invited India to assess local facilities to work out a plan of action.

The Mi–26 seen here at Chandigarh in December 2008

***VAYU**: Are there delays in the LCA Mk.1A deliveries? What is the total order envisaged by the IAF?*

CAS: The deliveries of LCA Tejas Mk.1A were supposed to commence from February 2024 onwards. Tejas Mk.1A programme has been delayed due to engine and a few more issues. The IAF has been pro–active in its approach and we are hopeful that the engine delivery will start soon. HAL has also been asked to increase the production of Tejas and they have been forthcoming about it. Case for procurement of additional 97 LCA Mk.1A is under progress. Eventually IAF will have 220 LCAs.

LCA Mk.1 at Aero India 2023

***VAYU**: For over 2 decades now we have been tracking the MMRCA/MRFA programme: could you give us its status please.*

CAS: An RFI for procurement of 114 MRFA was issued on 6 April 2018. Responses have been received for eight aircraft types. It is planned to integrate indigenously developed weapons on the aircraft being manufactured in India by an Indian Production Agency (IPA). The case is being pursued as per the provisions of DAP–2020. The timelines can be ascertained after accord of AoN for the MRFA project.

VAYU: Besides the MQ–9B UAS, what are the other UAV/ UAS the IAF is currently evaluating or planning to induct (including the Heron Mk.II and Drishti 10) etc?

CAS: The IAF is tirelessly working on roadmap for acquisition of Unmanned Air Systems to meet both the short term and long term operational requirements. The plan includes the procurement of various types of UAS systems ranging from small drones and counter drone systems to the MALE and HALE class of UAS along with the combat capability.

IAF C–130J–30 at Exercise Tarang Shakti (Photo: Mayyank Kaul)

A combined case for procurement of 31 Sky/Sea Guardian (MQ–9B Predator) HALE UAS has been approved by DAC on 15 June 2023 from General Atomics, USA (Qty 16 RPAs are for IAF and IA) with Indian Navy as the lead service.

VAYU: After the success of Exercise Tarang Shakti, will the IAF have more on the same lines every year?

CAS: The exercise is the maiden edition with participation of a large number of Friendly Foreign Countries (FFCs). It is also the biggest multinational exercise hosted by India. Hosting an exercise of this scale takes a lot of planning and preparation. Although our engagement with FFCs will continue, decision on the periodicity of such a large scale exercise would be taken in due course of time. As of now, we plan to hold Ex–Tarang Shakti once in two years.

CAS at the annual media press conference on 4 October 2024 at Akash Mess, New Delhi

Some highlights:

1. Astra Mk.1 inducted; Astra Mk.2 and 3 being developed. IAF is committed to those.
2. LCA Mk.1A deliveries soon.
3. Eventually 200+ LCA Mk.1 and 1A.
4. LCA Mk.2 and AMCA: IAF is committed to them. Currently being developed. IAF plans on inducting 4–6 squadrons of both types.
5. SAM regiments being increased with more Akash and MRSAMs to be inducted.
6. IAF in the process of inducting many types of air to surface weapons. Some inducted, some being developed and IAF committed to inducting them.
7. "We are looking at inducting the long–range surface to air–guided weapons like the Kusha"
8. Large number of Akash missiles have been inducted; now looking at Akash NG.
9. Agniveers will make IAF proud.
10. "If you want to fight the war like it is being fought where 200–300 missiles are being fired, it needs to be manufactured indigenously"
11. Three S400 units are operational with India (2 more next year).
12. "When it comes to building the capacity, one is capability, another one is capacity. So building the capacity, it becomes important for our manufacturing agencies to come forward and increase their production rate"

IAF and its 92nd anniversary celebrations

An immaculate ceremonial parade, a breath–taking demonstration of air power and a spectacular static display of state–of–the–art equipment marked the celebrations of the 92nd anniversary of the Indian Air Force (IAF) at the Air Force Station, Tambaram in Chennai, Tamil Nadu on 8 October 2024. Chief of Defence Staff General Anil Chauhan graced the celebrations, while the ceremonial parade was reviewed by Chief of Air Staff Air Chief Marshal AP Singh.

In his address, the Chief of Air Staff underscored the need for IAF to remain prepared to meet any contingency that challenges the national interests. He stated that the current global security environment is in a state of constant flux and ongoing conflicts have demonstrated an inescapable need to have a strong and capable Air Force. Adopting the latest technology along with innovative and out–of–the–box thinking will play a decisive role in today's multi–domain environment, he added.

Air Chief Marshal AP Singh emphasised "that the theme of Air Force Day 2024, 'Bhartiya Vayu Sena: Saksham, Sashakt, Aatmanirbhar' perfectly described the aspirations of IAF. Over the years, we have become more empowered with better technology and achieved new levels

op–exploitation of systems and weapons. Aatmanirbharta in the field of defence R&D and manufacturing is our priority. Concrete steps have been taken to support Make in India initiatives by engaging MSMEs, start–ups, individual innovators, professionals, R&D institutes and academia."

The Chief of Air Staff described the Air Force Day as an occasion for the air warriors to rededicate themselves in the service of the nation, introspect on the previous year, celebrate the achievements, recognise the areas of improvement and realign to the present and future requirements. On the previous year's achievements, he said that IAF had proved its mettle on various fronts.

"One of our primary objective is to deliver weapons, on target, on time, every time and this capability was aptly showcased during the firepower demonstration exercise 'Vayu Shakti' at Pokhran Range in February 2024," he stated.

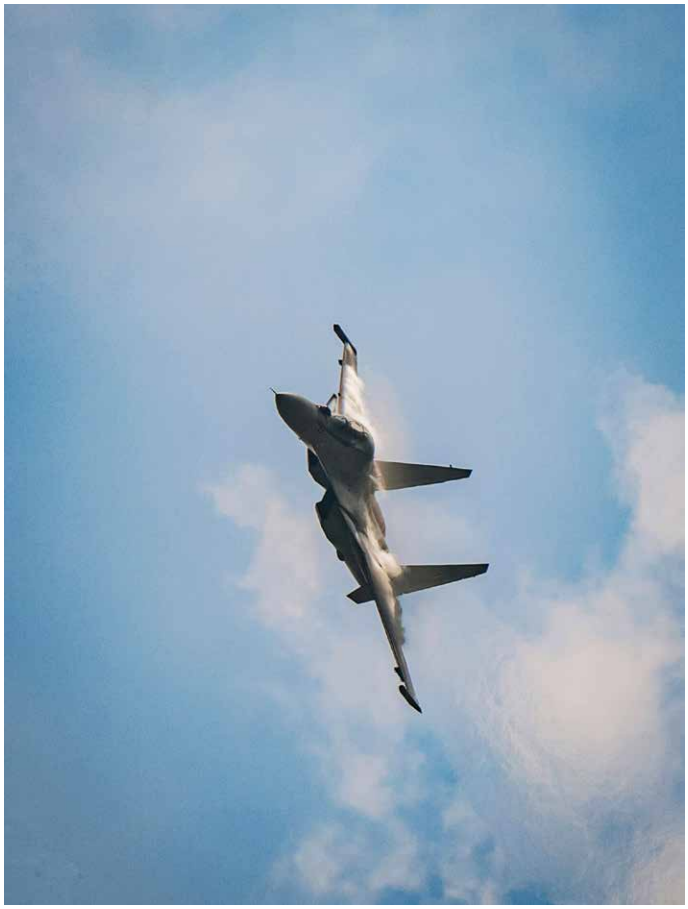
Air Chief Marshal AP Singh added that the IAF, this year, had expanded its participation in bilateral and multilateral exercises with friendly countries.

He stated that the successful conduct of the largest multi–national exercise on Indian soil 'Tarang Shakti' was a testimony to the competence and professionalism of India's air warriors.

The Chief of Air Staff asserted that "IAF has always been the first responders in calls of humanitarian assistance and disaster relief both within the country and abroad, highlighting the various ops conducted in the last one year".

He reaffirmed IAF's full commitment towards providing a conducive and working environment to the air warriors, terming the welfare and well–being of the personnel and their families as of utmost importance.

The parade commenced with the marching–in of the President's Colours, symbolising pride, unity, strength and esprit–de–corps. The atmosphere became even more melodious through the performance of a Tri–Services Band, which filled the air with patriotic fervor. The Air Warrior Drill Team captivated the audience with their sharp and synchronised movements, leaving a lasting impression on all present.



The parade was followed by an aerial display, with various jets including Tejas Light Combat Aircraft, Sukhoi–30MKI and Pilatus performing daring low level aerobatic manoeuvres. The skies over Chennai were painted in the colours of the national flag as the Suryakiran Aerobatics Team and Sarang Helicopter Team mesmerised the crowd with thrilling performances.

The static display featured assets such as ALH Mk–4, C–295 transport aircraft, Akash Missile Defence System, HTT–40 and Rohini radar.

On the occasion, Chief of Defence Staff General Anil Chauhan extended greetings to all air warriors, veterans and their families on the 92nd anniversary of the Indian Air. In his message, CDS stated, “Since its inception in

1932, the Indian Air Force has emerged as a shining exemplar of valour, excellence, and national pride. The Air Warriors have defended India's skies, contributing decisively in wars and humanitarian missions. Their selfless service, precision, and bravery inspire awe, and stand as a testament to their unwavering dedication and unparalleled service. Today we honour and acknowledge this legacy."

"We have made significant strides in enhancing our capabilities with the induction of cutting edge platforms

such as the Rafale jets and Apache helicopters. The IAF's focus on self–reliance has led to the successful development of the Light Combat Aircraft Tejas and Light Combat Helicopter Prachand, showcasing our commitment to indigenous innovation. Our air warriors have demonstrated exceptional prowess in various operations, including humanitarian assistance and disaster relief efforts, underlining the IAF's readiness and responsiveness. The maintenance support systems have been bolstered, ensuring optimal aircraft serviceability and reducing downtime.

We have strengthened our international partnerships, participating in joint exercises and collaborations with friendly nations. These engagements have enhanced our operational effectiveness and fostered cooperation in the global aviation community." Gen Anil Chauhan said that "as a potent tech–driven force the IAF stands vigilant, safeguarding India's sovereignty and interests. It remains committed to harnessing the latest advancements in technology, fostering international cooperation and nurturing the expertise of our personnel. The Indian Air Force will continue to soar to greater heights, safeguarding our nation's interests and upholding the values of courage, commitment and excellence."

Text: IAF

Visit to AFS and all photos by Samarth Mahajan (Instagram @indian_spotter)

President of India onboard INS Vikrant

The President of India, Smt Droupadi Murmu, witnessed the operational demonstration by the Indian Navy at sea on 7 November 2024. The President arrived at INS Hansa (Naval Air Station at Goa) and was received by Admiral Dinesh K Tripathi, Chief of the Naval Staff, and Vice Admiral Sanjay J Singh, the Flag Officer Commanding–in–Chief, Western Naval Command. A 150–men ceremonial 'Guard of Honour' was also paraded on her arrival.

The President thereafter embarked the indigenous aircraft carrier INS Vikrant at sea off Goa, operating in the company of 15 frontline warships and submarines of

the Indian Navy. This was President Smt Droupadi Murmu's maiden visit to Indian Navy ships at sea. The President was provided a briefing on the Indian Navy's role and charter and the concept of operations.

The President thereafter witnessed several naval operations, including deck based fighter take–offs and landings, missile firing drills from a warship, submarine operations, flypasts of over 30 aircraft, and culminating with traditional steam–past of warships. The President also interacted with the crew of INS Vikrant at lunch, which was followed by her address to the fleet that was broadcast to all units at sea.

Union budget: Rs 6.22 lakh crore allocated to MoD

In the Regular Union Budget of Financial Year (FY) 2024–25, Ministry of Defence (MoD) has been allocated Rs 6,21,940.85 crore (approx US $75 Billion), the highest among the Ministries. While maintaining the allocation made to MoD during interim budget, the Government has made an additional allocation to the tune of Rs 400 crore on innovation in defence through the Acing Development of Innovative Technologies with iDEX (ADITI) scheme.

Through this scheme, MoD is engaging with start–ups/ MSMEs and innovators to develop Def–Tech solutions and supply the Indian military with innovative and indigenous technological solutions. A grant of upto 50% of Product Development Budget with enhanced limit (Max) of Rs 25 crore per applicant will be awarded as per extant iDEX guidelines.

The allocation to MoD for FY 2024–25 is higher by Rs one lakh crore (18.43%) over the allocation for FY 2022–23 and 4.79% more than allocation of FY 2023–24. Out of this, a share of 27.66% goes to capital; 14.82% for revenue expenditure on sustenance and operational preparedness; 30.66% for Pay and Allowances; 22.70% for Defence Pensions, and 4.17% for civil organisations under MoD. The total allocation comes out as approx. 12.90% of Budgetary Estimate of Union of India.

The allocation is aimed to promote 'Aatmanirbharta' in defence technology & manufacturing and equipping the Armed Forces with modern weapons/platforms along with creation of job opportunities for the youth.

In absolute terms, budgetary allocation under capital head to the Defence Forces for FY 2024–25 is Rs 1.72 lakh crore, which is 20.33% higher than the actual expenditure of FY 2022–23 and 9.40% more than the Revised Allocation of FY 2023–24. The allocation is aimed to fill the critical capability gaps through big ticket acquisitions in current and subsequent FYs. The enhanced budgetary allocation will fulfill the requirement of annual cash outgo on planned Capital acquisitions aimed at equipping the Armed forces with state–of–the–art niche technology, lethal weapons, fighter aircraft, ships, submarines, platforms, unmanned aerial vehicles, drones, specialist vehicles etc.

MoD has earmarked 75% of modernisation budget amounting to Rs 1,05,518.43 crore for procurement through domestic industries during this FY. This will have a multiplier effect on GDP, employment generation and capital formation, thus providing a stimulus to the economy.

The continued higher allocation for operational readiness boosts the morale of the Armed Forces with the sole motive of keeping them battle ready at all times. The Government has allocated Rs 92,088 crore during the current FY under this head, which is 48% higher than the budgetary allocation of FY 2022–23. This is aimed to provide best maintenance facilities and support system to all platforms including aircraft and ships. It will facilitate procurement of ammunition; mobility of resources and personnel as demanded by the security situation, and strengthen the deployment in forward areas for any unforeseen situation.

The Government is firm on its commitment to improve border infrastructure through higher allocation to the

agencies involved in executing strategically significant projects along with providing last–mile connectivity in the border areas. In this endeavor, the budgetary allocation to Border Roads Organisations (BRO) under capital for Budget Estimates (BE) 2024–25 has been made as Rs 6,500 crore, which is 30% higher than the allocation for FY 2023–24, and 160% higher over the allocation of FY 21–22.

The financial provision made during the budget this year will promote strategic infrastructure development in border areas, while boosting socio–economic development in that region. Projects such as development of Nyoma Airfield in Ladakh at an altitude of 13,700 feet, permanent bridge connectivity to southernmost Panchayat of India in Andaman and Nicobar Islands, 4.1 km strategically–important Shinku La tunnel in Himachal Pradesh, Nechiphu tunnel in Arunachal Pradesh and many other projects will be funded out of this allocation.

The allocation to the Indian Coast Guard (ICG) for this FY 2024–25 is Rs 7,651.80 crore, which is 6.31% higher over the allocation of FY 2023–24. Out of this, Rs 3,500 crore is to be incurred only on capital expenditure, adding teeth to the arsenal of ICG for addressing the emerging maritime challenges and providing humanitarian assistance to other nations. The allocation will facilitate the acquisition of fast–moving patrolling vehicles/interceptors, advance electronic surveillance system and weapons.

The budgetary allocation to Defence Research and Development Organisation (DRDO) has been increased to Rs 23,855 crore in FY 2024–25 from Rs 23,263.89 crore in FY 2023–24. Out of this allocation, a major share of Rs 13,208 crore is allocated for capital expenditure. This will financially strengthen the DRDO in developing new technology with special focus on fundamental research and hand–holding of the private parties through development–cum–production partner. The allocation to Technology Development Fund (TDF) scheme stands out to be Rs 60 crore which is specially designed for new start–ups, MSMEs and academia attracting the young bright minds interested in innovation and developing niche technology in collaboration with DRDO.

The Government has increased the allocation on innovation in defence through iDEX from Rs 115 crore during FY 2023–24 to Rs 518 crore in the current fiscal year, which will boost start–ups/MSMEs/innovators in developing Def–Tech solutions and invite young ignited minds.

Total budgetary allocation on account of defence pensions is Rs 1,41,205 crore which is 2.17% higher than the allocation made during 2023–24. It will be incurred on monthly pension to 32 lakh pensioners through System for Pension Administration (Raksha) or SPARSH and through other pension disbursing authorities.

Space news from India

Cabinet's approval of $2.7 billion in new funding for space

Bharatiya Anthariksh Station (BAS)

The Union Cabinet chaired by the Prime Minister Narendra Modi on 18 September 2024 approved the building of first unit of the Bharatiya Anthariksh Station by extending the scope of Gaganyaan programme. Approval by the cabinet was given for development of first module of Bharatiya Anthariksh Station (BAS–1) and missions to demonstrate and validate various technologies for building and operating BAS; to revise the scope and funding of the Gaganyaan Programme to include new developments for BAS and precursor missions, and additional requirements to meet the ongoing Gaganyaan Programme.

Revision in Gaganyaan Programme is to include the scope of development and precursor missions for BAS, and factoring one additional uncrewed mission and additional hardware requirement for the developments of ongoing Gaganyaan Programme. Now the human spaceflight programme of technology development and demonstration is through eight missions to be completed by December 2028 by launching first unit of BAS–1.

The Gaganyaan Programme approved in December 2018 envisages undertaking the human spaceflight to Low Earth Orbit (LEO) and to lay the foundation of technologies needed for an Indian human space exploration programme in the long run. The vision for space in the Amrit Kaal envisages including other things, creation of an operational Bharatiya Anthariksh Station by 2035 and Indian Crewed Lunar Mission by 2040. All leading space faring nations are making considerable efforts and investments to develop and operationalise capabilities that are required for long duration human space missions and further exploration to Moon and beyond.

Gaganyaan Programme will be a national effort led by ISRO in collaboration with Industry, Academia and other National agencies as stake holders. The programme will be implemented through the established project management mechanism within ISRO. The target is to develop and demonstrate critical technologies for long duration human space missions. To achieve this goal, ISRO will undertake four missions under ongoing Gaganyaan Programme by 2026 and development of first module of BAS and four missions for demonstration and validation of various technologies for BAS by December 2028.

The nation will acquire essential technological capabilities for human space missions to Low Earth Orbit. A national space based facility such as the Bharatiya Anthariksh Station will boost microgravity based scientific research and technology development activities. This will lead to technological spin–offs and encourage innovations in key areas of research and development. Enhanced industrial participation and economic activity in human space programme will result in increased employment generation, especially in niche high technology areas in space and allied sectors.

With a net additional funding of Rs. 11,170 Crore in the already approved programme, the total funding for Gaganyaan Programme with the revised scope has been enhanced to Rs. 20,193 Crore.

New re–usable low–cost launch vehicle

The Union Cabinet has approved the development of Next Generation Launch Vehicle (NGLV) on 18 September 2024 that will be a significant step towards the Government's vision of establishing and operating the Bharatiya Anthariksh Station and towards developing capability for Indian Crewed Landing on the Moon by 2040. NGLV will have 3 times the present payload capability with 1.5 times the cost compared to LVM3, and will also have reusability resulting in low–cost access to space and modular green propulsion systems.

The goals of the Indian space programme during the Amrit Kaal require a new generation of human rated launch vehicles with high payload capability and reusability.

ISRO's LVM3

Hence, the development of the Next Generation Launch Vehicle (NGLV) is taken up which is designed to have a maximum payload capability of 30 tonnes to Low Earth Orbit, which also has a reusable first stage. Currently, India has achieved self–reliance in space transportation systems to launch satellites up to 10 tonne to Low Earth Orbit (LEO) and 4 tonne to Geo–Synchronous Transfer Orbit (GTO) through the currently operational PSLV, GSLV, LVM3 and SSLV launch vehicles.

The total fund approved is Rs. 8240 Crore and includes the development costs, three developmental flights, essential facility establishment, Programme Management and Launch Campaign.

India sights science goals on Venus with VOM

The Union Cabinet also approved the development of Venus Orbiter Mission (VOM) that will be a significant step towards the Government's vision of exploring and studying the Venus, beyond moon and mars. Venus, the closest planet to Earth and believed to have formed in conditions similar to Earth, offers a unique opportunity to understand how planetary environments can evolve very differently.

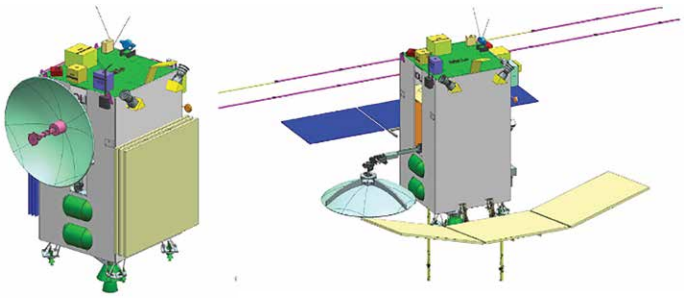
The 'Venus Orbiter Mission' to be accomplished by Department of Space is envisaged to orbit a scientific spacecraft in the orbit of planet Venus for better understanding of the Venusian surface and subsurface, atmospheric processes and influence of Sun on Venusian atmosphere. The study of the underlying causes of transformation of Venus, which is believed to be once habitable and quite similar to Earth would be an invaluable aid in understanding the evolution of the sister planets, both Venus and Earth.

ISRO will be responsible for the development of spacecraft and its launch. The Project will be effectively managed and monitored through the established practices prevailing at ISRO. The data generated from the mission would be disseminated to the scientific community through existing mechanisms.

The mission is expected to be accomplished on the opportunity available during March 2028. The Indian Venus mission is expected to answer some of the outstanding scientific questions resulting in various scientific outcomes. The realisation of the spacecraft and launch vehicle is through various industries and it is envisaged that there would be large employment potential and technology spin–off to other sectors of the economy.

The total fund approved for the "Venus Orbiter Mission" (VOM), is Rs. 1236 Cr out of which Rs 824 Crore will be spent on the spacecraft. The cost includes development and realisation of the spacecraft including its specific payloads and technology elements, global ground station support cost for navigation and network as well as the cost of launch vehicle.

The mission would enable India for future planetary missions with larger payloads, optimal orbit insertion approaches. There would be a significant involvement of Indian industry during the development of the spacecraft and launch vehicle. The involvement of various academic institutions and training to students in pre–launch phase that includes design, development, testing, test data reduction, calibration etc. is also envisaged. The mission through its unique instruments offers the Indian Science community new and valuable science data and thereby providing emerging and novel opportunities.



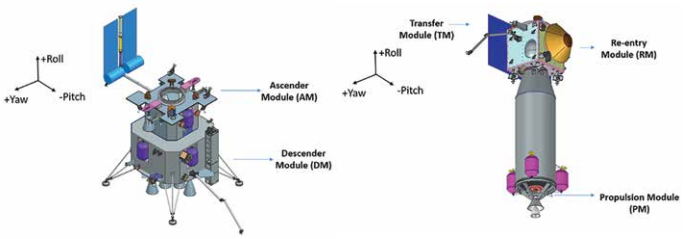
Left: Launch configuration of VOM and Right: On–Orbit configuration of VOM

India goes to Moon again: This time to come back to Earth after landing on the Moon

The Union Cabinet approved the mission to moon, named Chandrayaan–4 to develop and demonstrate the technologies to come back to Earth after successfully landing on the Moon and also collect moon samples and analyse them on Earth. This Chandrayaan–4 mission will achieve the foundational technologies capabilities eventually for an Indian landing on the moon (planned by year 2040) and return safely back to Earth. Major technologies that are required for docking/undocking, landing, safe return to Earth and also accomplish lunar sample collection and analysis would be demonstrated.

The total fund requirement for the technology demonstration mission "Chandrayaan–4" is Rs. 2104 Crore. The cost includes spacecraft development and realisation, two launch vehicle missions of LVM3, external deep space network support and conducting special tests for design validation, finally leading to the mission of landing on moon surface and safe return to Earth along with the collected lunar sample.

The mission would enable India to be self–sufficient in critical foundational technologies for manned missions, lunar sample return and scientific analysis of Lunar samples. Towards realisation there would be a significant involvement of Indian industry. Plan for associating the Indian academia through Chandrayaan–4 science meets, workshops, is already in place. This mission will also ensure the establishment of facilities for curation and analysis of the returned samples, which will be national assets.



Left: Stack–1 in Chandrayaan–4, which comprises the Ascender and Descender Modules Right: Stack–2 in Chandrayaan–4, which comprises the Transfer, Re–entry and Propulsion Modules.

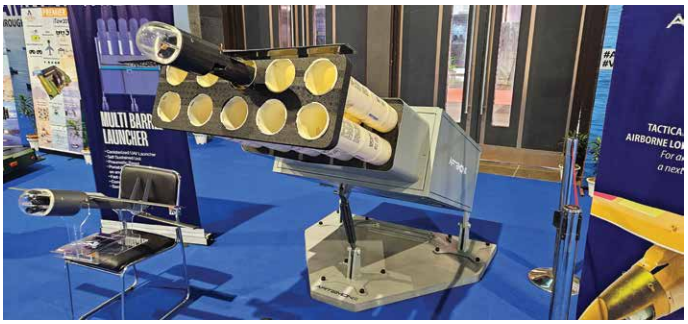
Indian Navy's Swavlamban 2024

The exhibition open to innovators, startups and MSMEs organised as part of the third edition of the Naval Innovation and Indigenisation Organisation's annual event, Swavlamban, was inaugurated by Admiral Dinesh K Tripathi, Chief of the Naval Staff, at Exhibition Hall 14, Bharat Mandapam, on 28 October 2024. The theme of Swavlamban 2024 was "Strength and Power through Innovation and Indigenisation". Open for public viewing on 28 and 29 October 2024, the exhibition showcased niche innovative technologies, concepts and products designed and developed by Indian defence startups and MSMEs.

Events of 28 October 2024 included an interactive outreach session aimed at discussing problem statements and challenges posed as part of the Defence Innovation Organisation's ADITI 2.0 launch under the iDEX scheme, as also the bringing together of 'Fund Seekers' (i.e. startups/ MSMEs) and 'Fund Providers' (i.e. venture capitalists/ incubators). Wide participation of eminent dignitaries, the Defence Attache Corps, members of the three Armed Forces and CAPFs, the academia and the general public at the exhibition is expected to provide fillip to the spirit of innovation and strengthen the culture of creativity in addressing emerging challenges to national security.

This third edition of Acing Development of Innovative Technologies with iDEX (ADITI 3.0) challenge and 13th edition of Defence India Start–up Challenges (DISC 13) was unveiled by Raksha Mantri Mr. Rajnath Singh during Naval Innovation and Indigenisation Organisation (NIIO) seminar 'Swavlamban' at Bharat Mandapam. These challenges aim to advance indigenous defence technologies and operational efficiencies.

The ADITI 3.0 features a challenge from the Indian Navy to design a High Power Microwave Weapon System. The DISC 13 presents seven challenges, three from Indian



Army and two each from Indian Navy and Indian Air Force, in the domains of Artificial Intelligence, military communication and autonomous bots among others.

Raksha Mantri also felicitated iDEX winners and Hackathon awardees on the occasion. In his address, he stated that in the last two sessions of 'Swavlamban', Indian Navy had received over 2,000 proposals from Indian industries under the SPRINT challenges, which were unveiled by Prime Minister Mr. Narendra Modi during Swavlamban 1.0 in July 2022. SPRINT stands for Supporting Pole–Vaulting in R&D through iDEX,

Naval Innovation and Indigenisation Organisation and Technology Development Acceleration Cell.

The Defence Minister said that these proposals had been converted into 155 challenges, which would help in completing 171 contracts. In addition, the Swavalamban initiative has collaborated with 213 MSMEs and start–ups under iDEX. Till now, Acceptance of Necessity of more than Rs 2,000 crore had been given in 19 cases, of which contracts worth up to Rs 784 crore have been completed.

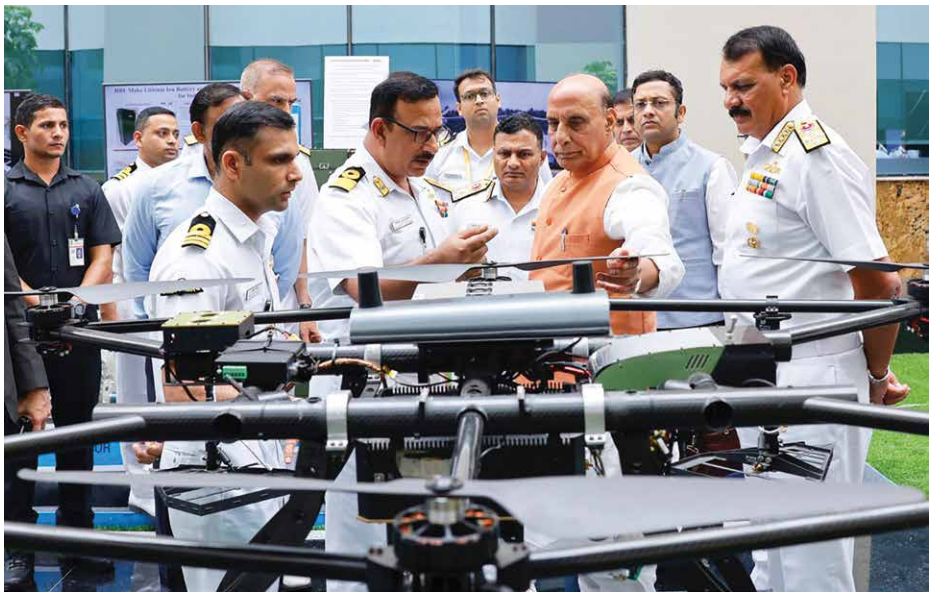
Speaking on the occasion, Chief of the Naval Staff Admiral Dinesh K Tripathi reiterated the Indian Navy's commitment to safeguard national maritime interests, adding that to facilitate this journey, a solemn resolve had been made to become a 'Fully Aatmanirbhar Force' by 2047. He mentioned that through collaborative efforts of Defence Innovation Organisation (DIO) and NIIO, 173 challenges presented to the Industry by the Navy, including all the 75 challenges launched by the Prime Minister as part of 'Azadi ka Amrit Mahostsav' had been converted into pragmatic solutions and positive outcomes.

"The overwhelming success of our previous two editions has inspired us to expand the scope and scale of this year's edition through the launch of new transformational technology challenges and a Hackathon. This landmark edition is also witnessing the largest ever participation of delegates from across our defence sector, including counterparts from the Army, Air Force and Coast Guard as well as Central Armed Police Forces, Defence PSUs and DRDO," the Chief of the Naval Staff stated.

Chief of the Army Staff General Upendra Dwivedi, Chief of the Air Staff Air Chief Marshal AP Singh, Defence Secretary–designate RK Singh, Secretary, Department of Defence R&D, Chairman DRDO Dr Samir V Kamat, Chief of Integrated Defence Staff Lt Gen JP Mathew, other senior civil and military officials of Ministry of Defence, President, Society of Indian Defence Manufacturers Rajinder Singh Bhatia, industry leaders and academia were present on the occasion.

Naval Commanders' Conference

The second edition of the bi–annual Naval Commanders' Conference 2024 was conducted from 17 to 20 September 2024 at Nausena Bhawan, New Delhi. The Conference focused on contemporary security paradigms, and critical analysis to further enhance the combat capability of the Navy and synergise operations with the other Services. It was also meant to delve into the dynamics of the geostrategic situation of the region in the backdrop of international developments and through intense discussions by the senior hierarchy of the Navy, formulate a future roadmap to consolidate as a First Responder and Preferred Security Partner in the Indian Ocean Region and its steadfast commitment and contributions to the national vision of Aatmanirbharta.



The maiden Conference at the new Nausena Bhawan, New Delhi, commenced with the inaugural address by Adm Dinesh K Tripathi, Chief of the Naval Staff, highlighting the Conference as the single most important apex level forum of the Indian Navy to discuss, ideate, and find solutions towards ensuring that the Navy remains a Combat Ready, Credible, Cohesive & Future Ready Force. CNS highlighted the flux in the contemporary geostrategic environment together with emerging disruptive technologies and evolving tactics in the maritime domain. Enumerating the key focus areas for the IN in the short, medium, and long term, CNS reiterated the need to ensure combat readiness of all naval platforms, equipment, weapons, and sensors underpinned by the singular focus on Ordnance Delivery on Target. CNS also impressed upon the need to maintain vigil towards ensuring maritime security and coastal defence, through close liaison, synergy, and functional linkages with the Coast Guard and other maritime agencies. CNS urged the Commands and Staff at Naval Headquarters to continue evolving as a well–balanced multi–dimensional seamlessly networked force ready to respond, protect, and promote our national maritime interests–Anytime, Anywhere, Anyhow!

Raksha Mantri Shri Rajnath Singh addressed and interacted with the Naval Commanders on 19 September 2024. The RM acknowledged Indian Navy's efforts in maintaining maritime security in IOR and appreciated the key role played by the Indian Navy in protecting the critical commodities transiting through the Gulf of Aden. He shared his thoughts on a multitude of operational and strategic issues with the Naval Commanders, exhorting them to maintain high operational preparedness and readiness to tackle emerging maritime challenges. He also impressed upon the need for enhancing jointness with other Services.

RM also attended a Tech Demo, organised as part of the event. Various agencies, including Indian Navy's premier R&D organisation Weapons & Electronics Systems Engineering Establishment (WESEE) showcased indigenous solutions, including Autonomous Systems, domain awareness, software defined radios and other niche tech initiatives. Chief of Defence Staff General Anil Chauhan, Defence Secretary Giridhar Aramane and other senior civil and military officials were present on the occasion.

The CDS, the COAS and the CAS also interacted with the Naval Commanders during the Conference sharing their assessments of the operational environment, and outlining readiness levels to defend national interests. They also highlighted areas of convergence amongst three Services vis–a–vis the prevailing operational environment, to enable further integration of the Armed Forces to collectively meet India's national security challenges and imperatives.

The Conference included a review of major operational, materiel, infrastructure, logistics and human resource related initiatives, and discussions on contemporary and emerging maritime security challenges and mitigating strategies.

TASL and Airbus inaugurate C295 FAL in India

L–R: Rémi Maillard, President and Managing Director at Airbus India & South Asia; Noel Tata, Chairman, Tata Trusts; Mr. Bhupendrabhai Patel, CM, Gujarat; Pedro Sanchez Perez–Castejon, President of the Government of Spain; Mr. Narendra Modi, PM, India; Mr. Rajnath Singh, Defence Minister, India; N. Chandrasekaran, Chairman, Tata Sons and Sukaran Singh, CEO & MD, Tata Advanced Systems Ltd.

As a major milestone for India's aerospace and defence industry, Tata Advanced Systems Limited (TASL) and Airbus inaugurated the Final Assembly Line (FAL) complex for the Airbus C295 aircraft in Vadodara, Gujarat in India on 28 October 2024. TASL and Airbus are partnering for the pioneering 'Make in India' project to deliver 56 C295 aircraft to the Indian Air Force (IAF). The state–of–the–art facility was inaugurated by the Prime Minister of India, Mr. Narendra Modi and the President of the Government of Spain, Pedro Sanchez Perez–Castejon in the presence of N. Chandrasekaran, Chairman of Tata Sons and Michael Schoellhorn, CEO of Airbus Defence and Space.

Providing a major boost to the Government of India's 'AatmaNirbhar Bharat' (self–reliant India) programme, this is the first instance of the private sector setting up an aircraft FAL in India. The inauguration comes three years after the Indian Air Force (IAF) formalised the acquisition of 56 Airbus C295 aircraft to replace their legacy Avro fleet. As per the contract, 40 units will be manufactured and assembled in partnership with TASL at this FAL, while 16 will be delivered to the IAF in 'fly–away' condition from Airbus' final assembly line in Seville, Spain. To date (end–October 2024), a total of six aircraft have already been delivered.

N. Chandrasekaran, Chairman of Tata Sons, stated, "The Tata Group is very proud in setting up this advanced facility which will manufacture the nation's first private defence aircraft from the ground up. It will significantly enhance both defence and advance manufacturing capabilities. I am thankful to Prime Minister Shri Narendra Modi, Hon'ble Pedro Sanchez Perez–Castejon and the distinguished guests for joining us at this momentous occasion in India's indigenous manufacturing journey."

"The inauguration of this final assembly line (FAL) is a significant milestone in India's journey towards self–reliance in defence manufacturing. The C295 India programme demonstrates Airbus' commitment to supporting India's vision of 'Atmanirbhar Bharat' in defence manufacturing. Aligned to this vision, this FAL will propel the advancement of the aerospace industrial ecosystem in the country, unlocking the potential for cutting edge design, component manufacturing, aircraft assembly and services capabilities across the Indian value chain," stated Michael Schoellhorn, CEO of Airbus Defence and Space.

The FAL will integrate manufacturing of detail parts and related tooling, sub–assemblies, major component assemblies, tools, jigs and testers. The production of components of the C295 aircraft have already started in the Main Component Assembly (MCA) facility in Hyderabad. The parts for the first C295 aircraft to be made in India have been shipped to the Vadodara FAL, where the aircraft will be assembled and then delivered to the IAF.

The first 'Make in India' C295 will roll out of the Vadodara FAL in September 2026, which will be a milestone for the Indian aerospace industry; and shall ramp–up to deliver 40 aircraft to the IAF by August 2031, as required by the IAF contract.

India has become the largest customer for the C295, with the acquisition of 56 aircraft. The C295 'Make in India' programme will produce more than 85% structural and final assembly of 40 aircraft along with the manufacturing of 13,000 detail parts in India, for which 21 special processes have been certified and 37 India based suppliers, both from the private and public sectors, have been onboarded.

For Airbus, India is a strategic resource hub where the company is expanding its industrial footprint with aircraft assembly, component manufacturing, engineering design and development, MRO support, pilot and maintenance training as well as academic collaboration to foster human capital. Airbus invests more than $1 billion every year in a robust and comprehensive supply chain in India for components and services, generating more than 15,000 jobs. Additionally, Airbus India's own engineering and digital centres in Bengaluru contribute to all the commercial and helicopter programmes of Airbus globally.

‘HIM–DRONE–A–THON 2’

In a bold stride toward redefining military capabilities in high altitude environments, the Indian Army, in collaboration with the Federation of Indian Chambers of Commerce and Industry (FICCI), conducted the highly anticipated HIM–DRONE–A–THON 2. This pioneering initiative aimed to tap into the power of cutting edge indigenous technology, focusing on enhancing operational efficiency and tactical superiority in some of the most challenging terrain on the planet through the use of drones.

Conducted from 17–18 September 2024 in the backshop of the breathtaking Wari La Pass, Ladakh, at altitudes of 15,400 feet, HIM–DRONE–A–THON 2 offered an exclusive platform for many drone manufacturers to showcase a spectrum of drone solutions designed for high–altitude applications. These products spanned across domains of surveillance, logistics, loitering munitions, swarm and FPV (first–person view) operations.

The event had extensive themes ranging from FPV Drones, Swarm Drones, ISR Drones and several others. The primary focus of the competition was to evaluate and compare the performance of various aerial, ground, water and underwater drones in the challenging terrain of Ladakh. The event aimed to identify cutting edge technologies that could enhance the operational strength of the Indian Armed Forces and border guarding forces in high altitude terrains.

BonV Aero in record for high altitude drone flight

BonV Aero, India’s aerial mobility manufacturing startup firm has entered the International Book of Records for setting a new world record in high altitude Unmanned Aerial Vehicles (UAV) technology. The Odisha based startup company, a key supplier of heavy–lift UAVs to the Indian Army, completed a hover flight test at 19,024 feet, carrying a 30 kg payload, setting a world record for UAV operations at high altitudes.

The test was conducted at Umling La Pass, Ladakh, the highest motorable mountain pass in the world. BonV Aero’s UAV platform lifted a 30kg payload and hovered at 19,024 feet with a maximum takeoff weight of 100kg. This record breaking flight, executed safely, marked a milestone in logistic UAV capabilities, especially in areas where helicopters, like the Cheetah, face payload limitations.

Scandron at HIM–DRONE–A–THON 2

Scandron Pvt. Ltd won first place in the High Altitude Logistics category at HIM–DRONE–A–THON 2, held at the Wari La Pass in UT Ladakh. This esteemed event, organised by the Indian Army in partnership with the Federation of Indian Chambers of Commerce & Industry (FICCI), highlighted the latest innovations in drone technology specifically designed for challenging High–Altitude Areas (HAA). This win was particularly significant as Scandron continues to solidify its position as a leader in Logistics Drones technology. Earlier this year, Scandron became the first and only company in India to

receive DGCA Type Certification for its logistics drone. DGCA Type Certifications is mandatory for commercial drone operations in India.

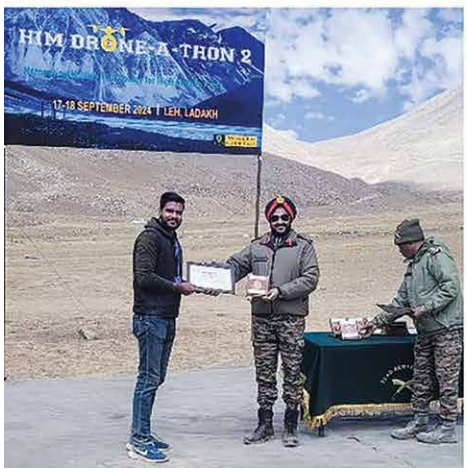
InsideFPV crowned first prize in FPV category

InsideFPV, an Indian drone company and a leading innovator in First Person View (FPV) drone technology, announced its achievement of being adjudged the winner of Him–Dron–A–Thon at Himtech 2024. The Gujarat–based firm's display at the event was highlighted by agility and performance in the FPV category, as their Advik Recce drone completed all 9 obstacles in a time of 2 minutes and 36 seconds, with a payload of 120 grams (camera), at the speed of 200 kph at a takeoff altitude of 15,600 feet with a range of 5,855 meters.

Optiemus Unmanned Systems at Him Drone–A–Thon 2024

Optiemus Unmanned Systems Private Limited (OUS), a wholly owned subsidiary of Optiemus Infracom Limited (a leading telecommunications and electronics manufacturing group in India), announced that it has marked a significant milestone at the Him Drone–A–Thon 2024. The first phase of trials took place at the Wari la Pass, with successful companies advancing to demonstrate their drone capabilities at the Umling La Pass, World's highest motorable pass at an altitude of 19,200 feet.

OUS Vajra series drones "sets new standards in endurance and altitude, by demonstrating advanced mission capabilities in loitering munitions (bomb drop capabilities) and long–range surveillance".



HAL's 1st AL–31FP for Su–30MKI under new contract

Hindustan Aeronautics Limited (HAL) handed over the first AL–31FP aero engine manufactured under the 240 engine contract to IAF on 30 September 2024 at Koraput in the presence of Mr Sanjeev Kumar, Secretary (Defence Production) and Dr. D K Sunil, CMD (HAL).

Mr Saket Chaturvedi, CEO (MiG Complex) handed over the first aero engine for Sukhoi–30MKI fighter to Air Vice Marshal, K Harisankar of IAF. Mr R B Nagaraja, ADG AQA (Koraput) handed over the document to IAF. The contract for 240 AL–31FP aero engines for Su–30MKI aircraft was signed with HAL on 9 September 2024 and these engines would be delivered in eight years.

Mr Sanjeev Kumar lauded HAL's efforts in delivering the first engine within two weeks of signing the contract. "This key milestone reflects HAL's aero engine manufacturing competency and dedication to support Su–30MKI fleet of IAF. It is very heartening to see that Koraput Division has mastered cutting edge technologies of aero engine manufacturing and has set up required infrastructure to match with the global OEMs. I am confident that the Division will not only serve IAF but will also play a bigger role in exporting to global customers", he stated. He also motivated the employees of Koraput to focus on self–reliance efforts and adopt Quality 4.0 processes.

Dr. Sunil in his inaugural address stated, "HAL is committed to timely delivery of 240 engines. Koraput Division will proactively procure material as well as work towards capacity enhancement to meet IAF's expectations. The Government has envisioned Atmanirbharta to build a vibrant eco–system in Aerospace and Defence. During this entire engine manufacturing process, we aim to engage Indian industries from present level of work share from 40% to more than 50% in next 2–3 years and help in employment generation. With the support and guidance from the Ministry of Defence, we will strive to achieve Atmanirbharta in Defence and propel HAL towards Viksit Bharat".

AVM Harisankar appreciated the strong commitment, significant contribution and resilience of Koraput Division and its workforce over the years in supporting the MiG–21, MiG–29 and the Su–30MKI fleet of IAF. Mr. A B Pradhan, Director (HR & Finance) said that HAL's focus was on capacity and capability building to meet the commitments of its customers.

Sukhoi Engine Division, Koraput is a state–of–the–art Division created by HAL for manufacture of engines of Su–30MKI aircraft from raw material stage to final engine. Mr. S M Jena, Executive Director (Koraput) and other senior officials of HAL, DGAQA, RCMA, IAF and Odisha Govt were present on the occasion.

AL 31 Engine Handing Over

Embraer looking at enhancing supply chain base in India

A high level delegation from Embraer concluded a visit to India mid–September 2024 as it evaluates the expansion of its supply chain into the country. Embraer foresees potential suppliers across its defence, commercial aviation and executive jets businesses for areas such as aerostructures, machining, sheet metal, composites, forgings, wire harness, and hardware and software development, recognising that aerospace engineering capabilities are clearly present and available in the country. The visit comes amidst burgeoning relations between Brazil and India.

"India has a robust aviation and defence industry, and we see strong viability for manufacturers and systems developers in India to be key suppliers to Embraer," stated Roberto Chaves, Executive Vice–President of Global Procurement and Supply Chain at Embraer. "We are driven by a common vision, which is to drive the aviation capabilities of Brazil and India to greater heights, and to deliver value to our customers around the world."

India is a strategic market for Embraer in all its business segments. The Embraer footprint in the country surpasses 44 aircraft, including customers in Commercial Aviation, Executive Jets and Defense & Security. In particular, the Indian Government and Indian Air Force operate a fleet of 5 Embraer VIP jets and 3 EMB 145 AEW "Netra" military aircraft, respectively.

One of Embraer's key future opportunities in India is the Indian Air Force MTA (Medium Transport Aircraft) programme, in which Embraer is well positioned to offer the best in class, modern C–390 Millennium transport aircraft in partnership with the very reputed Indian company Mahindra. The two companies announced their partnership back in February 2024.

Embraer sees India as a key partner in the region and expects, together with Mahindra, to implement an extensive local supply chain programme. This initiative may include an assembly line for the C–390 in India, when selected for this programme. Tied with a local long term support programme offer, Embraer and Mahindra aim to fulfill the expectations of the "Make in India" initiative of the Indian Government.

Courtesy: Embraer

BEL and IAI in JV for MRSAM support

Bharat Electronics Limited (BEL) and Israel Aerospace Industries (IAI), Israel's leading aerospace and defence company, have announced the establishment of a joint venture company (JVC), which has been incorporated in the name of BEL IAI AeroSystems Private Ltd.

The JVC with its registered office in Delhi shall be the single point of contact (SPOC) for extending long term product support to the Medium Range Surface–to–Air Missile (MRSAM) systems of India's Defence Forces.

The partnership marks another significant step in cementing the relationship between the two companies that have a long history of association for strategic programmes. BEL and IAI are collaborating in several joint programmes for the Tri–services.

The JVC has been set up for providing life cycle support, both technical and maintenance related, for MRSAM air defence systems of the country. MRSAM is an advanced, air and missile defence system that provides protection against a variety of aerial threats. It was jointly developed by IAI and DRDO for India's Defence Forces and is currently used by the Indian Air Force, Indian Army, Indian Navy and also Israeli Defence Forces. The system includes an Advanced Phased Array Radar, Command and Control shelter, mobile launchers and interceptors with an advanced RF seeker.

The formation of the JVC is in line with the Indian Government's vision of Atmanirbhar Bharat. The JVC will leverage the capabilities of both IAI and BEL.

Morocco and TASL sign deal for local production of WhAP



The Kingdom of Morocco's Royal Armed Forces and Tata Advanced Systems Limited (TASL) on 30 September 2024 announced a strategic partnership for the final assembly and integration of the TASL Wheeled Armoured Platform 8x8 in Casablanca, Morocco. Tata Advanced Systems' local unit will produce a significant number of the specialised vehicle systems for Morocco and potentially for other countries in Africa. This will be Morocco's first large defence manufacturing plant, and the first defence manufacturing plant by an Indian defence OEM situated outside India. The TASL platform 8x8, which has been developed jointly by Tata Advanced Systems and Tata Motors with DRDO, is itself a successful example of Indian private sector and government partnership. This will generate production in India while also starting final assembly of a defence platform in Morocco.

The production facility is expected to be operational over the next 12 months to deliver the contracted quantity of units thereafter over time. Significant content of the TASL platform 8x8 will be exported from India, while also meeting a commitment for local employment, value addition and support in Morocco. The production facility in Casablanca covering 20,000 sq. m. has been identified. While the initial contracted quantity is entirely to meet the needs of Royal Moroccan Army, this facility will be a 100% subsidiary of Tata Advanced Systems and become an export hub to meet the requirements of other countries especially in Africa.

During the signing, Mr. Abdeltif Loudyi, Minister Delegate to the Head of Government in charge of the Administration National Defence, stated, "This partnership with Tata Advanced Systems marks a new era in the development of our defence industry. It is a strategic step that will not only contribute to our national self–reliance but also our ability to scale up our defence industry quickly and reliably. We are committed to creating a robust industrial ecosystem that drives economic growth and delivers tangible benefits to our investors and industry partners similar to the successful model of the automobile industry."

Mr. Sukaran Singh, Chief Executive Officer and Managing Director, TASL, stated, "TASL is extremely proud to sign this partnership with the government of the Kingdom of Morocco. This contract is of significant size and of strategic importance for us. This not only enables TASL to help initiate Morocco's defence ecosystem but also acts as a launch point for TASL into rest of Africa for select defence systems. We would like to acknowledge the progressive and industry friendly policies of the Kingdom of Morocco that made it viable for TASL to sign this landmark production and supply agreement."

Tata Advanced Systems will work closely with the government of the Kingdom of Morocco to develop a robust ecosystem which would include engaging with the local supply chain partners and vendors, training and skill development of the workforce and building related capabilities, and to maintain the systems in–country. Further, the facility will adopt global standards in line with international best practices.

TASL platform 8x8 incorporates state of the art critical technologies like a high power, integrated power pack with automatic transmission, with modularity and scalability which can be easily customised to cater to various missions and operating conditions of Morocco's Royal Armed Forces.

Tata Advanced Systems Limited, a wholly owned subsidiary of Tata Sons, is a significant player for aerospace and defence solutions in India. Tata Advanced Systems offers a full range of integrated solutions across: Aerostructures & Aeroengines, Airborne Platforms & Systems, Defence & Security, and Land Mobility. Tata Advanced Systems has a strong portfolio of partnerships and joint ventures with leading global aerospace and defence firms, making it an integral partner in the international supply chain and in some instances, a global single source provider for leading aerospace and defence OEMs. With the requisite capabilities, resources and scale, Tata Advanced Systems is equipped to deliver end–to–end innovative solutions throughout the entire aerospace and defence value chain from design to full platform assembly, and is well positioned in areas that include satellites, missiles, radars, unmanned aerial systems, artillery guns, command and control systems, optronics, homeland security and land systems, in addition to aircraft and helicopters.

DRDO's field firing trials of Light Tank 'Zorawar'

Defence Research and Development Organisation (DRDO), on 13 September 2024, successfully conducted the preliminary automotive trials of the Indian light Tank, Zorawar, a highly versatile platform capable of deployment in high altitude areas. During the field trials conducted in the desert terrain, the Light Tank demonstrated exceptional performance, efficiently meeting all the intended objectives. In the initial phase, the tank's firing performance was rigorously evaluated and it achieved the required accuracy on designated targets.

Zorawar has been successfully developed by the Combat Vehicles Research & Development Establishment (CVRDE), a unit of the Defence Research and Development Organisation (DRDO), in collaboration with Larsen & Toubro Ltd. Numerous Indian industries, including Micro, Small, and Medium Enterprises (MSMEs), contributed to the development of various sub–systems, showcasing the strength of indigenous defence manufacturing capabilities within the country.

Raksha Mantri Rajnath Singh lauded DRDO, the Indian Army, and all associated industry partners for the successful trials of the Indian Light Tank.

He described the achievement as a significant milestone towards India's goal of self–reliance in critical defence systems and technologies.

Secretary, Department of Defence R&D and Chairman DRDO Dr Samir V Kamat also extended congratulations to the entire team involved in the project.

All photos: Screen grabs from DRDO video

HAL continues to shine

The Make in India (Atmanirbhar) initiative, launched by the Prime Minister of India, is aimed at transforming India into a global manufacturing hub. The defence sector, a key pillar of this initiative, has witnessed significant changes in the past decade and catalysed a shift in approach, particularly in the case of Hindustan Aeronautics Limited (HAL). Since its inception in the 1940s, HAL has played a pivotal role in enhancing India's defence capabilities by manufacturing aircraft, helicopters and other aviation systems crucial to the Indian defence forces. Over the years, HAL has transformed itself from a producer of high–tech assets into a technology company credited with an array of indigenous products such as the ALH Dhruv, Rudra, and LCA Tejas.

Policy changes

The government has taken several policy initiatives in recent years and introduced reforms to encourage the indigenous design, development and manufacture of defence equipment, thereby promoting self–reliance in defence manufacturing and technology in the country. These initiatives, inter alia, include prioritising the procurement of capital items from domestic sources under the Defence Acquisition Procedure (DAP) 2020, which has led to a reversal of the 70:30 import–export ratio; the announcement of 18 major defence platforms for industry–led design and development in March 2022; and the notification of 'Positive lndigenisation Lists' for the Services and Defence Public Sector Undertakings (DPSUs), imposing an embargo on imports beyond specified timelines.

Strategic autonomy and security

When HAL started off in 1940 as an MRO for allied forces, very few would have predicted that it would produce the first indigenous supersonic fighter, the Hindustan Fighter–24 (Marut), in the early 1960s. However, in the 1970s and 1980s, the country's focus shifted towards licensed manufacturing due to the geopolitical pressures of the time. The design of the LCA Tejas and ALH Dhruv in the 1990s further pushed the country towards indigenisation. The next significant boost for the development of indigenous capacity and capability came in 2014 through the Make in India initiative.

The Make in India initiative has helped HAL transform itself from being a production agency for licensed/ToT manufacturing into an integrated provider of advanced technology solutions through indigenous design, development and production for both fixed and rotary wing platforms. The initiative mandates increasing domestic content in defence projects, and HAL has responded by developing new platforms with higher levels of indigenisation, including the Light Combat Aircraft Tejas, Hindustan Turbo Trainer–40, Light Combat Helicopter Prachand, Light Utility Helicopter and Advanced Light Helicopter Dhruv.

Self–reliance and indigenous capability building

The initiative has significantly boosted India's defence production capabilities. In the fiscal year 2023–24, the defence production value reached approximately Rs. 1.27 lakh crore, marking a 16.7 per cent growth over the previous year. In the last five years, an increase of 60 per cent has been achieved.

HAL has been a major player in this achievement by contributing 23.7 per cent of the share. The Value of Production of HAL has been steadily growing over the years from Rs. 20,590 crore in FY 2019–20 to Rs. 30,118 crore in FY 2023–24. Now there is a considerable decrease in dependency on foreign OEMs resulting in decreased Turn Around Time and increased serviceability of aircraft/helicopters/systems. The Make in India initiative has led to a spurt in indigenisation efforts over the last ten years and has helped HAL in addressing supply chain challenges faced due to the current geopolitical situation. HAL's indigenisation efforts have witnessed a fourfold increase in annual foreign exchange savings and a multi–fold increase in vendor base.

Increased foreign direct investment (FDI) and technology transfer

The initiative has opened up the sector to Foreign Direct Investment (FDI), with up to 74 per cent allowed through the automatic route and 100 per cent with government approval in specific cases. This has led to joint ventures, partnerships and technology transfers between Indian companies and global aerospace and defence giants, enabling Indian manufacturers to adopt advanced technologies.

HAL signed an MoU with General Electric, USA, in June 2023 for ToT and Manufacturing of GE–414 aero–engine in India for LCA Mk.2 aircraft with 80 per cent technology transfer. A 50:50 Joint Venture "SAFHAL Helicopter Engines Pvt Ltd" was formed with Safran Helicopter Engines, France, in November 2023, for indigenous design and development of engines for Indian Multi Role Helicopter and Deck Based Multi Role Helicopter. This is the first instance where a high performance aero–engine will be jointly developed for an Indian platform with access to core engine technologies. Both the projects will result in acquiring core engine design and manufacturing technologies and transform the Indian aero engine manufacturing ecosystem.

Boost in defence exports

The focus on indigenous manufacturing has also enhanced export opportunities for Indian made defence and aerospace products. Defence exports have seen a remarkable rise, reaching Rs. 21,083 crore in 2023–24, which is a 32.5 per cent increase from the last financial year. Over the last decade, defence exports have grown 21 times, indicating India's strengthening position in the global defence market. This growth not only enhances India's economic stature but also strengthens diplomatic ties with importing countries.

HAL exported two Hindustan 228 aircraft to Guyana Defence Forces and set up a new regional marketing office in Kuala Lumpur, Malaysia, in July 2023 to promote indigenous platforms in the export market. This regional office will serve as a hub for HAL's engagement with other South East Asian Countries and also act as a window for other Indian Defence PSUs.

Economic benefits and growth of small and medium enterprises (SMEs)

The aerospace and defence sector, under Make in India, has fostered the growth of SMEs. With the emergence of the manufacturing ecosystem, HAL's efforts have resulted in industry partners graduating from Tier III to Tier I.

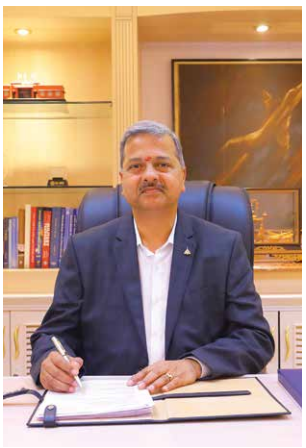
HAL aims to be a lead aerospace integrator, primarily through robust private partnerships. HAL has been supporting the private industries (including MSMEs), with more than 2,000 registered sub–contractors, by extending technical support and handholding. HAL has uploaded around 26,000 imported items in Srijan Portal to invite private vendors for indigenous development. HAL is also utilising private vendors in the design and development of systems; examples include Multi Function Display and Solid State Flight Data Recorder.

Job creation and skill development

Make in India initiative has created numerous job opportunities across the aerospace and defence sector. The demand for skilled labour in the aerospace sector has increased for production and assembly lines to high–end R&D.

HAL has formed an Aerospace and Aviation Sector Skill Council (AASSC) to address the need for the development of a specialised workforce through skill development programmes and bridge the gap between demand and supply of skilled man power in areas like design and development, manufacturing, MRO, Airline Operations and Airports.

The Make in India initiatives at HAL have been made possible due to the active support extended by all stakeholders lite Indian Defence Services, DRDO, ADA, ADE, RCMA, DGAQA, DGCA, industry partners and MSMEs.



The success of HAL under Make in India has been fuelled by the inflow of orders from the government. This is a testament to the power of well executed industrial policy in shaping the nation's defence and economic future.

By Dr DK Sunil, Chairman and Managing Director, HAL

(This first appeared in The Times of India, 28 September 2024)

GE Aerospace's GEnx milestone with South Asian airlines

(Photos: GE and Vistara)

GE Aerospace announced on 25 September 2024 that its GEnx commercial aviation engine family achieved a milestone of two million flight hours with South Asian airlines. The first GEnx was delivered in the region in 2012 with 90 GEnx engines now powering Air India, Vistara and Biman Bangladesh flights.

"The GEnx engine has been instrumental in supporting South Asia's aviation growth. This milestone is a testament to its engineering excellence and technology maturity," stated Mahendra Nair, Group Vice President for Commercial Programme at GE Aerospace, during a visit to New Delhi. "We continue to support our customers' business goals, with our best technology and services offerings."

"We are proud of our long relationships with the South Asian airlines, including most recently Air India as it plans expansion of operations with 20 new widebody aircraft that will be powered by 40 GEnx engines," stated Vikram Rai, South Asia Chief Executive Officer, GE Aerospace.

"GE Aerospace has been a trusted partner in our journey towards expanding our widebody operations, and the GEnx engine has consistently delivered in terms of reliability, efficiency and sustainability," stated Nipun Aggarwal, Chief Commercial Officer, Air India. "As we continue to grow our fleet, we are confident that the GEnx engine will play a critical role in helping us achieve our operational goals."

Reliable and sustainable technology

As a preferred choice for airlines worldwide, powering Boeing's 787 Dreamliner and the 747–8, the GEnx engine showcases a leap forward in propulsion technology. The engine's superior performance contributes to reduced operating costs and a lower carbon footprint, aligning with the global aviation industry's sustainability goals by making it 15% more fuel efficient and emitting up to 15% less CO2 than its predecessor, the CF6 engine. The GEnx engine is a product of decades of operational knowledge and experience, derived from the GE90 engine. With its innovative twin–annular pre–swirl (TAPS) combustor, the engine significantly reduces nitrogen oxide (NOx) emissions by up to 60% below current regulatory limits. Researchers and engineers at GE Aerospace's technology centre in Bengaluru worked closely with regional customers and implemented various performance improvement solutions and deployed various innovative on–wing technologies like foam wash, advance blade inspection and operational data based insights to improve engine's time–on–wing and reduce maintenance burden.

In March 2023, the GEnx engines powered the first widebody aircraft on a long–haul route to India using Sustainable Aviation Fuel (SAF). Vistara's Boeing 787–9 Dreamliner flew from Charleston, South Carolina to New Delhi on a blend of 30% SAF with conventional jet fuel.

To further enhance the engine's efficiency and sustainability, GE Aerospace introduced 360 Foam Wash, a cutting edge alternative to traditional water washing methods. This advanced cleaning process helps maintain optimal engine performance by removing dirt and debris, improving fuel efficiency, and extending the time between maintenance cycles. The 360 Foam Wash has already been implemented by seven airlines including Air India, Emirates, Etihad Airways, Japan Airlines, Qatar Airways, Royal Jordanian, Saudi Arabian Airlines and SkyWest. There have been thousands of foam washes conducted in the field with customers, further driving down operational costs and environmental impact.

Improving service quality with AI

GE Aerospace continually monitors its GEnx commercial engines in service and uses digital insights to help identify predictive maintenance measures to enhance the quality of service. To support this effort, the company uses advanced artificial intelligence (AI) and machine learning (ML) driven models to increase the number of conditions that can be monitored with even greater accuracy. GE Aerospace's AI–enabled Blade Inspection Tool (BIT) guides the selection of Stage 1 and 2 High Pressure Turbine engine blade images in GEnx commercial engine for technicians to inspect for faster, more accurate inspections. This helps in obtaining consistent images, a key input to building predictive models.

GE Aerospace has been a partner to India's aviation industry for over forty years. Thirteen hundred GE Aerospace and partner engines are in service, powering major Indian airlines. GE Aerospace's defence engines and systems power Indian Airforce's Light Combat Aircraft Tejas Mk.1, helicopters and Indian Navy's aircraft carrier, battleships and frigates. Its Pune manufacturing facility and thirteen local Indian partners are part of the company's global supply chain. Researchers and engineers at the company's John F Welch Technology centre in Bengaluru are building the latest aviation technologies.

Courtesy: GE

India–France naval exercise Varuna

Indian Navy's frontline stealth frigate, INS Tabar commanded by Captain MR Harish visited Toulon, France from 29 August to 1 September 2024 and later upon departure participated in the 22nd edition of IN–FN bilateral exercise Varuna from 2–4 September 2024 in the Mediterranean Sea. In addition to INS Tabar, Indian Navy was represented by the shipborne helicopter; LRMR aircraft P8I, whereas French side was represented by FS Provence, submarine Suffren, aircraft F20; Atlantique2, fighters MB339 and helicopters NH90; Dauphin. A series of advanced naval operations were conducted during the exercise involving enhanced tactical manoeuvers, advanced anti–submarine warfare exercises, FLYEX, Air Defence Exercise, live weapon firings, Photo–EX and Steam Past, seamlessly integrating assets of both the navies in all three domains viz air, surface and sub–surface. The bilateral exercise Varuna which began in 2001 is the backbone of IN– FN relationship and has evolved significantly over the years towards enhancing interoperability and exchange Best Practices.

ICGS Sujay at Incheon, South Korea

Indian Coast Guard (ICG) Offshore Patrol Vessel (OPV) ICG Ship Sujay with integral helicopter made a port call at Incheon, South Korea on 4 September 2024, as part of its ongoing overseas deployment to East Asia. During the four day visit, the crew of ICG Ship Sujay engaged in professional interactions focusing on Marine Pollution Response (MPR), Maritime Search and Rescue (M–SAR) and Maritime Law Enforcement. The visit aimed not only to strengthen ties between the ICG and their Korean counterparts but also to showcase India's shipbuilding capabilities, supporting the concept of "Atamnirbhar Bharat."

India–USA Exercise Yudh Abhyas–2024

The 20th edition of India–USA Joint Military Exercise Yudh Abhyas–2024 took place at Foreign Training Node in Mahajan Field Firing Ranges, Rajasthan from 9–22 September 2024. Exercise Yudh Abhyas has been held annually since 2004, alternating between India and the USA. This edition marked a significant increase in the scope and complexity of the joint exercise in terms of troop strength and equipment. The Indian Army contingent comprising 600 personnel was represented by a battalion of the Rajput Regiment along with personnel from other arms and services. The US contingent comprising of similar strength was represented by the troops of 1–24

Battalion of the Alaska based 11th Airborne Division of the US Army.

IAF and RAFO in Eastern Bridge VII

The Indian Air Force (IAF) successfully completed Exercise Eastern Bridge VII with the Royal Air Force of Oman (RAFO) at the RAFO airbase in Masirah on 21 September 2024. The IAF contingent returned to India after participating in a comprehensive series of training missions, which featured the participation of MiG–29 and Jaguar aircraft from IAF, F–16 and Hawk from RAFO. Exercise Eastern Bridge VII aimed to strengthen military cooperation and enhance the interoperability of both forces. The exercise included complex air operations, air–to–air combat drills, and mission scenarios designed to improve strategic and tactical capabilities. The IAF contingent gained valuable insights into RAFO tactics and operational philosophies, enriching combat strategies.

India– Oman Exercise Al Najah V

The Indian Army contingent took part in the 5th edition of India–Oman Joint Military Exercise Al Najah which was conducted from 13–26 September 2024 at Rabkoot Training Area in Salalah, Oman. Exercise Al Najah has been held biennially since 2015, alternating between India and Oman. Last edition of the same exercise was conducted at Mahajan in Rajasthan. The Indian Army contingent comprising 60 personnel was represented by a battalion of the Mechanised Infantry Regiment along with personnel from other arms and services. The Royal Army of Oman contingent also comprising 60 personnel was represented by the troops of Frontier Force.

ICGS Sujay at Bali, Indonesia

Indian Coast Guard's Offshore Patrol Vessel (OPV) ICGS Sujay with integral helicopter made a port call at Bali, Indonesia on 18 September 2024, as part of its ongoing overseas deployment to East Asia. During the three day visit, while undertaking the Operational Turn Around (OTR), the crew of ICGS Sujay engaged in professional interactions with BAKAMLA, focusing on Marine Pollution Response (MPR), Maritime Search and Rescue (M–SAR) and Maritime Law Enforcement. Activities included professional interactions with BAKAMLA (Indonesia Coast Guard), cross deck training, joint yoga sessions and friendly sports events.

INS Talwar's visit to Mombasa, Kenya

Strengthening India's growing ties with East Africa in accordance with the Prime Minister's Vision of SAGAR – Security and Growth for All in the Region, INS Talwar made a port call at Mombasa, Kenya, from 22 to 25 September 2024. To bolster interoperability and enhance cooperation, personnel from the Indian Navy and Kenyan Navy engaged in a wide range of professional interactions and cross–exchange visits during the harbour phase.

The Command team of KNS Shujaa visited INS Talwar to familiarise themselves with and finalise the exercise

programme for the Exclusive Economic Zone (EEZ) Surveillance and Maritime Partnership Exercise (MPX). Upon departure, the ship participated in Joint EEZ Surveillance and MPX with KNS Shujaa.

Indian Army Exercises

Amogh Division successfully conducted a Special Heliborne Exercise in collaboration with Indian Air Force on 24 September 2024. This joint exercise executed during day and night showcased "exceptional air–ground coordination and underscored the Indian Army's readiness for rapid response and swift deployment". Earlier, Dot On Target Division, conducted Heavy Vehicle Operations training on behalf of Shapta Shakti Command. The exercise focused on enhancing troop proficiency in complex vehicle operations, ensuring optimal vehicle readiness and "cultivating expertise in navigating challenging military environments".

Indian Navy's 1TS visits Bander Abbas, Iran

The ships of the First Training Squadron (1TS) – INS Tir, INS Shardul and ICGS Veera arrived at the port city of Bandar Abbas, Iran as part of long range training deployment in the Persian Gulf on 1 October 2024. The visit signified a vital step in strengthening maritime cooperative engagement and fostering mutual

understanding. The ships were escorted by IRI naval ship Zereh into harbour and received a ceremonial welcome on jetty by dignitaries from IRI navy's First Naval District and the Indian NA. Earlier, the Iranian training flotilla ships Bushehr and Tonb had visited Mumbai in March 2024 as part of training interaction. IRI naval ship Dena had also participated in the multilateral naval exercise MILAN 24 in February 2024.

1TS at Muscat, Oman

Indian Naval Ships Tir, Shardul and Indian Coast Guard Ship Veera of First Training Squadron (1TS) of the Indian Navy on long range training deployment arrived at Muscat, Oman on 5 October 2024. During the visit from 5–9 October 2024, the Indian Navy engaged with Royal Navy of Oman on various aspects of maritime security and interoperability, including harbour interactions and joint exercises. The deployment also focused on training exchanges, professional interactions and friendly sports fixtures between the two Navies.

INS Talwar at South Africa for Ibsamar VIII

Indian Navy's frontline stealth frigate, INS Talwar, arrived at Simon's Town, South Africa, on 6 October 2024 to participate in the eighth edition of IBSAMAR, a joint multinational maritime exercise among Indian, Brazilian and South African Navy. The exercise aimed to enhance interoperability and strengthen cohesion between the three navies. The broad concept was based on blue water naval warfare, encompassing the dimensions of surface and anti–air warfare.

INS Suvarna visits Dar es Salaam

INS Suvarna paid a port call at Dar es Salaam, Tanzania from 19-21 October 2024 for Operational Turnaround, during her ongoing anti-piracy deployment in the Gulf of Aden. Cdr Lalit Yadav, Commanding Officer called on Rear Admiral AR Hassan, Commander of Tanzanian People's Defence Force (TDPF) Naval Forces and Mr. Bishwadip Dey, High Commissioner of India (HCI) to Tanzania. During the visit, Ops Team of both navies held professional interactions including joint training on Visit Board Search Seizure, Damage Control and Fire Fighting drills, including sports engagement. The ship also handed over the Infantry Weapon Training Simulator to the TPDF side.

IAF and Singapore Air Force exercise

On 21 October 2024, the Indian Air Force (IAF) and Republic of Singapore Air Force (RSAF) commenced the 12th edition of the Joint Military Training (JMT) exercise at Air Force Station Kalaikunda, West Bengal. The bilateral phase of the exercise was conducted from 13 to 21 November 2024 and "generated intense collaboration between the two forces, as they engaged in advanced air combat simulations, joint mission planning and debriefing sessions". The bilateral phase aimed to enhance interoperability, sharpen combat readiness and promote the exchange of knowledge between the two Air Forces.

The RSAF participated with its largest contingent till date, comprising of aircrew and support personnel from F–16, F–15 squadrons along with G–550 Airborne Early Warning and Control (AEW&C) and C–130 aircraft. The IAF participated with Rafale, Mirage 2000I/TI, Su–30MKI, Tejas, MiG–29 and Jaguar aircraft.

Since its inception, JMT has been conducted under the ambit of a bilateral agreement signed between the two nations. JMT exercise comes right after RSAF's participation in one of the largest multinational aerial exercises, Ex–Tarang Shakti hosted by the IAF, which is "reflective of a growing professional association between the two Air Forces".

1TS departs Manama, Bahrain

Indian Navy's First Training Squadron (1TS) INS Tir and ICGS Veera completed their long range training deployment to Manama, Bahrain, on 16 October 2024. During the port call, Capt Anshul Kishore, Senior Officer, 1TS called on Maj Gen Salman Mubarak Al–Doseri, Royal Command Staff and National Defence College and Cmde Ahmed Ebrahim Buhamood, Commander Flotilla and held discussions on regional maritime security challenges and avenues for future collaboration in training and operations. Senior Officer, 1TS along with CO ICGS Veera also called on Cmde Mark Anderson of Royal Navy, Deputy Commander of Combined Maritime Forces (CMF). Interactions at US Naval Forces Central Command (NAVCENT) focussed on strengthening maritime cooperation and reinforcing strategic partnership between the Indian Navy and other maritime forces in the region. Further, visits were organised onboard 1TS ships for Bahrain Defence Forces, CMF and naval personnel from other friendly foreign nations, enabling "understanding of common operating procedures paving way for collaborative exercises in the future".

INS Shardul concludes Dubai visit

INS Shardul as part of long range training deployment concluded its visit to Port Rashid, Dubai, UAE, on 16 October 2024. The visit marked another important milestone in strengthening maritime cooperation between India and UAE. During the port call, the key engagements included interactions with UAE Navy, cross training visits, and community outreach activities.

The sea trainees of INS Shardul participated in organised visits to Naval Officers Training Academy and UAE Naval Ship providing opportunity for professional interactions and productive discussions on shared knowledge and training practices. Joint training sessions, yoga activities and friendly sports fixtures were the other highlights of the visit.

On departure from Dubai, INS Shardul participated in a Maritime Partnership Exercise with the UAE Naval ship Al Quwaisat. Both ships executed a series of naval maneuvers, communication drills and coordinated movements, demonstrating "mutual coordination and interoperability".

Exercise Malabar 2024

Maritime Exercise Malabar 2024 took place from 8 to 18 October 2024, beginning with the Harbour Phase in Visakhapatnam, followed by the Sea Phase. Hosted by India, this year's exercise saw participation of Australia, Japan and the United States of America.

Exercise Malabar, which began in 1992 as a bilateral naval drill between the United States and Indian Navy, has evolved into a key multilateral event aimed at enhancing interoperability, fostering mutual understanding, and addressing shared maritime challenges in the Indian Ocean and Indo–Pacific region.

The exercise featured participation of various Indian naval platforms including guided missile destroyers, multi–purpose frigates, submarines, fixed wing MR, fighter aircraft and helicopters. While Australia deployed HMAS Stuart, an Anzac class frigate with its MH–60R helicopter and P8 Maritime Patrol Aircraft, the United States Navy fielded the USS Dewey, an Arleigh Burke class destroyer with its integral helicopter and P8 Maritime Patrol Aircraft. Japan joined the exercise with JS Ariake, a Murasame class destroyer. Special Forces from all four nations also participated in the Exercise.

Malabar 2024 focussed on a broad range of activities designed to enhance cooperation and operational capabilities, including discussions on special operations, surface, air, and anti–submarine warfare through a Subject Matter Expert Exchange (SMEE). Complex maritime operations such as anti–submarine warfare, surface warfare, and air defence exercises were conducted at sea, with an emphasis on improving situational awareness in the maritime domain.

A Distinguished Visitors' Day took place on 9 October 2024 during the Harbour Phase, during which the

delegations from all four nations, were hosted by Vice Admiral Rajesh Pendharkar, Flag Officer Commanding–in–Chief, Eastern Naval Command. The exercise also featured a joint press conference as part of Harbour phase, co–chaired by heads of delegations from all participating countries.

The Opening Ceremony of Malabar 2024 under the aegis of Eastern Naval Command was held onboard Indian Naval Ship Satpura at Visakhapatnam on 9 October 2024. The ceremony was attended by senior naval and military dignitaries from participating nations. The heads of delegations and other dignitaries participating included General Yoshihide Yoshida, Chief of Staff, Joint Staff, Japan, Admiral Stephen Koehler, Commander US Pacific Fleet, VAdm Katsushi Omachi, C–in–C, Japan Self Defence Fleet and RAdm Chris Smith, Commander Australian Fleet. The crew and planning staff of participating ships, aircraft and Special Forces from Australia, India, Japan and the USA were also present. The Commanders of all participating navies acknowledged the importance of Ex Malabar in enhancing understanding, collaboration and engagement to address common maritime challenges and to create cooperative framework.

Harbour activities included Key Leadership Engagement (KLE), Subject Matter Expert Exchange (SMEE), cross–deck visits, sports fixtures, and pre–sailing discussions, all aimed at enhancing maritime cooperation, building camaraderie, and fostering operational synergy.

The Sea Phase of Exercise Malabar 2024 commenced on 14 October 2024 off the coast of Visakhapatnam. Naval warships, embarked integral helicopters and long range maritime patrol aircraft from Australia, India, Japan and USA exercised in unison in the Bay of Bengal, demonstrating a high level of collaboration and operational synergy. As part of this phase, the participating navies engaged in a wide range of maritime warfare operations, covering the surface, sub–surface, and air warfare domains. These advanced and complex exercises are designed to enhance mutual understanding and coordination, with the aim of operating seamlessly as a Combined Task Force at sea. In sub–surface warfare exercises, Indian Naval submarines participated and combined drills of Special Forces from participating nations also featured in this phase.

Text and images: Indian Navy

Project 75 India
(everything you need to know)

INS Kalvari at sea

Other than the aircraft carrier, if any platform took a significant role in changing the course of war during World War 2, it is the submarine. Quickly comprehending the importance and potential in maintaining the sovereignty of India, the newly independent Indian Navy focused on rapid modernisation with the induction of aircraft carriers and submarines from the beginning. According to the first 15 year refurbishment plan, a fleet of 16 submarines was desired. Unfortunately, for various reasons, the Indian Navy would get the first submarine only in 1967, when the Soviet Project 641 Foxtrot class got inducted as Kalvari class. In due course, 8 platforms were inducted within 1974. But this was not enough to maintain the security of Indian interests. Sanction of the proposal of procurement of four new and more capable diesel electric submarines was accorded in 1982, which later was increased to a total number of six. HDW Type 209/1500 of the West German origin was selected to serve as Shishumar class in the navy. According to the original plan, two platforms were directly procured from Germany, while the rest four were to be manufactured by Mazagon Dock Limited (MDL) following the transfer of technology (ToT) and material packages. However, only two boats were constructed following political turmoil in the late 1980s.

At the same time, India signed a deal with the Soviet Union for the procurement of Project 877EKM Kilo class. Subsequently, a total of 10 such submarines entered into the service as Sindhughosh class. As the older Foxtrot–class platforms came closer to their retirement, India became concerned about the eventual fall of underwater capability. So, India restarted the programme to construct the two left submarines designed by the Submarine Design Group (SDG) of the Indian Navy, based on the Shishumar class under P–75 (Project–75), with the collaboration of a foreign agency for the validation of the design. Eventually, TCDF of France was roped in. France offered SM 39, a submarine launched variant of the Exocet anti–ship

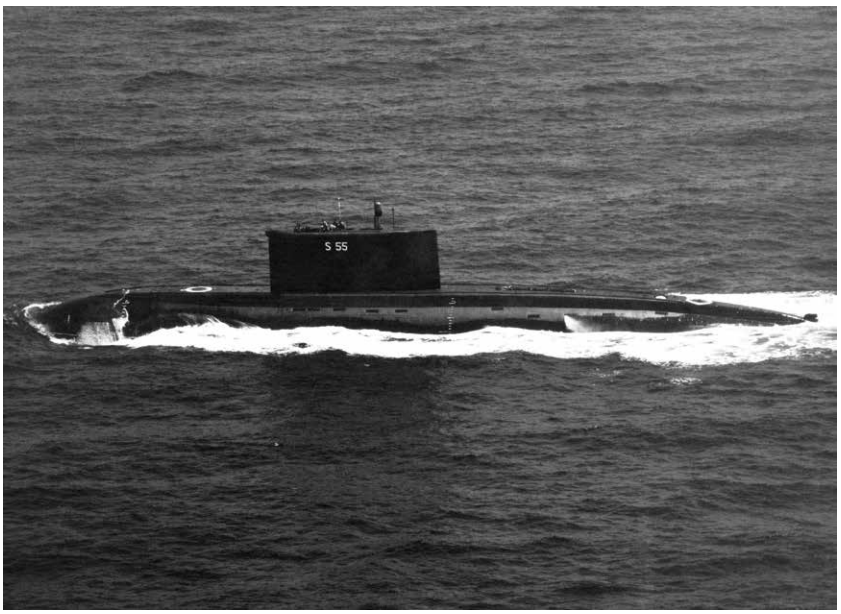
Indian Flag and Naval Ensign being hoisted onboard INS Kalvari in 2017.

missile, provided their combat suite be inducted into the boats. At the same time, approval came for the "Project for Series Construction of Submarines for the Indian Navy and Acquisition of National Competence in Submarine Building." Under the ambitious project, the Indian Navy was to have 24 advanced SSK's in 30 years!

Unfortunately, things didn't move as hoped. France offered Scorpene class. Initially, it was decided that some earlier platforms would be the design developed by the SDG while the rest would be the Scorpene class. But, in the course of events, it was decided that all submarines would be of the Scorpene class under P–75.

While there was a lot of movement between 1997 and 1999, it was only in 2005 that P–75I was accorded at a total cost of Rs. 18,798 crore. Scorpene class platforms would be constructed by MDL and eventually would enter into service as Kalvari class. Six such platforms are acquired. But the project took such a long time that older Kalvari class and Vela class platforms made an exit of service life. The Indian Navy faced a grave danger amidst dwindling fleet strength. As the Kalvari class project was going on, in parallel more numbers were required.

So, an Acceptance of Necessity (AoN) was granted in 2007, followed by issuing the Request for Information (RFI) the next year to four companies: the French DCNS, Spanish Navantia, Russian Rubin and German HDW. Initially known as the Project–75A, all six platforms were required



INS Sindhughosh en route India in 1987

to be equipped with air–independent propulsion (AIP) systems to boost their underwater operational capabilities significantly. Those platforms were to have less acoustic signature than existing platforms then in service and capabilities to launch land attack cruise missiles as well! In 2010, the Defence Acquisitions Council (DAC), chaired by then defence minister A. K. Antony took a decision for the procurement of six new submarines at a potential cost of Rs. 50,000 crores. Two submarines were to be imported directly from the manufacturer, while three submarines were to be constructed at MDL and one at Hindustan Shipyard Ltd (HSL) in Visakhapatnam. It also opened the door to the private shipyards as a potential participant. The idea was to have the first submarine in just six to seven years. While the name of the project got changed to Project–75, the project faced a hiatus by bureaucratic red tape amidst repeated delays in the issue of the Request for Proposal (RFP).

In October 2014, the DAC again cleared the P–75I with an approved budget of Rs. 53,000 crore. State–owned Mazagon Dock, Hindustan Shipyard and Cochin Shipyard, privately owned Larsen & Toubro, and Pipavav Shipyard were shortlisted to bid for the project in collaboration with a foreign shipyard. Six Original Equipment Manufacturers (OEM) entered the fray, including MHI from Japan, DCNS of France, RDB of Russia, Navantia of Spain, TKMS of Germany and Saab from Sweden.

Soon it was decided that the P–75I would be pursued under the Strategic Partnership (SP) policy. The idea was to shortlist foreign OEMs following their offer, including ToT to their Indian counterpart. Under the SP model, once the RFP was issued, both the OEMs and Indian companies would be shortlisted. Then there would be partnerships between interested OEMs and Indian counterparts. The partnership would then enter the bidding process. But the process didn't go as smoothly as had been hoped. While Japan didn't respond to the RFI within the stipulated time period, Saab announced withdrawal, fearing losing control of the project to the prospective Indian partner in the future. DSME of South Korea though would be a new contender.

However, quite shockingly, most of the contenders didn't even have any specific answer to the Indian requirement. Russia offered Project 677E Amur 1650 as a separate programme and not under the P–75I. No specific offer came afterwards. France reportedly started their journey offering a modified Scorpene class. But gradually changed the course and announced to design a brand new platform with technologies incorporated from Attack Class, Ocean Class and SMX 3.0. Even South Korea didn't pitch any specific design, though they asserted the platform would be based on their KSS–III submarines but stripped of the vertical launch system (VLS) cells! Russia withdrew, citing technical reasons. However, to woo the Indian side, it offered Project 636 and Project 877 class submarines to enhance the Indian submarine fleet. France also announced their inability to remain further in the race. And ultimately, South Korea was quiet too.

Isaac Peral, a S–80 Plus class submarine.

To ease the procedure, in 2022, there was an amendment to the tender process. This made only the strategic partner responsible for the work share, while the foreign OEM was liable only for its share of work. Finally, MDL and TKMS signed a Memorandum of Understanding (MoU), while Navantia teamed up with the L&T. Eventually tenders were issued to the two competitors. Spain offered the existing S–80 Class, while Germany proposed a new design based on the Type 212 submarine. The render of the proposal showcased a much similar platform to Type 212CD, the latest in the family, with stealthier hull and X–shaped rudder. It's noteworthy to mention that the AIP proposed by the two parties has become a major course decider. Spain claimed to offer theirs at the lowest price possible. The Indian Navy began trials of the German AIP in Kiel in March 2024, which reportedly got cleared only in August. TKMS even has offered a 60% indigenous content (IC) from the first submarine against the desired 45%.

Meanwhile, the trials for the Spanish counterpart did take place in Cartagena in June. However, reportedly none

U–34, a Type 212A class submarine

of the contenders could fully satisfy the navy with their existing AIP systems. Nevertheless, both the frontrunners are now trying their best to impress the customer, as the Navy is in the final stage to finalise field evaluation trials (EFT) of AIP systems.

As the P–75I is taking a time much longer than expected to keep India's underwater capability compromised, discussion is going on with the MDL for three additional and improved Kalvari submarines at an estimated cost of Rs. 35,000 crore. The proposed platforms are to be bigger than existing Kalvari class submarines with enhanced stealth capabilities and longer underwater endurance. At the same time, MDL is working on the development of the design of a full scale conventional submarine by 2028. However, at this moment, not much detail is known about this project.

The P–75I project now stands at reportedly Rs. 60,000 crore. It's clear that the proposed construction of the new 9 submarines will take a huge cost, but it is a must take step for the navy. Currently, the Indian Navy has 11 old submarines soon to be retired, other than the existing six Kalvari–class. Eventually, the Kalvari boats will also go through mid–life upgrades with modernisation, including incorporation of indigenous AIP. In fact, the fifth and sixth boats from the beginning will have the capability. Nevertheless, this will increase Indian prowess. But the bigger question is, how long will it take to meet the Indian requirement of a fleet strength necessary to protect Indian interests?

The adversaries of India pose a great threat with frequent sailing close to Indian waters. It must not be forgotten that China already has around 50 conventional submarines. They are rapidly replacing the old platforms with the new ones. If this was not enough, the large fleet of nuclear attack submarines (SSN) further enhances the graveness. On the other hand, Pakistan too is upgrading 4 of their old submarines along with 8 new submarines under procurement from China. So, India is facing a two faced saw significantly undermining the security.

According to the original plan, by now India should have gotten the majority of the 24 submarines. Instead, the navy is left with just six! As the P–75I has entered the culmination stage, hope lies to exit the tragic phase as fast as possible. But there will remain a question: if this is really enough?

By Sankalan Chattopadhyay (Twitter/X @vinoddx9)

Super 'Special Ops' Hercules for India

Operation Entebbe/Entebbe Raid/ Operation Thunderbolt was a daringly executed counter–terrorism hostage rescue mission carried out by the Israeli Defense Forces (IDF) at Entebbe Airport in Uganda on the night of 3 July and early morning of 4 July 1976 in which Israeli operated C–130 Hercules played a pivotal role. Originally codenamed Operation Thunderball/ Thunderbolt, the operation was later renamed Operation Yonatan in memory Lieutenant Colonel Yonatan Netanyahu who was killed in action. In the wake of the hijacking of Air France Flight 139 and the hijackers' threats to kill the hostages if their demands were not met, a plan was drawn up to airlift the hostages to safety still taking into account of possible hostile involvement of Ugandan military troops.

On 3 July, the Israeli cabinet approved a rescue mission, Operation Entebbe, under the command of Major General Yekutiel Adam and Deputy Commander Matan Vilnai. Brigadier General Dan Shomron was appointed to command the operation on the ground. After days of intelligence gathering and assessment by Netanyahu's deputy Moshe Betser, four (arguably three) Israeli Defence Force–Air Force (IDF–AF) C–130 Hercules 'transport' aircraft flew discreetly to Entebbe. Initially crossing Sharm al–Sheikh, and down the international flight path over the Red Sea, a flying height of no more than 100 feet was maintained to avoid radar detection by hostile Egyptian, Sudanese and Saudi Arabian forces. Near the south outlet of the Red Sea the IDF–AF C–130s turned right and passed south of Djibouti. From there they went to a point Northeast of Nairobi, Kenya then turning west passing through the African Rift Valley and over Lake Victoria. They were accompanied by two Boeing 707 jets with the first Boeing carrying medical facilities landing at Jomo Kenyatta International Airport in Nairobi, Kenya whereas the commander of the operation, General Yekutiel Adam on board the second Boeing that circled over Entebbe Airport during the operation.

Approach was at the Entebbe airport was executed by cover of night minus aid of Entebbe ground control and in a tightly controlled 'single file' ensuring that they would present a single radar signature even if spotted. While one IDF–AF C–130 was extensively used for deceptive operations (details irrelevant here) the other C–130 Hercules platforms landed and unloaded Armoured Personnel Carriers (APC). They were used for defence during the anticipated hour of refuelling, destruction of Ugandan MiG–17 jet fighters at the airport and for intelligence gathering. Within 30 minutes all eight hijackers were eliminated as against loss of single Israeli commando plus five injured. Out of the one hundred and five hostages, only three lost their lives and around ten were wounded. Nearly fifty Ugandan soldiers were killed during the raid. Only one hostage remained behind and executed by Ugandan army officers later. The rescued hostages were flown to Israel via Nairobi.

In Indian context, Lockheed Martin and Tata Advanced Systems Limited (TASL) have entered into a teaming agreement to expand upon the companies' business relationship through the C–130J–30 Super Hercules tactical airlifter. This announcement marks a significant step in enhancing India's defence and aerospace capabilities while also deepening India–US strategic ties. This agreement provides a framework for collaboration on future potential business opportunities to include establishing a Maintenance, Repair and Overhaul (MRO) facility in India to support the Indian Air Force's (IAF) existing fleet of 12 C–130J–30s as well as other global Super Hercules fleets plus expanding C–130J manufacturing and assembly in India to produce aircraft for the IAF's Medium Transport Aircraft (MTA) programme, subject to US and Indian government approvals. The IAF is actively seeking to acquire up to 80 medium transport aircraft and issued a Request for Information (RFI) last year. Lockheed Martin responded to the RFI as the C–130J–30 Super Hercules is ideally suited to meet the requirements. Lockheed Martin will continue to build C–130Js for the US government and other global operators at the existing Super Hercules production facility in Marietta, Georgia, USA. Lockheed Martin will establish additional production and assembly capacity in India if awarded the MTA contract. The projected scenario will also enable a significant proportion of IAF transport fleet capable of undertaking Special Operations, extremely relevant in background of disturbing and unstable political situation around the subcontinent.

The IAF purchased six "stretched"C–130J–30 Super Hercules in early 2008 at a cost of up to US$ 1.06 billion under a package deal with the United States government under its Foreign Military Sales (FMS) programme. India subsequently bought six more of these aircraft for its special forces for combined army–air force operations with the platforms entering IAF service 2011 onwards. Incidentally Pentagon's request to the United States Congress for the sale acknowledged India as an "important force for political stability, peace and economic progress" and the sale would "provide Indian government with credible Special Operations airlift capability that will deter aggression" in the region. Capable of transiting 5,200 km without refuelling with a 20 ton payload, the first C–130J–30 for the United Kingdom Royal Air Force (RAF) was delivered in November 1999 and deliveries of all fifteen aircraft ordered were completed in June 2001. The aircraft remains additionally in production for the United States Air Force (USAF) and twenty–three nations worldwide.

Capable of executing Short Take–Off and Landing (STOL) operations from unprepared strips, the originally developed troop, Medical Evacuation (MEDEVAC) and cargo transport platform, the C–130J–30 Super Hercules represents one of the finest special operations platforms. If necessary, the special mission equipment is removable to allow the C–130J–30 to revert back to cargo delivery role. The cargo floor length of the stretched C–130J–30 version is increased from 40 feet to 55 feet significantly increasing the aircraft's airlift capability. At least three APC can be accommodated, or eight 463L pallets, or ninety–seven litters, or twenty four US Container Delivery System (CDS) bundles, or one hundred and twenty eight fully equipped combat troops or ninety–two paratroopers. Equally important is C–130J–30's capability to place its 20–ton "supplies" with pinpoint accuracy within an area of a "football field".

Four Rolls–Royce AE2100D3 turboprop engines with Full–Authority Digital Electronic Control (FADEC), each rated at 4,591 shaft horsepower (3,425–kW) in conjunction of all composite six–blade Dowty R391 propeller system ensures superb handling characteristics. An automatic thrust control system (ATCS) optimises the balance of power on the engines. This Vayu correspondent aboard a C–130 during Aero India 2009 has experienced that the aircraft remains relatively stable even during prolonged transits in low altitudes. The aircraft can carry a maximum internal fuel load of 45,900 lb, plus an additional 18,700 lb of fuel can be carried in external underwing fuel tanks. The refuelling probe has been relocated on the C–130J to the port side, over the cockpit, and the C–130J–30 is capable of theoretically undertaking a non–stop flight from India to United States with three refuelling. It was initially anticipated that the C–130J–30s for IAF service will come with refuelling pods capable of providing Air–to–Air Refuelling (AAR) to assault helicopters, however it was later confirmed that such arrangements will not be made.

The C–130J–30 is well suited to provide passive defence to the platform in hostile environment as the ATK AN/AAR–47 missile warning system uses electro–optic sensors to detect missile exhaust and advanced signal processing algorithms and spectral selection to analyse and prioritise threats. Sensors are mounted near the nose just below the second cockpit window and in the tail cone. The BAE Systems AN/ALR–56M Radar Warning Receiver (RWR) is a superheterodyne receiver operating in the 2 GHz to 20 GHz bands. A low–band antenna and four high–band quadrant antennae are installed near the nose section below the second window of the cockpit and in the tail cone. The BAE Systems Integrated Defense Solutions AN/ALE–47 countermeasures system is capable of dispensing chaff and infrared flares in addition to the POET and GEN–X active expendable decoys.

The Lockheed Martin AN/ALQ–157 infrared countermeasures system generates a varying frequency–agile infrared jamming signal. The infrared transmitter is surface mounted at the aft end of the main undercarriage bay fairing. Meanwhile, the USAF has selected the Northrop Grumman Large Aircraft Infrared Countermeasures (LAIRCM) system based on the AN/AAQ–24(V) NEMESIS to equip its C–130 aircraft.

The primary sensor is the Northrop Grumman MODAR 4,000–colour weather and navigation radar with a range of 250 nautical miles installed in the upward hinged dielectric radome in the nose of the aircraft. The principal special operations suite is the AN/AAQ–22 Star SAFIRE III electro–optical/infrared Forward Looking Infra–Red (FLIR) sensor providing full digital high–definition (1280x720) video compliant with United States and North Atlantic Treaty Organisation (NATO) specifications. This sensor system is suitable for Intelligence, Surveillance and Reconnaissance (ISR), Search and Rescue (SAR), maritime patrol, border patrol, and force protection missions. Mounted on a gyro–stabilised platform, Star SAFIRE HD features megapixel thermal, daylight, and low–light cameras with 120x magnification optics, laser payloads and a fully – integrated Inertial Measurement Unit (IMU) to precisely locate targets.

By Sayan Majumdar

Does the Indian Air Force need dedicated firefighting aircraft and equipment?

IAF An–32s can be modified for aerial firefighting roles (Photo: Vayu)

The devastating forest fires in Uttarakhand in April 2024 highlighted the fragility of our natural environment.

A DC–10 Tanker operated by a private contractor for the U.S. Forest Service demonstrates a water drop (Photo: USFS)

With over 600 fires reported within days, thousands of hectares of forest were destroyed, wildlife was displaced and human lives were at serious risk. Despite the efforts of local authorities and volunteers, the mountainous terrain made containment slow and inefficient.

This event has emphasised the urgent need for dedicated aerial firefighting aircraft in the Indian Air Force. While local authorities worked hard, their efforts were hindered by the difficult terrain and lack of proper aerial support. A specialised fleet, equipped with water bombers, helicopters and fire suppression technologies, would be crucial in future firefighting operations, especially in regions like Uttarakhand and Himachal Pradesh.

Global practices in aerial firefighting

Around the world, militaries have deployed specialised equipment to support firefighting. In the United States, DC–10, C–130 aircraft and helicopters with water buckets are used for aerial firefighting, delivering water and fire retardants. Australia's Royal Air Force deployed aircraft during the 2019–2020 bushfires, while Canada uses

aircraft like CL–415 and helicopters for water bombing in remote areas. Russia's Be–200 and Il–76 water bombers are essential in dousing fires across the country. This list is obviously not comprehensive but these examples underline the importance of modifying military aircraft for firefighting.

Russia's Beriev Be–200 filling water tanks in the Mediterranean Sea while in operation against the 2010 Mount Carmel forest fire in Israel (Photo: Wikipedia)

IAF's readiness and challenges

The Indian Air Force (IAF) has a history of supporting disaster relief missions, including forest fires. Helicopters and transport aircraft have been used for search and rescue, delivering personnel and equipment, and dropping water and fire retardants. However, these missions are often conducted on an ad hoc basis, using aircraft not specifically designed for firefighting like the Mi–17V5 and HAL Dhruv. Helicopters typically carry limited water or fire retardants in underslung buckets, which are far less efficient than dedicated firefighting aircraft.

IAF's 'Bambi Bucket Operation' dousing forest fires in Nilgiris (Photo: IAF)

According to the India State of Forest Report (ISFR) 2019, over 36% of India's forest cover is at risk of regular fires. A dedicated aerial firefighting force would improve response time, particularly in remote or mountainous regions. Fires spread quickly in dry conditions, and a specialised unit would allow for faster action. A dedicated fleet would also provide greater reach, as India's forests cover vast, often inaccessible areas. Aircraft equipped with water bombers and fire retardant systems would help manage these areas more effectively.

Adapting the IAF fleet

The IAF could retrofit older aircraft, like the An–32, with aerial firefighting systems. These aircraft could carry water or fire retardants, making them suitable for firefighting missions. This approach would enable the IAF to meet the increasing demands of forest fire management without the cost of acquiring new aircraft.

Leveraging DRDO expertise

The Defence Research and Development Organisation (DRDO) can play a key role in addressing the need for a dedicated aerial firefighting fleet. By modifying older aircraft like the An–32, DRDO can retrofit them with firefighting equipment at a fraction of the cost of new aircraft. Modular fire retardant tanks could be installed, allowing the aircraft to carry water or fire suppressants. This modularity ensures that the aircraft remain versatile for other roles when needed.

Water bombing systems could also be added to disperse large amounts of water over affected areas. Furthermore, DRDO could equip these aircraft with infrared sensors to detect hotspots and improve manoeuvrability in challenging terrains.

Financial and environmental sustainability

Retrofitting vintage aircraft offers a financially sound alternative to cloud seeding, which relies on favourable weather and can have adverse environmental impacts. Modifying existing aircraft for firefighting provides an immediate, direct response to wildfires, particularly in remote areas. This strategy not only maximises the use of military resources but also avoids the unpredictability and risks associated with cloud seeding.

Implementing this approach on an experimental basis would allow the IAF to assess its effectiveness in regions prone to forest fires. If successful, the initiative could be expanded, ensuring the optimal use of India's vintage fleet while strengthening disaster response capabilities.

By maximising the dual use potential of existing aircraft, India can develop a cost effective, scalable and sustainable solution to address the growing threat of forest fires.

Article by Jatin Yaduvanshi

Indonesian AF for 4 Airbus H145's

The Indonesian Air Force has placed an order for four Airbus H145 helicopters as part of its training modernisation programme. Under the agreement between the Indonesian Air Force and PT Dirgantara Indonesia (PTDI), Airbus will deliver the five bladed H145s to PTDI, who will manage the reassembly and completion of the mission equipment and other customisation work at its facility in Bandung, Indonesia.

100th TH–73A Thrasher for USN

Leonardo celebrated a significant milestone with the 100th delivery of the TH–73A Thrasher helicopter to the United States Navy at a ceremony in Northeast Philadelphia. In early 2020, the Navy selected the Leonardo TH–73A, an advanced Instrument Flight Rules (IFR) rated version of the commercial AW119Kx, to replace its aging fleet of TH–57B/C Sea Rangers as the primary training helicopter to produce the next generation of rotary and tilt–rotor pilots for the Navy, Marine Corps, Coast Guard and selected allied nations.

Sikorsky delivers 23 new VH–92A's

The US Marine Corps formally accepted the 23rd and final next–generation VH–92A presidential helicopter built by Sikorsky marking a significant milestone for the company whose aircraft have flown every US president since 1957.

Chicago Police receives Bell 429 and more types

Bell Textron announced the delivery of one Bell 429 and a signed purchase agreement for two Bell 407GXi for the Chicago Police Department. The three aircraft will join the Helicopter Operations Unit's existing fleet of all Bell aircraft.

Iraq orders 12 Airbus H225M's

Airbus Helicopters has been awarded a contract for 12 H225M multi–role helicopters by the Republic of

Iraq. These helicopters will be operated by the Iraqi Army Aviation command replacing older Mi–17s for a wider range of missions: counter–terrorism, special operations, tactical troop transport, attack, ground fire support, MEDEVAC and combat search and rescue.

Boeing offers CH–47 Chinook to Poland

Boeing is offering the CH–47 Chinook heavy lift helicopter to Poland. The CH–47F Block II is the newest iteration of the Chinook, providing increased lift and range.

Chinook Block II is a modernised and "ready now solution that provides increased operational flexibility, improved performance, and enhanced survivability.

It builds upon the proven capabilities of the CH–47 Chinook, offering an upgraded platform that meets the capability that militaries need today and serves as a strong foundation for affordable future upgrades".

Airbus marks 40 years in Canada

Airbus celebrates 40 years of presence in Canada with an order by the Government of Ontario for three Airbus H135 helicopters for the Ontario Provincial Police in Ottawa, the Greater Toronto Area and in the OPP's North West (Thunder Bay) Region.

Kongsberg JSM for Australia

"Our business area Kongsberg Defence & Aerospace has signed a contract with the Commonwealth of Australia to deliver the Joint Strike Missile (JSM) for the F–35A aircraft. The initial contract is worth about NOK 1 billion. The specific JSM capabilities enhance the advanced F–35A aircraft, creating a formidable capability against land and sea targets, and boosting Australia's ability to strike targets from long–range", stated the company.

Japan for 9 KC–46A

Japan has requested to buy up to nine (9) KC–46A aircraft; up to eighteen (18) PW4062 turbofan engines; up to sixteen (16) AN/ALR–69A radar warning receivers (RWRs); up to thirty–three (33) Large Aircraft Infrared Countermeasure (LAIRCM) Guardian Laser Turret Assemblies (GLTAs), etc.

Netherlands for 246 AIM–9X

Netherlands has requested to buy two hundred forty–six (246) AIM–9X Sidewinder Block II tactical missiles; six (6) AIM–9X Block II sidewinder captive air training missiles (CATM); two (2) AIM–9X Block II Sidewinder special air training missiles; fourteen (14) AIM–9X Block II Sidewinder tactical guidance units, etc.

Egypt to add C–130J Super Hercules

The Egyptian Armed Forces announced at the Egypt International Air Show that Lockheed Martin will deliver two C–130J–30 Super Hercules tactical airlifters to the Egyptian Air Force (EAF) through a Foreign Military Sale (FMS) with the US Air Force. Egypt is the 23rd nation to join the worldwide Super Hercules operating community.

Romania for 32 F–35's

Romania has requested to buy thirty–two (32) F–35A Lightning II Joint Strike Fighter Conventional Take Off and Landing (CTOL) aircraft and thirty–three (33) Pratt & Whitney F135–PW–100 engines (32 installed, 1 spare).

IRIS–T SLM for Germany

With the completion of training for the first operators for the ground based air defence system IRIS–T SLM, delivered by Diehl Defence, the German Air Force achieved the initial operating capability (IOC) for the system.

Bulgaria for 218 FGM–148F Javelin's

Bulgaria has requested to buy two hundred eighteen (218) Javelin FGM–148F missiles (includes four (4) fly to buy missiles) and one hundred seven (107) Javelin Lightweight Command Launch Units (LWCLU). Also included are Javelin LWCLU Basic Skills Trainers (BST); Javelin Outdoor Trainers (JOT), etc.

1st flight of UK E–7 Wedgetail

Boeing has completed the first flight of the UK's E–7 Wedgetail for the Royal Air Force (RAF). A Boeing flight test crew conducted functional checks during the first flight from Birmingham Airport, marking a significant milestone in the programme's test and evaluation phase. Currently unpainted, the aircraft is one of three 737 NG aircraft on British soil undergoing modification by a highly skilled team of over 100 people at STS Aviation Services in Birmingham.

Rheinmetall and MBDA Germany Agreement

Rheinmetall and MBDA Deutschland have decided to continue their successful cooperation in the field of laser weapons. The aim is to bring a joint maritime product to the market within the next five to six years, which opens up new possibilities, particularly in relation to drone defence on ships. Both companies are convinced

that their complementary skills in the field of laser weapon technology will enable them to successfully develop a military laser weapon system. The companies have now concluded a corresponding cooperation agreement.

7th C–390 for Brazilian AF

Embraer has delivered the seventh C–390 Millennium multi–mission aircraft to the First Squadron of the First Group (1º/1º GT) at Galeao Air Force Base in Rio de Janeiro. This milestone comes as the Brazilian Air Force celebrates five years of service for the C–390, performing a wide spectrum of military and humanitarian missions across the globe.

Australia for 100 AARGM–ER's

Australia has requested to buy up to one hundred (100) Advanced Anti–Radiation Guided Missiles–Extended Range (AARGM–ER) with global positioning system (GPS) precise positioning system (PPS) provided by Selective Availability Anti–Spoofing Module (SAASM) or M–Code, etc.

US Navy Contract for ESSM Block 2 missiles

Raytheon has received a $525 million contract from the US Navy to produce ESSM Block 2 missiles and spares for the US and allied nations.

ESSM Block 2 is a short to medium range, ship launched, dual mode, guided missile that has increased maneuverability and improved performance over its Block 1 predecessor.

Rheinmetall to supply Skyranger 30

Denmark has contracted with Rheinmetall Air Defence to supply sixteen Skyranger 30 air defence turrets and additional vehicle equipment for an 8x8 wheeled platform for use by the Danish armed forces. In addition, the customer has ordered ammunition in the low double digit million euro range.

Naval Group Barracuda's for Netherlands

Gijs Tuinman, Dutch State Secretary for Defence, and Pierre Eric Pommellet, CEO of Naval Group, signed the Delivery Agreement for the Replacement Netherlands Submarine Capability (RNSC) programme. The ceremony was held at the DMI in Den Helder. This decisive step marks the launching of the Orka class programme, following the signature of the Industrial Cooperation Agreement (ICA) between Naval Group and the Ministry of Economic Affairs.

Airbus and MUM–T

Airbus Helicopters and its partners have conducted a full scale demonstration of a manned–unmanned teaming (MUM–T) system developed as part of a project funded by the European Union and code–named MUSHER. The demonstration took place in France and Italy from 30 September to 9 October and involved multiple manned helicopters and unmanned systems connected to a single MUM–T network.

Saudi Arabia for 2503 Hellfire II's

Saudi Arabia has requested to buy two thousand five hundred three (2,503) AGM–114R3 Hellfire II missiles (3 for lot acceptance testing). Also included are support and test equipment; integration and test support; spare and repair parts; software delivery and support; publications and technical documentation, etc. The total estimated cost is $655 million.

Saudi Arabia for 220 AIM–9X Block II's

Saudi Arabia has requested to buy two hundred twenty (220) AIM–9X Block II Sidewinder Tactical Missiles. Also included are missile containers; support equipment; spares; missile software; training; and US Government and contractor technical assistance; and other related elements of logistics and programme support. The estimated total cost is $251 million.

UAE for 259 GMLRS and ATACMS Munitions

United Arab Emirates has requested to buy two hundred fifty nine (259) Guided Multiple Launch Rocket System (GMLRS) M31A1 Unitary Pods (1,554 missiles at six missiles per pod) and two hundred three (203) Army Tactical Missile Systems (ATACMS) M57 Unitary Missiles. The estimated total cost is $1.2 billion.

Updates from Thales

Strengthening Spanish Army's BMS

Thales is strengthening the capacity of the Spanish Army's BMS (Battlefield Management System) and preparing it to operate in highly digitalised scenarios in which its data exchange and degree of coordination are extremely high and key to gaining an advantage over the adversary.

7 additional sections of the SAMP/T NG

As announced on the 17 September 2024 during the Conference on European Air and Missile Defense in Rome (Italy) by the French Ministry of Defence, Sebastien Lecornu, French Minister of armed forces officialised a contract, through OCCAR–EA, to launch the serial production of seven additional SAMP/T NG sections for the French Air and Space Forces. Each French SAMPT–NG section will be based on the Thales GF300, multifunction rotating active electronically scanned array radar and on the New Generation Engagement Module (ME–NG) produced by Thales.

Drone swarms using AI

On 16 October 2024, in the first flight tests of their kind, Thales demonstrated the potential of deploying swarms of drones with different levels of autonomy. Autonomous functionality optimised by Artificial Intelligence (AI) and intelligent agents reduces the cognitive load on operators yet ensures that they remain in control at all times, particularly during critical mission phases.

300 NVGs for French Army

French forces have received the first 300 Thales night vision goggles ordered by the French defence procurement agency (DGA) in 2020 as part of the Bi–NYX contract. The 300 goggles delivered to the DGA are the first batch of an order for 2,000 sets placed in December 2023. The Bi–NYX binocular goggle is optimised for vehicle driving and will complement the 12,960 O–NYX binocular night vision goggles already in service with French Army regiments for dismounted soldiers.

Ground Alerter 10 deliveries

Thales officially handed over the final commissioned Ground Alerter (GA) 10 radar, from a total order of 17 GA 10 warning and alerting systems delivered to the German Armed Forces in Koblenz. The GA10 is a portable C–RAM (Counter – Rocket, Artillery, Mortar) alert and impact zone early warning system for camp protection as well as dismounted operations in convoy protection. The radar system has already proven itself in asymmetric scenarios and saved numerous lives in the past.

KNDS selects Thales for Leopard 2 A8

KNDS awarded Thales a contract to deliver compact, programable and scalable High–Power Solid State Power Distribution Boards (SSPDB) for the Leopard 2 A8 platform. The SSPDB developed by Thales is designed to provide overcurrent and short circuit protection, and to enable smart electrical power management of protected vehicles.

Updates from Saab

Saab delivers next gen artillery hunting radars

As of mid–2024, five next generation Arthur systems, named TAIPAN by the British Army, have been delivered, accepted, and are now with 5th Regiment Royal Artillery. Replacing MAMBA last generation Arthur radar, TAIPAN offers the British Army rapid deployment and re–deployment, high operational mobility, and precise counter–battery operations, locating an increased number of targets at greater range with reduced electronic warfare signatures, leveraging Saab's Digital Antenna technology. This ensures survivability, reliability and high availability.

Saab delivers 5th GlobalEye to UAE

The recent delivery is the fifth in the series of five GlobalEye Airborne Early Warning and Control (AEW&C) aircraft delivered to the UAE since 2020. "In close partnership with the UAE Air Force, Saab has developed, produced and delivered a fleet of five GlobalEye aircraft, all in a period of less than 10 years. This further reinforces Saab's position as leading provider in the airborne early warning and control segment," stated Carl–Johan Bergholm, head of Saab's business area Surveillance. GlobalEye is an advanced multi–domain AEW&C solution with an array of active and passive sensors that provide long–range detection and identification of objects in the air, at sea and over land.

US Army selects Saab's AT4

The US Army has awarded Saab an Indefinite Delivery, Indefinite Quantity (IDIQ) contract, which allows the US Army to place orders for up to $494 million over five years for the XM919 Individual Assault Munition (IAM) programme. Saab's solution is the AT4CS TW (Confined Space Tandem Warhead). Saab's new addition to the battle tested AT4 family combines the capability of multiple existing shoulder launched munitions while reducing soldier load, training complexity and logistics burden.

Sweden for Giraffe 1X surface radar

Saab has received an order from the Swedish Defence Materiel Administration (FMV) for the Giraffe 1X radar for one of Sweden's Ground Based Air Defence (GBAD) solutions. The contract period is 2024–2027 and the order value is approximately SEK 700 million. The order includes Saab's Giraffe 1X radar, associated command and control systems and integration to a Swedish GBAD solution. The radar will be installed on a Sisu GTP armoured vehicle.

MSHORAD for Lithuania

Saab has received an order from the Lithuanian Ministry of Defence (MoD) for deliveries of Saab's Mobile Short Range Air Defence (MSHORAD) solution. The order value is approximately SEK 1.3 billion and deliveries will take place 2025–2027. The recent order is placed within a framework agreement between Saab, the Swedish Defence Materiel Administration (FMV) and the Lithuanian MoD which allows Lithuania to place orders for Saab's mobile short range air defence missile solution RBS 70 NG.

The laser revolution in defence and space

MBDA Dragonfire on the left and on the right, the high energy laser (HEL) weapon demonstrator developed by the German 'High–Energy Laser Naval Demonstrator working committee' (ARGE), consisting of MBDA Deutschland GmbH and Rheinmetall Waffe Munition GmbH.

Power laser sources are becoming increasingly essential in defence and space applications due to their unique capabilities and versatility. In defence, these lasers provide precise and effective solutions for targeting and neutralising threats such as missiles, drones and other airborne objects. Laser systems can also disrupt enemy communications and electronic systems, providing significant tactical advantages on the battlefield. In space, high power lasers have the potential to revolutionise satellite protection, space debris removal, and propulsion systems, opening new frontiers for exploration and defence.

In defence, power laser sources are explored as cost effective alternatives to traditional air defence systems like missiles, particularly for countering unmanned aerial vehicles (UAVs). With UAVs becoming more common and affordable, using expensive missiles for interception poses financial challenges. While soft kill solutions, such as radio frequency (RF) jamming, have been developed, directed energy weapons (DEWs) like lasers and microwaves offer more effective defence against drones and emerging threats like hypersonic missiles.

Similarly, in space applications, power laser sources are emerging as alternatives or supplements to RF communication systems. Ground–to–space and space–to–space communication systems are being enhanced with laser technology, promising improved performance and reliability.

Advancements in power laser sources have led to the development of systems capable of effectively countering small drones, improvised explosive devices (IEDs), and other similar threats, positioning them as crucial components of short range air defence systems. Moving forward, the focus is on enhancing scalability to achieve even higher power outputs, ranging from 500 kW to 1 megawatt, significantly expanding their operational capabilities against larger or more distant targets.

In space applications, the scalability of power laser sources aims to achieve data transmission rates of up to 200 Gbps, enabling efficient communication systems for deep space missions. These advancements will facilitate faster and more reliable data transfer, supporting various space exploration and communication objectives with greater efficiency and effectiveness.

The report "Power Laser Sources for Defence and Space Applications – Market and Technology Forecast to 2032" offers a comprehensive and forward looking analysis of the current state of the industry and future developments. It emphasises the critical importance of high power laser sources in the defence and space sectors, where recent advancements are driving significant progress and adoption.

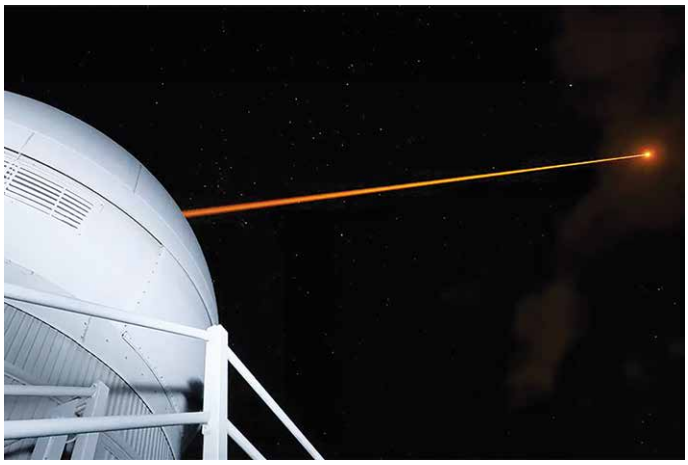
One key area of development is in beam combining techniques, which enable the integration of multiple laser beams into a single, high power output beam with exceptional quality. This innovation allows for increased power output while maintaining precise beam characteristics essential for defence applications like targeting and countermeasures.

The study also analyses critical raw materials essential for advancing laser technology in defence and space applications. These raw materials play a foundational role in enabling the production and optimisation of high performance laser systems. The report provides insights into the strategic implications of raw material dependencies and market trends for stakeholders in the defence and space industries, including recommendations

for diversifying supply sources, developing alternative materials, and fostering international collaborations to enhance material security and resilience.

Courtesy: Market Forecast

The US Navy's Laser Weapons System (LaWS) aboard the USS Ponce in the Persian Gulf (Photo: USN)



Space debris can be mitigated through the use of high energy laser technology to prevent potential collisions and protect vital space assets. (Photo: EOS)

Lockheed Martin's Directed Energy Interceptor for Maneuver Short Range Air Defence System (DEIMOS) solution is a ruggedised, tactical laser weapon system that can be integrated in the US Army's Stryker combat vehicle. (Photo: Lockheed Martin)

US Army's Indirect Fires Protection Capability–High Energy Laser (IFPC–HEL) demonstrator laser weapon system. (Photo: Lockheed Martin)

India's DRDO directed energy weapon system (Photo: DRDO)

The Sodium Guidestar at the US Air Force Research Laboratory Directed Energy Directorate's Starfire Optical Range. Researchers with AFRL use the Guidestar laser for real time, high fidelity tracking and imaging of satellites too faint for conventional adaptive optical imaging systems. The SOR's adaptive optics telescope is the second largest telescope in the Department of Defence. (Photo: AFRL)

GCAP's new look unveiled

The three nations of the Global Combat Air Programme (GCAP) – UK, Italy, and Japan – have unveiled a new concept model of their next generation combat aircraft at Farnborough International Airshow.

Exhibiting at the show together for the first time, the three GCAP government partners and their lead industry partners BAE Systems (UK), Leonardo (Italy) and Mitsubishi Heavy Industries (Japan) showcased the significant strides they are making to progress the delivery of a next generation combat aircraft. The new concept model on display featured a much more evolved design with a wingspan larger than previous concepts to improve the aerodynamics of the future combat aircraft.

Engineers from across BAE Systems, Leonardo and Mitsubishi Heavy Industries are working together under a collaboration agreement on the design and development of the future combat aircraft using a range of innovative digital tools and techniques, including computer based modelling and virtual reality to evolve the aircraft's design during its concepting phase.

Guglielmo Maviglia, Chief Global Combat Air Programme Officer, Leonardo, stated, "The pace of the programme is extraordinary, building on a solid foundation and industrial legacy in each country and government led partnership. Since the treaty was signed in December 2023, the programme has seen strong commitment from each partner. Each brings different, but complementary, qualities and requirements. We are now working closely together to exchange knowledge, address common challenges and achieve common goals. The programme is immensely important for Italy, for Leonardo, including our UK based business, and for wider Italian industry. GCAP represents the future of combat air in a System of Systems perspective for our generations to come."

Herman Claesen, Managing Director, Future Combat Air Systems, BAE Systems, stated, "In the 18 months since the launch of the Global Combat Air Programme, we've been working closely with our industrial partners in Italy and Japan under the collaboration agreement, and also with the three governments, to understand and align requirements for a next generation combat aircraft. The new model, unveiled at Farnborough International Airshow, shows notable progress in the design and concepting of this future fighter jet. We'll continue to test and evolve the design, as we move closer towards the next phase of the programme."

The combat aircraft, set to be in service in 2035, will be one of the world's most advanced, interoperable, adaptable and connected fighter jets in service, boasting an intelligent weapons system, a software driven interactive cockpit, integrated sensors and a powerful next generation radar capable of providing 10,000 times more data than current systems, giving it a battle winning advantage. GCAP is a strategically important partnership, bringing together the governments of the UK, Italy and Japan, and their respective industries, to collaborate on shared military and industrial objectives in the delivery of a next generation combat air capability.

The next generation combat aircraft being developed by GCAP will be known as Tempest in the UK.

The industrial leaders (Lead Systems Integrators) on the GCAP are BAE Systems (UK), Leonardo (Italy) and Mitsubishi Heavy Industries (Japan).

The Lead Sub–System Integrators on the programme are: Avio Aero (Italy), ELT Group (Italy), IHI (Japan), Leonardo (Italy and UK), MBDA (Italy and UK), Mitsubishi Electric (Japan) and Rolls–Royce (UK).

UCAV programme kicks off as part of the Rafale F5 standard

On 8 October 2024, Sebastien Lecornu, French Minister of the Armed Forces and Veterans Affairs, announced the development launch of the unmanned combat aerial vehicle (UCAV) that will complement the future Rafale F5 standard after 2030. The announcement was made at a ceremony marking the 60th anniversary of the French Strategic Air Forces (FAS) at the Saint–Dizier air base, in the presence of General Jerome Bellanger, Chief of Staff of the French Air and Space Force (AAE), and Éric Trappier, Chairman and CEO of Dassault Aviation.

"This stealth combat drone will contribute to the technological and operational superiority of the French Air Force by 2033. It is significant that it is being initiated today, as we mark the 60th anniversary of the Strategic Air Forces and the 90th anniversary of the Air and Space Force: in aeronautics — a highly complex field — the future has deep roots, and innovation is built on experience. Dassault Aviation and its partners are proud to serve the French Armed Forces and the French Defence Procurement Agency (DGA). Their renewed confidence honours and obliges us," declared Éric Trappier.

This UAV will be complementary to the Rafale and suited to collaborative combat. It will incorporate stealth technologies, autonomous control (with man–in–the–loop), internal payload capacity, and more. It will be highly versatile and designed to evolve in line with future threats.

It will benefit from the achievements of the nEUROn programme, Europe's first stealth UCAV demonstrator.

The Rafale F5 combined with the UCAV and their evolutions, like the Mirage IV in its times, will ensure France's independence and capability superiority in the coming decades.

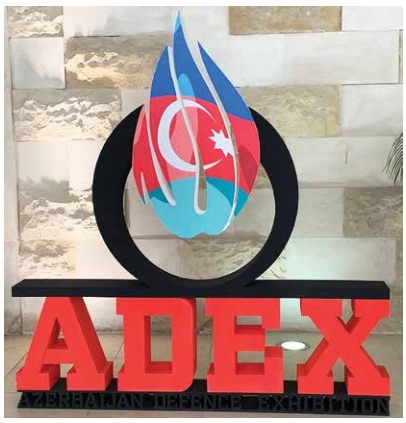
Initiated in 2003, the nEUROn programme brought together the aeronautics resources of six European countries, with project management by Dassault Aviation. nEUROn completed its maiden flight in December 2012.

More than 170 test flights have been conducted to date. The nEUROn programme has lived up to all its promises in terms of performance levels, lead times and budget.

Text and photos: Dassault

Rosoboronexport exhibits Lancet–E at ADEX 2024

Rosoboronexport JSC (part of Rostec State Corporation) organised a single Russian exhibit at the ADEX 2024 International Defence Industry Exhibition, which was held from 24–26 September 2024 at Baku (Azerbaijan). Twelve Russian companies took part in the exhibition and presented products for all services of the armed forces, police and counter–terror units.



"Russia and the Caspian countries have long–term good neighbourly relations, including in the sphere of military–technical cooperation. Our partners are well aware of reliable and effective Russian defence products. At ADEX 2024, Rosoboronexport will showcase battle–proven and most in–demand modern weaponry, including the Lancet–E loitering munition system and the latest counter–UAV electronic warfare system for the first time exhibited outside Russia. The solutions we are presenting provide protection against the entire spectrum of external and internal threats to the security of States in the region," stated Alexander Mikheev, Director General of Rosoboronexport.

The Lancet–E loitering munition system – the main highlight of the companys exhibit – provides assured engagement of MBTs, IFVs, APCs, engineer equipment, fortified strongpoints and command posts, aircraft at home airfields, electronic warfare and counter–UAV systems, as well as fixed and moving surface targets. Battlefield experience has proved the high effectiveness of Item 51–E and Item 52–E loitering munitions, which are part of the Lancet system, in counter–battery warfare and as a weapon for engaging high–speed land and surface targets like off–road vehicles and powerboats.

The RP–377VM1 (version 4) compact jammer, exhibited overseas for the first time, is the latest general purpose

electronic countermeasure device, capable of suppressing both radio control command links of IEDs and satellite navigation and control links of commercial UAVs.

RP–377VM1 (version 4) passed tests in real combat conditions and proved effective in protecting automotive and armored vehicles.

In the counter UAV segment, Rosoboronexport unveiled Item RB–504P–E, capable of detecting and jamming UAV communication and navigation links, including in automatic mode. This model provides both sector and omnidirectional jamming to counter a "swarm" of drones.

The aircraft segment featured the Su–35 multirole super–maneuverable fighter, Ka–52E scout/attack helicopter, Mi–17V–5 military transport helicopter and the Orlan–10E reconnaissance UAV.

For Army delegations, the company showcased the T–90MS MBT, Terminator BMPT tank support fighting vehicle, modernised Msta–S self–propelled howitzer as well as S–400 Triumf long–range SAM system in the air defence segment.

As part of a security exhibit, a wide range of optical and electro–optical products, including daylight sights, thermal imaging sights and attachments, thermal imaging surveillance and counter–sniper devices, as well as a line of special weapons were on display at the booth.

Rosoboronexport scheduled an extensive business programme at the exhibition. The company discussed promising cooperation projects with the representatives of the armed forces and other security agencies of the countries in the region, including in the format of industrial partnership.

Rosoboronexport is Russia's sole state agency for export of the full range of defence related and dual use

products, services and technologies. It is part of Rostec State Corporation. Rosoboronexport is among leaders in the global arms market. Rosoboronexport accounts for over 85% of Russia's exports of arms and military equipment and cooperates with more than 700 Russian defence industrial enterprises and organisations. The geographical scope of Russia's military–technical cooperation encompasses more than 100 countries.

Rostec State Corporation is the largest industrial company in Russia, uniting over 800 research and production organisations across 60 regions of the country. The company plays a crucial role as a major supplier of armaments, military, and special equipment through the state defence order. Additionally, Rostec focuses on the development of high–tech civilian production in strategically important industries, including aircraft engineering, engine building, transportation, power engineering, medical technologies, pharmaceuticals and innovative materials among others. In 2023, the corporation achieved a consolidated revenue exceeding RUB 2.8 trillion.

Rosoboronexport at AAD 2024

Rosoboronexport JSC, part of Rostec State Corporation, presented Russian defence products that are in demand on the African continent at the Africa Aerospace and Defence (AAD) 2024 expo, that took place from 18–22 September 2024 at Air Force Base Waterklof in Centurion, Pretoria, South Africa.

"Rosoboronexport has been successfully cooperating with more than 40 countries in Africa and is steadily expanding its footprint on the continent, including through active participation in exhibitions. We help our partners in the region to strengthen their defence capabilities and sovereignty, adequately respond to today's security threats related to organised crime and terrorism. In addition, joint projects and transfer of Russian technologies give an impetus to the development of industry in African countries," stated Alexander Mikheev, Director General of Rosoboronexport.

Rosoboronexport organised a single Russian exhibit at AAD, which comprised 250+ military, dual–use and civilian products. Most of the exhibit items were successfully used in the battlefield and are being modernised to meet the realities of today's combat operations.

Capabilities of Russia's wheeled armoured vehicles to transport mechanised units, provide fire support, as well as evacuate the wounded and provide first aid were among the focus of the company's exhibit.

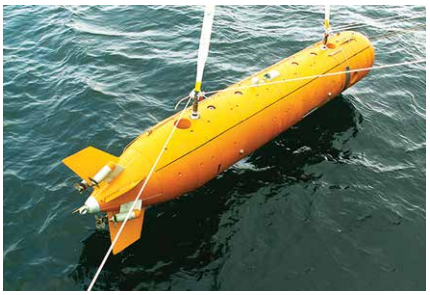
The company presented the Typhoon–K, ZA–SpN Titan, 3–STS Akhmat, Spartak, Tiger mine–resistant ambush–protected (MRAP) vehicles as well as the upgraded Linza protected ambulance vehicle, assembled entirely from Russian components under the import substitution programme.

Recent military conflicts have demonstrated the need to additionally protect armoured vehicles from new threats, namely reconnaissance and attack UAVs. For the first time on the African continent Rosoboronexport exhibited advanced armoured vehicle protection systems. Among them was the Nakidka radio–absorbing material, which heavily reduces the thermal and radar signature of hardware, add–on slat armour and explosive reactive armour (ERA) kits for tanks and light armored vehicles.

For Air Force delegations the modern Russian military transport and combat aircraft and helicopters, as well as the Yak–130 combat trainer, a modernised version of which was presented in 2024 for global marketing, was on display at Africa Aerospace & Defence 2024.

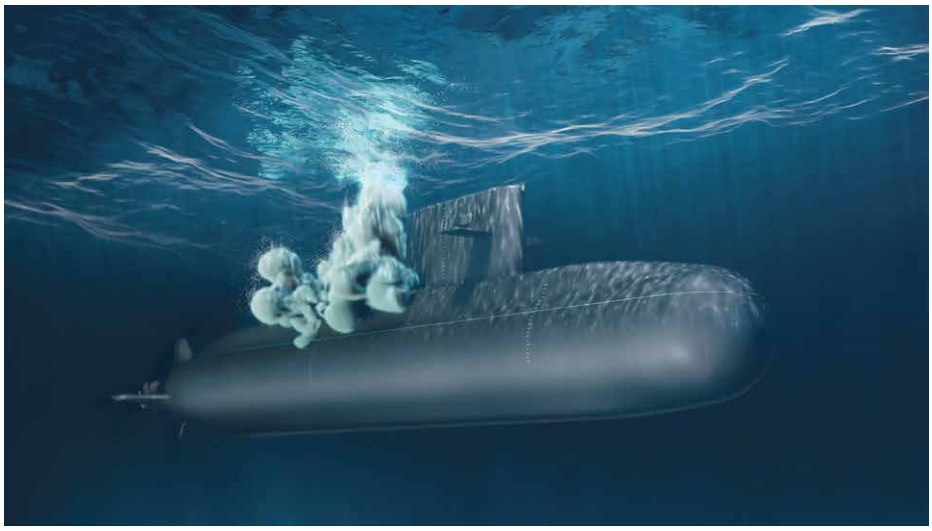
In the UAV segment, the Russian exhibit featured the Orion–E reconnaissance/strike UAV, Orlan–10E and Orlan–30 reconnaissance UAV systems, S–350 Skat UAV and the Kub–E loitering munition.

At its booth, the company showcased a wide range of small arms to equip army, special and police units, including Kalashnikov AK–200 series, AK–15, AK–308 and AK–19 assault rifles. Visitors to the company's exhibit were also be able to get acquainted with Russian Chukavin and Dragunov sniper rifles (with folding buttstock), MPL, PLK, MPL–1, Viking pistols and PPK–20 submachine gun.



Updates from the Rubin Design Bureau

Conventional Amur 950 submarine with vertical launchers

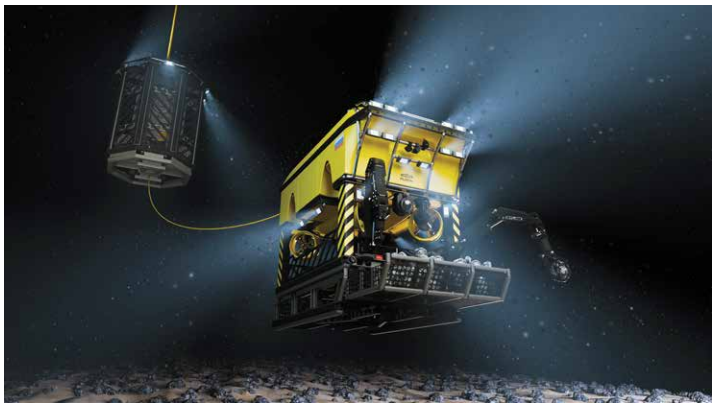


The extensive experience of creating submarines with vertical launch systems is possessed by only four countries, Russia included. The technology itself caters for lots of nuances, as the pressure hull with missile containers takes water pressure in a different manner, and container covers and their drives shall work reliably under largely varying conditions that emerge throughout the service life of a submarine. A missile carrying submarine will be of no use without the system of data input to missile, system of missile ejection from a container, system of post–firing stabilisation of the submarine and a great number of other systems. Besides, the infrastructure on the shore for storage, checks, loading and unloading of missiles is also necessary.

Rubin Design Bureau with its entire system of cooperation that emerged due to regular construction of nuclear submarines possesses and elaborates all necessary technologies, and these can be offered to the customer. As an example at Army 2024 show, Rubin Design Bureau unveiled the conventional Amur 950 ocean submarine with vertical launchers. In fact, it is a floating battery, capable of inflicting a powerful preventive salvo strike upon opponent's ships and shore based facilities. Low noise characteristics as well as sonar equipment, which ensures high cognizance, make the boat perfectly suitable for reconnaissance and covert surveillance operations. A 30 day endurance enables Amur 950 to operate as far as up to 1000 miles from the shore. Its full submerged speed is 20 kn. The complement is 19 people. The vessel's displacement is about 1000 tons.

Due to its small displacement and technical solutions implemented by Rubin during the creation of the third and fourth generation conventional submarines, Amur 950 suits well as a basic platform for designing national submarines to suffice the requirements from customer's navies.

W–ROV for science, underwater building, oil and gas production



Rubin Design Bureau has unveiled a model of a remotely operated unmanned underwater vehicle WHALE–3000 which is a work class ROV. It will fetch an equipment from surface and install it at the target point.

Using two manipulators, it will fulfil assembly work, stretch an electrical cable and plug it; switch an oil and gas transportation system. Maximum automated control makes operator's work easy. For instance, the ROV maintains mostly autonomously the given depth and track.

The WHALE manipulators have removable grippers allowing the ROV to manage a wide range of tasks.

Submerged, it can cut and weld pipes, clean infrastructure from fouling and siltation, install vacuum anchors that will hold large underwater constructions; cut cables and wires. High–definition video cameras and ultra–powerful LED lights ensure operation with total absence of sunlight.

Thereby it is useful in underwater building, maintenance of sea pipelines, drilling and production platforms. It can be used for rescue operations. Its depth rating is up to 3 kilometers.

The WHALE may assist in scientific research. Its grippers will grab samples of polymetallic nodules and biological samples from the bottom to the ROV removable basket.

ROV is about 3 meters long and about 1.8 meters wide; height slightly exceeds two meters. WHALE is transported in a standard 20 foot container.

Composite materials helped to reduce ROV weight to five tons.

It is designed with the use of 3D modeling, which significantly simplifies the process of its production.

NGC's B–21 Raider in flight test, production

Northrop Grumman's B–21 Raider programme is making great progress as the team executes a robust flight test campaign and scales into production. In collaboration with the US Air Force, Northrop Grumman's programme management approach on B–21 centers around producibility and adoption of digital technology to ultimately deliver an effective, affordable system to the warfighter that is adaptable to future threats.

Verifying through test

Edwards Air Force Base, renowned as the "Centre of the Aerospace Testing Universe," is home to the Combined Test Force (CTF), made up of Northrop Grumman and Air Force personnel responsible for evaluating capability ranging from flight sciences and hardware functionality to mission systems, software integration and beyond. Early feedback from test pilots confirms the first test vehicle is performing well in flight and flying like the simulators used for training.

"Overall, I am pleased to see the performance of our test jet. The handling qualities are better than expected coming out of the simulated environment; validating the accuracy of the digital models the team has developed and analyzed over many years," stated Chris "Hoss" Moss, B–21 Raider test pilot, Northrop Grumman. Flight testing continues to expand the operational envelope, and model predictions are matching flight test data, demonstrating the value and efficacy Northrop Grumman's digital ecosystem is delivering on B–21.

"Flight test is an exciting time, and we're making great progress on B–21," stated Tom Jones, corporate vice president and president, Northrop Grumman Aeronautics Systems. "The CTF team has demonstrated we can execute multiple flight test events within the span of a week. Northrop Grumman's digital ecosystem is enabling that progress, allowing us to analyse test data, make updates and return to flight test with speed and efficiency."

Ground test performance is another essential piece of aircraft development. Northrop Grumman successfully verified the B–21 structural design with the completion of static testing, thus validating original models and signifying a solid structural design. Northrop Grumman has also begun fatigue testing on another ground test article to simulate a lifetime of flight conditions on the aircraft structure.

"The progress we've made on B–21 in the last 12 months is remarkable. The consistent alignment of our digital models both on the ground and in flight gives us additional confidence as we look ahead to delivering on B–21," Jones further said.

Scaling into production

Another key strategy behind delivering the B–21 Raider was to build the first test aircraft like the production aircraft. Transitioning away from a standard industry practice of taking a demonstration–like vehicle to flight test, the B–21 workforce is already familiar with production tooling and materials and has come forward with innovative ways to establish repeatable processes for an optimal build.

The B–21 team has embraced the deployment of advanced manufacturing and digital tooling across the factory. "We are expanding the use of augmented reality tools and advanced robotics to drive efficiency and accuracy with repeatable, precision processes," Jones said. "Northrop Grumman is finding innovative ways to introduce advanced technologies in a restricted manufacturing environment today, while paving the way for sustainment processes at the depot and flight line of the future over the B–21 programme life cycle." For example, Northrop Grumman manufacturing technicians utilise augmented reality headsets to support installation of subsystem components and robotic tools for specialised aircraft coatings in the factory.

Preparing for Tomorrow, Today

The driving force underpinning Northrop Grumman's approach on B–21 is delivering the nation's next gen airborne strategic deterrent to meet the threat. These strategies are yielding desired results as Northrop Grumman executes the test campaign and scales into production. The digital ecosystem supporting flight test progress today will enable the future technology and capability insertion that will keep B–21 ahead of future threats for years to come.

Courtesy: Northrop Grumman Corporation

EUROSATORY
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Eurosatory 2024: A record breaking edition (Part–2)

The tradeshow Eurosatory 2024 (17–21 June) ended the five day extravaganza with extremely intense and busy days. This 28th edition reported record attendance by exhibitors, public and private sector decision makers, armed forces and homeland security representatives, high authorities, civil security and crisis response professionals, official delegations, experts and journalists.

With 2,028 exhibitors from 61 countries, Eurosatory confirmed its role as a catalyst for user available and emerging innovation and new generation technology, providing the most extensive global spectrum of solutions to enhance defence and security capabilities. The French Armed Forces Minister Sébastien Cornu, during his visit to inaugurate the exhibition, took advantage of the occasion to highlight its importance, global reach and strategic role: "This exhibition is without a doubt an exhibition for the military and not just for industry, to take stock of all the operational needs of the armed forces. And it is ultimately also this change of culture that we are seeing, where there is a tightening of ties between the soldier/customer and the manufacturer/producer. This exhibition was designed in this perspective, and for that I extend my thanks to you."

With more than 42,000 professional visitors including 44% from outside France (up 23% on 2022), and 355 official delegations from 92 countries, Eurosatory illustrated once again that it is the premier event for the international defence and security community. The 120 round table discussions and nearly 500 speakers helped to confirm the exhibition's role as a global platform for experience sharing, and offered further insights into the leading underlying trends that are shaping our century for the long term.

The 2024 show was held on a global backdrop featuring five megatrends that combine and contrast with one another, ultimately impacting the Defence and Security world: The geopolitical sphere with the return of superpowers and claims of sovereignty; the economic sphere, which has become unpredictable following the impacts generated successively by the global pandemic and the war in Ukraine, and which is still putting pressure upon international markets; the technological sphere, with a new digital revolution, that of AI and quantum science; the societal sphere, rapidly changing, marked by increasing violence in society and finally the environmental sphere which, under the effects of climate change, is seeing an ever greater frequency of humanitarian and environmental disasters and higher migratory movements.

Ground–based action in all its forms, from high intensity conflict to humanitarian disaster response, calls on the integration of all domains (land, air, space, naval, cyber). In light of this, the air–to–ground action of helicopters is of predominant importance. As leader in its category, Eurosatory had a duty to develop this segment more extensively. As a first for Eurosatory in 2024, exhibition space was given specifically to helicopters, drawing notably on the resources of the French Army, the Gendarmerie Nationale and the US Army, along with French and international manufacturers.

Milrem Robotics at Eurosatory 2024

This year's largest European defence industry event, Eurosatory 2024, featured the biggest ever presence of unmanned combat systems by the robotics and autonomous systems developer Milrem Robotics. Altogether 10 of the company's robotic systems were on display at the exhibition. Eight of these systems were different versions of the THeMIS Unmanned Ground Vehicle (UGV) and two Type–X Robotic Combat Vehicles (RCV).

In addition to Milrem Robotics' stand, systems were showcased together with leading industry partners: Avalor. AI, CNIM, KNDS, Kongsberg and Thales, additionally featuring integrated technology by FN Herstal, Metravib Defence, Leonardo, Rheinmetall, Pearson Engineering, and Vegvisir.

"The vast number of partners demonstrates that Milrem Robotics' unmanned combat systems are preferred for payload integrations and battlefield deployment. The THeMIS UGV is already part of robotics programmes in 18

countries worldwide and assisting Ukrainian soldiers with casualty evacuation and route clearance in the war with Russia," stated Kuldar Vaarsi, CEO of Milrem Robotics. "Milrem has integrated more payloads than any other UGV provider and has a detailed understanding of how these payloads should be integrated and how to ensure the payload's performance to its maximum capability," he further added.

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PARIS

KNDS at Eurosatory 2024

KNDS presents technologies in future land warfare

KNDS, one of the leading manufacturers of military land systems in Europe, continues to expand its technological leadership in main battle tank development. At Eurosatory 2024, the Franco–German group presented a number of crucial innovations for land warfare in the coming years.

Beyond the latest evolutionary stages of the existing main battle tank generations – Leopard 2 A8 and Leclerc XLR – visitors got to see a milestone in the history of main battle tank development with the Leopard 2 A–RC 3.0 and the Leclerc Evolution.

The Leopard 2 A–RC 3.0 has an unmanned, remote controlled turret. The main weapon is loaded by a modular, automatic linear loader and calibres between 120 and 140 mm can be selected. Its innovative weapon mount prevents the weapon from being immersed in the hull, thus resulting in fundamentally new use of space in the chassis.

The crew of three to four persons can now be positioned completely in the chassis, within a highly protected crew cell. The ballistic protection is supplemented by a proven active protection system and a remote controlled weapon station to counter drone threats.

The fire power of the Leopard 2 A–RC 3.0 is augmented by a guided missile system with which targets beyond line of sight can also be engaged while on the move.

The remote controlled 30 mm weapon system completes the threat adapted weapon mix with its ability for deployment against near field and aerial threats.

The design of the Leopard 2 A–RC 3.0 hugely improves crew protection through the use of passive, reactive and active protection technologies, thus increasing its sustainability, while at the same time significantly enhancing the mobility and assertiveness of the overall system.

KNDS assesses the Leopard 2 A–RC 3.0 not only as a bridge solution until introduction of the next generation land combat system MGCS, but also as a decisive technological precursor to MGCS.

ASCALON: an improved and innovative fire function

With ASCALON, KNDS has developed a main gun for battle tanks that is more powerful than all comparable barrel weapons. It can fire compact and programmable ammunition beyond the line of sight with minimal wear. Due to its scalability, ASCALON can be fitted with any barrel from 120 to 140 mm.

The innovative concept, while proposing significant growth potential, delivers performance levels that current technologies do not offer. KNDS designed ASCALON with an open architecture to serve as a basis for cooperative development of a combat gun platform within the framework of the MGCS programme, laying the foundations for the future standard of European tank guns and ammunition.

The Leclerc Evolution on display at Eurosatory was equipped with a manned turret hosting a 120 mm ASCALON gun which can be easily retrofitted to higher calibers up to 140 mm. Introducing a new concept with four crew members that is adapted to the latest tactical situations, the Leclerc Evolution integrates a deputy commander crew station fitted in the chassis to manage an extensive sensors and effectors suite.

KNDS offers the complete range of proven artillery systems

The CAESAR has proven to be robust, reliable and easy to maintain as much in counter–insurgency as in high intensity warfare. These operational capabilities proven all around the world led the CAESAR to become the most ordered modern artillery system. For the first time, KNDS displays the CAESAR MkII: a new 6x6 chassis with a more powerful engine, an enhanced protection and a cab prepared for the SCORPION combat information system (SIC–S).

The RCH 155 wheeled howitzer and the field–proven PzH 2000 both demonstrate technological leadership in the 155mm gun sector.

KNDS makes progress on loitering ammunition

In partnership with Delair, a UAV manufacturer, KNDS has developed an innovative warhead for a loitering ammunition capable of observing, identifying and neutralising a static or dynamic threat within a radius of 5km, with a range of 45 minutes. A demonstrator of its innovative warhead has been made in less than two years. The first demonstrator will carry out test flights with this warhead at the end of June 2024, in cooperation with the French defence procurement agency (DGA).

With a range of 3 hours, between 80 and 120km, the Larinae loitering ammunition will carry a 3kg explosively formed penetrator charge capable of dealing with armoured targets while foiling their active protection systems. In partnership with EOS Technologie and TRAAK, the first demonstrations with an inert charge will take place in early 2025. This system which could be reusable will also enable it to carry out intelligence missions using an electro–optical system which is able to detect a vehicle at 15 km by day and 3 km by night. It will have navigation capabilities in a contested environment (jamming) thanks to its secured radio link at up to 80km provided by KNDS France Robotics. Larinae is proposed with two different platforms: a vertical take–off and landing system (VTOL) and a high–speed UAV (VELOCE). Both are equipped with a high performance solution for arming and disarmin the warhead, allowing the operator to recover them easily and safely.

KNDS armoured vehicles

The BOXER RCT30 offers maximum mobility, a large crew compartment for accommodating infantry squads

with combat equipment and high firepower including successfully and field proven combating small drones and swarms of drones at distances of up to 1,500 metres. The RCT30 is an unmanned turret, providing significant benefits to the entire crew (space, protection, operations,). Boxer RCT30 combines the proven and in–service Boxer vehicle and the Puma Turret. The RCT30 is therefore field proven, reliable and quickly available.

KNDS also offers the VBCI MkII infantry fighting vehicle equipped with the T40 unmanned turret. This new turret integrates a 40CTA gun, AKERON MP missiles and a 7.62mm machine gun. As a modular system, the VBCI MkII is available in other versions such as command post, recovery vehicle, or 120mm mortar carrier.

Helicopters at Eurosatory 2024

Sikorsky Black Hawk

Sikorsky Black Hawk

Boeing Chinook

Boeing Apache

Leonardo AW249

NH90 TTH

Tigre EC665

Tigre EC665

H160M

H160M

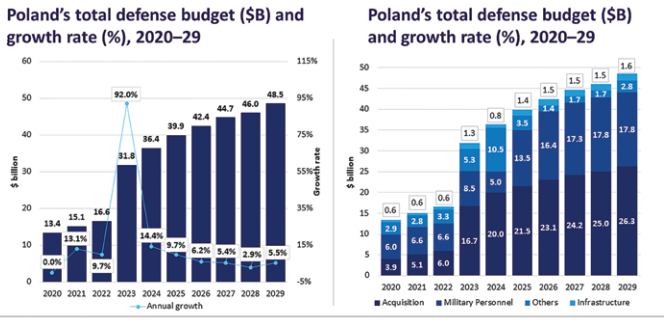
H175M

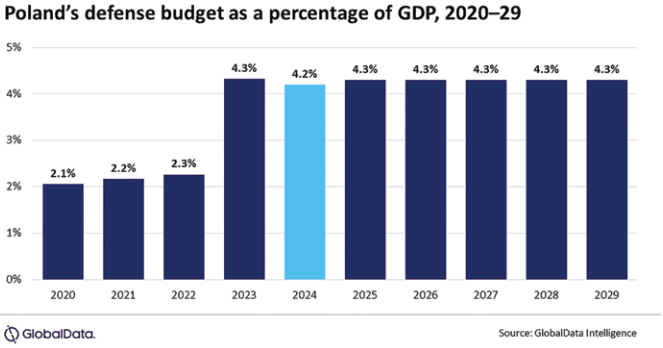
Poland at Eurosatory 2024

Poland defence expenditure to reach $48.5 billion in 2029

According to GlobalData, Poland seeks to strengthen its military readiness and contribute more to the North Atlantic Treaty Organisation (NATO) following Russia's invasion of Ukraine and mounting concern over the future of transatlantic security cooperation. Seeking to deter an emboldened autocracy in Russia, Poland will increase defence spending from $36.4 billion in 2024 to $48.5 billion in 2029, according to GlobalData, a leading data and analytics company. GlobalData's latest report, "Poland Defence Market Size, Trends, Budget Allocation, Regulations, Acquisitions, Competitive Landscape and Forecast to 2029," reveals that Poland's defence spending is forecasted to rise to $39.9 billion in 2025.

Poland's armed forces are undergoing a massive modernisation programme. The highest spending is occurring in the sectors of missiles and missile defence systems, artillery systems and military land vehicles.





Over the next decade, some of Poland's largest investments are for the Patriot air defence system ($14.1 billion), the Borsuk infantry fighting vehicle ($5.7 billion), and the Homar–A multiple launch rocket system HIMAR variant ($4.0 billion).

In addition to Poland's acquisition efforts, the Polish army is making substantial investments in its military personnel. Polish Prime Minister Donald Tusk has urged other countries who do not meet NATO guidelines to spend more on defence, claiming in March 2024 that Europe is entering a "prewar" era. GlobalData forecasts that Poland will spend $17.8 billion on military personnel by the end of the decade.

Milrem Robotics announces a centre of excellence in Poland

Milrem Robotics has established a centre of excellence for ground robotics in Poland. This strategic expansion aims to strengthen the company's presence in different regions of Europe and accelerate product development. The new engineering hub in Warsaw will serve as a centre for innovation and collaboration, bringing together top engineering talent from the capital and the surrounding region. The hub will focus on designing and developing advanced robotic systems that address the evolving needs of Milrem Robotics' customers. The new engineering hub will start with 20+ engineers already in July and is determined to grow rapidly. Establishing the hub underscores Milrem Robotics' commitment to the European market, supporting economic growth and technological advancement.

Milrem Robotics is the world leading robotics and autonomous systems developer and systems integrator, with offices in Estonia, Finland, Sweden, the Netherlands, and the US. The company is known for its THeMIS UGV, the Type–X Robotic Combat Vehicle, and MIFIK, the autonomous functionalities kit for defence platforms. The company is also renowned for successfully completing the European Defence Industrial Development Programme (EDIDP) project iMUGS, which focused on developing a modular and scalable architecture for hybrid manned/unmanned systems.

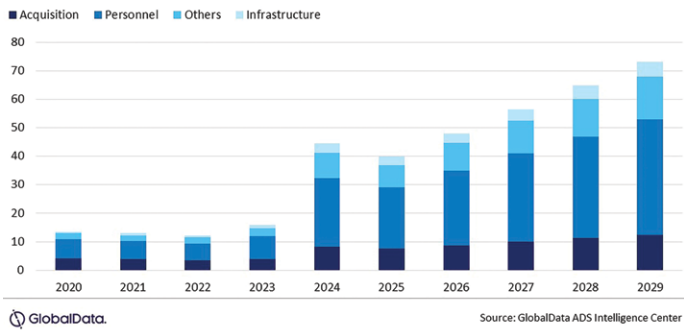
Turkey at Eurosatory 2024

Turkish defence industry offers promise for export potential but challenges remain

GlobalData says that Turkiye's growing domestic defence industry is seeking to expand into a growing export market. However, the country's economic and political issues threaten to undermine this potential, as poor fiscal policy, authoritarian politics, and erosion of an independent central banking system have limited Western investment, says GlobalData, a leading data and analytics company.

GlobalData's latest report, "Turkey Defence Market 2024–2029", reveals that Turkiye's defence budget is set to increase significantly to $73.2 billion in 2029, up from $44.5 billion in 2024. The acquisition budget, which is $8.3 billion in 2024, will rise to $12.5 billion by 2029. The personnel spend will increase from $24.1 billion in 2024 to $40.3 billion by the end of the forecast period.

Turkey's defense budget breakdown ($B), 2020–29



Wilson Jones, Defence Analyst at GlobalData, comments: "Turkiye is struggling with rising corruption and authoritarianism, and President Recep Tayyip Erdogan's rule is increasingly criticised as dictatorial. The targeting of opposition figures, independent judges, and rising corruption all contributed to the EU's 2023 decision to halt Turkiye's EU accession due to worsening human rights".

"Economically, Turkiye has been in a major crisis since 2018, with the lira dropping from 6–1 to 35–1 against the US dollar. Inflation is rising at an alarming rate, caused in part by a large government deficit and large amounts of foreign–currency denominated debt (largely held in stronger Euros and the US dollar). These factors disincentivise foreign investment in Turkey, as other markets are perceived to offer strong returns without these risks and challenges to doing business."

Jones continues: "One programme that highlights the Turkish defence industry's promises and challenges is the Altay Main Battle Tank (MBT). The Altay MBT is based on the South Korean K2 Panther and heavily relies on Korean technology. The Turkish firm BMC received technological assistance from Hyundai with the development and production of initial models, with the first prototype being delivered in 2016."

Compared to the K2, the Altay features a modified CN08 120mm cannon with improved gun stabilisers, chemical, biological, radiological, and nuclear (CBRN) resistant armour, and a braking system that allows for rapid acceleration and deceleration to avoid anti–tank guided missiles (ATGM). The T1 and T2 are extremely similar.

The T1 was originally supposed to feature a Turkish manufactured engine and transmission, but due to supply chain issues, it had to use a variety of German, Korean and Ukrainian imports for these components. The T2 is the serial production that features these Turkish elements. A future T3 model will have an unmanned turret, and it is possible these earlier T1's and T2's could receive such upgrades. All variants are compatible with exterior reactive armour additions.

Jones concludes: "Turkiye's acquisition plans of several hundred Altay's indicate it seeks to replace foreign systems in this domain. There has also been significant foreign interest in the Altay reported from Columbia, Saudi Arabia, and Pakistan. Qatar has already purchased 400 units, and Oman is currently negotiating a deal with Turkiye".

Phase out ceremony of Italy's AMX

In 1977 the Italian Air Force issued a requirement for 187 new build strike fighters for close air support to replace the Aeritalia G.91. In 1980 the Brazilian government announced that they intended to participate in a programme to provide a replacement for the Aermacchi MB–326. As a result of a memorandum between Italy and Brazil for the type's joint development an Italian–Brazil joint venture, called AMX International, was formed to develop, manufacture and market the aircraft in 1981. An agreement was also struck to divide AMX manufacturing between the partners, Aeritalia manufactured the central fuselage, stabilisers and rudders, Aermacchi manufactured the front fuselage and tail cone and Embraer manufactured the wings, air intakes, pylons and drop tanks. Each component of the aircraft was built at one source only.

The first prototype, which was assembled in Italy, made its maiden flight on 15 May 1984. Unfortunately this aircraft was lost on its fifth flight resulting in the death of its pilot. Further testing progressed smoothly and without further incidents. The first Brazilian assembled aircraft made its first flight on 16 October 1985 followed by the first flight of the first production aircraft on 11 May 1988. The first deliveries to the Italian and Brazilian Air Force began in 1989. The prototype of the two seat AMX–T training aircraft made its first flight on 14 March 1990. The first AMX was officially delivered to the Italian Air

Force on 19 April 1989. The first 6 AMX aircraft were delivered to the Reparto Sperimentale di Volo (RSV) Experimental Flight Department, based at Pratica di Mare air base near Rome. This unit tested the aircraft in all its aspects including the armament. The first production aircraft were delivered in October 1989 to the 103° Gruppo/51° Stormo based at Istrana air base.

The planned requirements were 187 aircraft for Italy and 100 aircraft for Brazil but the Italian Air Force acquired a total of 136, 110 single–seat AMX and 26 two–seat AMX–T, aircraft and the Brazilian Air Force acquired a total of 56, 44 single–seat AMX and 12 two–seat AMX–T, aircraft. The Italian Air Force named the AMX "Ghibli", taken from the hot dry wind of the Libyan desert. The Brazilian Air Force named their AMXs A–1.

In the late 1990s the AMX got a major engine refit, a non–afterburning variant of the Eurojet EJ200 with considerably more trust than the existing engine. In 2007 Embraer began with a major midlife upgrade programme and modernisation of 53 Brazilian AMXs, focusing on avionics systems and new armament additions to extend the lifespan of the fleet beyond 2027. In 2012 the upgrade programme ACOL (Aggionamento Capacita Operative e Logistiche – Operational and Logistical Capability Upgrade) was launched for 55 AMXs (43 single–seat AMX and 12 double–seat AMX–T) of the Italian Air Force adding a new multi–function colour cockpit display, laser INS, Night Vision Goggle (NVG) capability and the aircraft was able to drop Joint Direct Attack Munition guided bombs. In 2012 the Italian military designation for the AMX was A–11A and for the AMX–T it was TA–11A. After the ACOL upgrade programme the Italian military

designations changed, the A–11A became A–11B (AMX ACOL) and the TA–11A became TA–11B (AMX–T ACOL).

Operational history

The first operational squadron within the Italian Air Force was 51° Stormo and was formed in November 1989. In February 1992 an Italian Air Force AMX crashed due to an engine failure, resulting in grounding both the Italian and Brazilian AMX fleet. In May that year operations were allowed to restart following modifications on the engines.

In 1995 the first international deployment took place when Italy assigned 6 AMX aircraft for operations over Bosnia during Operation Deny Flight, followed by a similar deployment in support of the IFOR peacekeepers in Bosnia. Unfortunately this deployment was interrupted by another grounding between January and March 1996 due to an engine failure. The following deployment was in 1999 during the Kosovo war. From November 2009 till the end of 2010 four AMXs were deployed to Afghanistan for a reconnaissance role. They shared digital electro–optical and infrared sensor information with ground troops in real time, providing valuable reconnaissance information. A total over 700 combat missions were flown during this deployment. During the military intervention in Libya in 2011, the AMXs were employed to this conflict.

During its service life the aircraft was deployed to many operational theaters as mentioned above but the contribution of the AMX in the national scene was also very important. They were active in valuable photographic

reconnaissance missions during emergencies and public disasters such as earthquakes and floods.

In Italy the following units were equipped with the AMX:

- 13° Gruppo / 32 Stormo at Amendola
- 14° Gruppo / 2° Stormo at Rivolto
- 28° Gruppo / 3° Stormo at Verona Villafranca
- 101° Gruppo OCU / 32° Stormo at Amendola
- 103° Gruppo / 51° Stormo at Istrana
- 132° Gruppo / 51° Stormo at Istrana
- Reparto Sperimentale di Volo (RSV) at Pratica di Mare

Phase out ceremony

On 5 April 2024 there was a formal retirement (phase out) ceremony at the Aeronautica Militare 51° Stormo at Istrana air base, near Treviso in northern Italy. For this occasion an AMX aircraft was painted in special colours. On the top of the nose is the coat of arms of the Italian Armed Forces with the phrase 'Virtute Siderum Tenus' which means 'Through virtue to stars'. On top of the fuselage there is a large compass and a stylised world to represent the contribution to missions inside Italy and all over the world. On the tail is a pilot who salutes wrapped in the Italian tricolored flag and the phrase 'Volatus ad astra, memoria in aeternum' which means 'Flying to the stars, remembered forever'. The fuel tanks shows the years 1989–2024, which indicates the years that the AMX was in service with the Italian Air Force.

During this phase out ceremony, 5 AMX aircraft made nice formation flights, including formations with a Tornado, Eurofighter and F–35 and also a formation with 4 MB–339s of the national display team Frecce Tricolore. After all aircraft landed there was an official ceremony marking the end of the operational status of the AMX within the Italian Air Force. The day after the phase out ceremony 4 AMX aircraft flew to Piacenza San Damiano air base and became part of the collection of historic flying aircraft. This project will in the future allow enthusiasts of the aviation world and historians to admire the AMX and other assortments.

The authors of Lowpass Aviation.com would like to thank all the involved personnel of the Italian Air Force for their hospitality, time and help during our visit at 51 Stormo, Istrana air base.

Article and photos: Lowpass Aviation–Bram Marijnissen and Rene Sleegers
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Night and Day display at the National Military Museum

The National Military Museum in The Netherlands was once more reaching out to aircraft enthusiasts in another dedicated outdoors display which could be visited during normal day hours, but more interestingly, also during a special night entrance. During fall 2024 the NMM organised its 2nd night shoot. The premiere edition, organised in 2022, showed already to be a success event, making the question for a possible follow up not an if, but only a when. The recent held 2nd event appeared again to be successful, which may be an indication for a further developing tradition as recurring event for the future.

One of the elements that are thought to contribute to attract the numerous photographers and other

interested visitors to the event, is that the aircraft that can be seen in the temporary open air display are not part of the regular items on display. The aircraft which can be seen during the event are normally stored in the museums depot which is not open for the public. Additionally, this dedicated display is only open for 3 days, including 1 night entrance, making it a limited edition.

Line up

The aircraft selection of this years display was a nice diversity of historical interesting items. First timer at the open air display was Sud–Aviation SE–3160 "Alouette III" helicopter of which The Netherlands AF operated 77 samples mainly in support for the army and military liaison duties, which were in service from 1964 to 2015. Another 5 Alouette III's were active for Search and Rescue missions, but these were already in 1994 replaced by 3 Agusta AB–412 SP helicopters. The Alouette on display at the NMM was wearing a special overall red–white–blue livery from the former "Grasshopper" demonstration team. The Dutch "Koninklijke Marine" (Royal Navy) aviation was represented by a Grumman US–2N "Tracker" and a Lockheed SP–2H "Neptune" maritime patrol aircraft. The Tracker aircraft have had also an active career at

the countries only aircraft carrier the "Karel Doorman" which left Dutch service around the late sixties, to continue its service for Argentine where it was also in use during the Falkland war in 1982.

The museums aircraft line up included furthermore a Lockheed TF–104G "Starfighter" of the Operational Conversion Unit (OCU), at that time in charge of pilot training. The Starfighter was sided by a McDonnell Douglas F–4E "Phantom II" from the United States Air Forces in Europe (USAFE). In fact the F–4 was back at its original playground as it was once part of the 32nd Tactical Fighter Squadron (TFS) based at former Soesterberg air base, which is now home ground of the museum.

Orange Jumper

Other museum participant was General Dynamics F–16B MLU "Fighting Falcon", the aircraft type which was only recently taken out of Dutch military service per late September 2024. The displayed F–16 with serial number J–066 was a rare bird within the air force as it was a test bed for new developed hardware and system updates. As common with test aircraft, many of its imbedded test elements are not normal for the operational aircraft and are therefore orange coloured. As a kind of tribute this F–16 received the unique nickname "Orange Jumper" during its Dutch testing career which was finished by 2022.

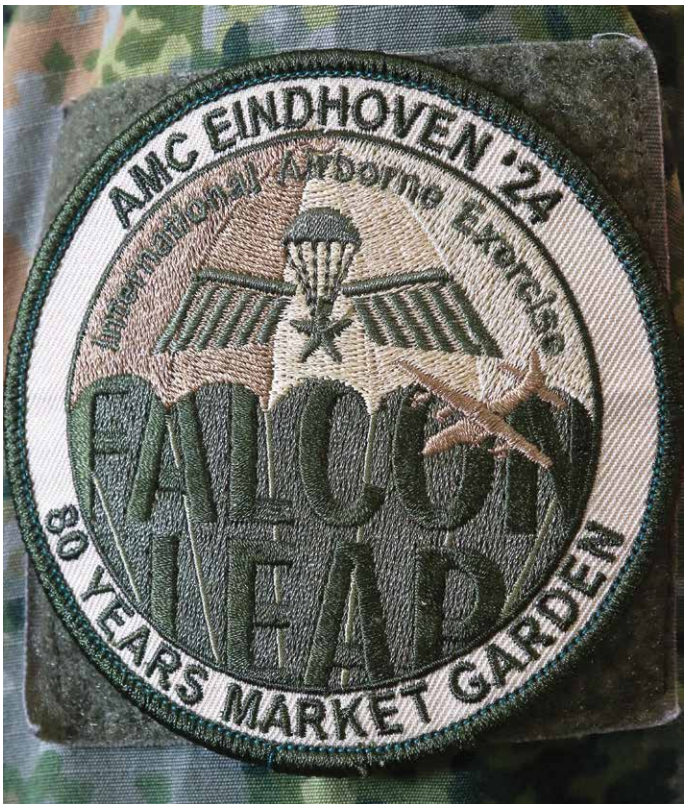
The display was finalised with a Dutch Hawker Hunter F.Mk.4, a USAF Cessna T–37B "Tweety Bird" trainer, an USAFE North American F–86F "Sabre" and a Soviet MiG–21 fighter. During the night display all these aircraft were nice lit up at their podium for the audience.

Text and photos by Peter ten Berg

Falcon Leap 24 and Market Garden Airborne exercise leads to WWII commemoration

On 6 June 1944, allied forces started their enormous World War II campaign to liberate Europe from German occupation. On this "D–Day", troops invaded the west coast of France and in a moderate pace they re–gained territory and pushed the German military further east wards. By September the allied forces reached the north of Belgium and a large plan was prepared to speed up liberation of The Netherlands before the winter. This plan "Operation Market Garden" would drop paratroopers in the Arnhem region to cut of German troops, and prepare a faster northern route for the allied ground forces from Belgium. On 17 September the operation started, however unexpected German resistance was the cause that the overall plan failed with the sad balance of around 17,000 allied service men who lost their lives in a couple of days. That was why the liberation of The Netherlands was delayed and finally took place in the spring of 1945.

Each year in September operation Market Garden is commemorated including current military paratroopers who perform mass droppings in the same areas as the original operation of 80 years ago. Their jumps for the commemoration of Market Garden are combined with the annual international Falcon Leap exercise.



Falcon Leap 24

This years Falcon Leap edition took place from 9 to 20 September and was executed from Dutch Main Operating

Base (MOB) Eindhoven. The base is amongst others host for transport squadron 336 equipped with C–130 Hercules aircraft and furthermore hosts the headquarters of the Dutch Air Mobility Command (AMC). At Eindhoven we spoke to Lt Colonel Linda Lauret, Chief of Staff AMC and, for the 2nd time, Falcon Leap exercise director. "Falcon Leap is one of the major European Airborne exercises in its field where the first week (phase I) focusses on aerial cargo droppings and the 2nd week on para trooper droppings". This year participants came from 12 nations, representing next to The Netherlands, Belgium, France, Germany, Greece, Poland, Italy, Spain, the UK, Portugal, Romania and the USA. Phase I of the exercise had C–130 aircraft from the USA and The Netherlands available, added with a C–27 from Romania to execute the cargo droppings. In this 1st week around 250 paratroopers from the Dutch 11th Air Mobile brigade supported the flight activities which took place at day and some at night time. A typical day tactical scenario was the initial dropping of pathfinder paratroopers at the selected location. These pathfinders cleared the way and prepared the landing zone for the arrival of more paratroopers who secured the area for the sub sequential following cargo droppings. Earlier in the day the logistic planners and load masters were already briefed about the cargo, in order to address the types of cargo to the different available aircraft according

to their capabilities. Other important elements to prepare for, included the distribution schedules of the cargo, telling which cargo had to be dropped first and taking into consideration the sequence of the aircraft in the formation. Knowing all this, Container Delivery Systems (CDS) were prepared in which appointed goods or equipment were bundled and packed together in such a way that they could withheld all forces during the dropping when attached to the parachute.

During phase II of Flacon Leap, the exercise focus shifted to mass droppings of paratroopers. This caused several changes in the fleet of available international aircraft half way the exercise and expanded considerably. The available aircraft for week 2 consisted out of C–295's of Poland, Spain and Portugal, C–27's from Greece and Romania, C–130's from the USA, The Netherlands and Greece and A–400's from the UK and Germany and made up a formation of 13 aircraft. The force of paratroopers consequently grew to about 1000. The focus for the para servicemen was all about interoperability, jumping from other aircraft than their own and also using other countries types of parachutes. As a deliverable for the practical experiences being able to use other parachutes, the paratroopers could earn other nations "wings".

The invitations to participate in Falcon Leap are sent to countries when taking in mind the likelihood that these

nations would combine operations during international conflicts or in cases of human disaster relief. Depending on the available exercise capacity, applicants are finally selected to join the exercise. That the exercise is also open for non–NATO members was displayed in this year's edition while, for example, some Jordanian observers joined Falcon Leap, after the Dutch cooperated with Jordan when conducting human relief cargo droppings over Gaza earlier this year.

Air Assault demo

The 80 years Market Garden commemoration saw also a demonstration of a nowadays sample of an air assault executed by the 101st Airborne Division of the US Army near the town of Schijndel. For the demo some CH–47F Chinooks and UH–60M Black Hawks of the 1st Air Cavalry Brigade currently deployed to Europe for "Operation Atlantic Resolve" showed up on scene. The audience was given a look at the units air assault when the manoeuvring helicopters entered the "hostile theatre", deploying combat forces in the field. During the demonstration of the ground forces, which were gaining territory, the US army Chinooks and Black Hawks performed a MedEvac and lifted vehicles by sling loads underneath the helo's into the battle field.

Text and photos by Peter ten Berg

Cobra Warrior 24–2

A Canadian Hornet returns back to base after a mission. Daily large scale missions were flown during the exercise at the end of each morning.

Twice a year, the United Kingdom hosts Cobra Warrior, a multilateral, Large Force Exercise (LFE) as part of their fighter weapons school graduation event. This exercise iteration focussed on operational to tactical high end spectrum warfighting in a contested, degraded and limited operating environment. The exercise comprised of up to 80 aircraft operating in mixed formations, including fighter jets, Airborne Early Warning (AEW), Intelligence, Surveillance & Reconnaissance (ISR) aircraft, Air–to–Air Refueling (AAR) and Air Mobility asset. This includes both fixed wing and rotary wing aircraft.

Staff from Royal Air Force (RAF) Waddington are running the operation, while aircrews from RAF stations at Lossiemouth, Brize Norton, Coningsby, Mildenhall and Lakenheath are taking part. In addition, several other foreign nations are participating from several of these bases as well. Organised twice a year by 92 Squadron, based at the Air & Space Warfare Centre at RAF Waddington, Cobra Warrior is the RAF's capstone large scale flying exercise, where participants employ composite air operations to achieve military objectives in challenging and contested threat environments. With Cobra Warrior 24–1 being cancelled, Cobra Warrior 24–2 kicked off on 16 September and ended on 4 of October. With support and participants already arriving on the 9th of September,

CW 24–2 badge.

with initial familiarisation flights started in the first week, the exercise ran for almost a full month. Cobra Warrior provides the opportunity to go somewhere new, integrate with different forces and learn in an environment that is going to give a mission scenario that is representative of real world operations.

High level cooperation

The objective of the three week exercise is to train the participants to contribute to large force multinational air operations. The exercise focuses on interoperability between different air arms and their respective aircraft in a contested air environment on a level that would be expected in a conflict with a peer or near peer adversary. International cooperation is a keystone of the exercise concept, as the participating nations include the United Kingdom's allies and partners from all around the world. Bringing together nations, whose first language may not be English, and asking them to participate in complex aerial activity may seem like a recipe for confusion. However, thanks to NATO's standardised practices, communication, basic tactics and procedures the pilots are well prepared to participate with the highest standards.

As a result, the exercise involves several different fighter types, enabling the combination of diverse fighter tactics and the development of air combat training. During fighter integration sorties, different nations' aircrews maximised

A Norwegian F–35A closing in to the KC–135 to add some much needed fuel.

their effectiveness by drawing on the strengths of each platform. Each squadron came to the exercise with their own goals to optimise their participation in Cobra Warrior. US Air Force Capt. Stiffler, callsign "Smooth", an F–16 pilot from 555th Fighter Squadron based at Aviano Air Base, Italy, explains; "The main objective for our squadron is to maximise interoperability between other nations. Working with Norwegian, Canadian and Polish pilots gives us the possibility to work together in terms of tactics

A Rovaniemi based F–18 lifts off from RAF Waddinton for the main exercise mission of the day.

Canadian Hornets from Cold Lake return to base after a Cobra Warrior mission.

Canadian Hornets are not unknown to operations. This F–18 shows a range of bombs dropped on targets somewhere in operational theatre.

and in terms of technology, like datalink. This ensures us to operate together and to pass necessary information that will maximise our capabilities. In addition, the social aspect of the exercise plays a big role. Being able to talk to pilots from other nations provides the opportunity to build trust."

The exercise included the Lockheed Martin F–35 Lightning II fighter jets from the Royal Air Force (RAF), the United States Air Force (USAF) and Luftforsvaret (Royal Norway Air Force RnoAF), General Dynamics F–16 Fighting Falcons from the Siły Powietrzne (Polish Air Force PAF) and the USAF, Eurofighter Typhoon from the RAF and McDonnell Douglas F/A–18 Hornets from the Ilmavoimat (Finnish Air Force FiAF) and the Royal Canadian Air Force (RCAF). This mix of air assets provided an opportunity to develop the cooperation between fourth and fifth generation jets.

The objective of such Fighter Integration activities is to optimise the capabilities of two different generations of jets, building on the strengths of each as well as learning from each other while operating the same aircraft, as US Air Force Capt W. Eris, callsign "Van Gogh", an F–35 pilot from 495th Fighter Squadron based at RAF Lakenheath, explains; "The Norwegian participants are working directly from our squadron building, so we have a direct comparison to what they are doing. We are working very closely with them, as they are also operating the F–35. We might be from different countries, but we have the same language in the F–35. Even though we come from different backgrounds and there are some minor differences in word choice for example, but we are still talking the same game plan and doing the same things. Our day–to–day training is integrating and working within the squadron. This makes it seamless to transition the integration with other F–35's and even other airframes. Working within the

Skull flight in formation waiting their turn to receive some fuel before heading out to the operating area.

exercise just increases the scale of what we operate with, meaning more jets and a bigger airspace and making sure that we are all on the same page on how to execute the mission safely."

One big advantage during Cobra Warrior is that young and less experienced pilots get to experience multi–asset scenarios, far larger than the small packages flown at home. These assets brought together a slew of different capabilities, including rotary wing, airborne early warning and fighters, testing their ability to maximise their effectiveness and to solve tactical problems. Training like this helps build the skills of young crews so that when/if they are deployed on real world operations, they are used to working and planning with different nations to accomplish their mission.

Capt. Stiffler elaborates; "Our squadron has tried to bring as many personnel as possible for the four week period of the full deployment. What we gain as a squadron, from being away from our home station, is that everybody can gain. It's not just necessarily about bringing the top performers, because we want everyone to improve. As this is my first assignment and I am one of the pilots with the least number of hours and least amount of experience. It is actually more important to give the younger pilots more time flying and more of the sorties because we have the most to gain from it from a flying perspective, whereas the more experienced people will have more to offer and gain on the mission planning side. We have not had any specific spin up for Cobra Warrior. Cobra Warrior is unique in the sense that a large part of the exercise is the mission planning aspect. A lot of the parts of each mission are planned a day prior to the mission. The integration with the British, as it is a big exercise for them, is them leading the planning and us bringing our expertise to the table. This shows them what we are capable of and how we can add value to their exercise." One interesting challenge all participants had to overcome was how the geographical spread of deployed assets would impact mission planning. Not only did communication need to be established with all detachments, but it also needed to be secure at a classified level. Capt. Stiffler continues; "What impressed me the most during Cobra Warrior has been the mission planning side of the exercise and how we have been able to refine the entire process taking into account that we are dealing with so many aircraft. Going through the missions it is really interesting to see a group of people coming together and mission plan something that is very complex."

Exercise operations

The large training areas over the North Sea have been a home to large NATO exercises for many decades. RAF Waddington was previously the control hub for a massive Air Combat Maneuvering Instrumentation (ACMI) range located there, which saw the base host an extraordinary range of visiting fast jets between its opening in 1990 and its closure in the mid–2000s. The formerly annual Exercise Nomad made heavy use of this range. Modern technology that has seen ACMI technology integrated into pods that can be fitted on an aircraft's weapon rails made fixed ranges like this redundant, but the large airspace and its military training areas (including the well–known D323 Complex or 'the 323s') are still heavily used.

This enables the exercise to fly in large packages and also enables the squadrons to make the most out of their training goals, as Capt. Eris explains; "We plan and brief

Kreivi von Rosen donated the Finnish White Guard its first aircraft in March 6th 1918. This F–18 honours this moment, seen as the birth of the Finnish Air Force.

The Polish F–16's participated for the first time during Cobra Warrior and made the most out of every opportunity they had top practice with their partners.

The Canadians participated for the second time in Cobra Warrior. This is a great opportunity for them to work closely together with their NATO allies.

our missions, execute it for the duration of the exercise and debrief to ensure we can see how it all went. We can then evaluate what could have been done better and how we can improve for our future operations." Typical Cobra Warrior missions were flown once a day in large formations during the first two weeks of the exercise. These missions took place between 10:00 and 13:00, with planes taking off from their respective bases spread out over the UK. Smaller missions were flown at the end of the afternoon, to allow participants to practice more specific missions. These included missions like low flying, through the Lake District in the North of England or the Mach Loop in Wales. The third week of the exercise was reserved for night flying missions with planes flying between 21:30 and 23:30.

With European security facing its toughest test of solidarity arguably since the Second World War, it is perhaps no surprise that the focus of Cobra Warrior was on countering state–on–state aggression. Developed by 92 Squadron RAF, Cobra Warrior portrayed a situation that changed dynamically day–to–day based on the results of each mission. The participants were given a scenario to work within and apply critical thinking and solve tactical problems. The first week of the exercise saw participants respond to, and defend against, a simulated surprise attack on a fictional European nation. During this opening stage, missions like defensive counter–air were flown, aiming to protect a list of strategic targets or high value airborne assets. Moving into the second week, the focus shifted to air interdiction/strike missions as the hypothetical campaign shifted from defence to offence, with Scotland standing in for enemy territory.

During this phase participants simulated dropping air–to–ground weapons while USAFE (United States Air Forces Europe) Suppression of Enemy Air Defences (SEAD) specialists engaged simulated surface–to–air missile sites. The aggressor aircraft operated by Draken Europe are an almost daily sight over the North Sea ranges, and Cobra Warrior 24–2 has been no exception. Operating from Teesside International Airport with specially modified Dassault Falcon 20 and Aero L–159 Honey Badger aircraft, the company is one of the main providers of threat simulation to the British military and their allied forces. They were formerly known as Cobham, who first made their name as pioneers of air–to–air refueling under the name Flight Refuelling Limited, but were acquired by the American red air giant Draken in 2020. During the exercise, some of the locally based forces were also assigned to play in the hostile red air role, similar to the setup used by the famous Red Flag exercises from Nellis Air Force Base, Nevada.

Many large scale exercises have a build–up period where intensity and complexity of the exercise is gradually

The crew of a KC–135 go through their procedures during their descent back to RAF Mildenhall.

increased. Capt Stiffler elaborates on the operational side during Cobra Warrior; "Personally I do not see the same happening during Cobra Warrior. The F–16 is a multi–role fighter aircraft, so we go through a phase–to–phase training where we hit every type of scenario that is in our portfolio. We are working in a similar way during the exercise here. One mission is not necessarily more difficult than the other, they just require different types of preparation. An example of a mission that we fly during the exercise is defensive counter air where we perform point defence. In this scenario we protect an asset that is very valuable. This can for instance be an air base. Blue air will protect this from the Red air forces. On the opposite side of this we perform offensive counter air, where you are trying to attack the protected asset. Within our role of the 555th Fighter Squadron we are focussing mainly on escort, strike or attack missions." Capt Eris adds; "With the capabilities of the F–35, the 495th Fighter Squadron has been focussing on Suppression of Enemy Air Defences (SEAD) and escort missions."

Tanker affairs

Another main aspect of a large scale, multinational, exercise is the tanker support. Having the ability to refuel aircraft in mid air is invaluable and increases the range of each aircraft. This expands the operating area of the mission, enabling for even more complex scenarios. It also enables more training opportunities for crews of both the provider and receiver of the fuel. Mastering air–to–air refueling is key to reach places that the mission envelope requires. Being able to get training for the tanker crew in large scale exercises is key, as a combination of different receivers during a single mission adds to the complexity.

US Air Force Capt. J. Knutson, a KC–135 instructor pilot with the 100th Air Refueling Wing (ARW), explains; "It has been exciting for us to support Cobra Warrior. For the tanker side of the exercise, it is great to work on some of the tactical capabilities that we have and just see our flying operations in a tactical mindset. It is a great opportunity for us in a training environment to practice those specific skillsets. The KC–135 is like customer service for the receiving aircraft. Whenever we can then see a glimpse of the tactical missions they are executing and be involved with that, it is always an exciting time for us and provides a lot of background information towards us tanker pilots."

The air–to–air refueling aircraft are often the first ones to take off and the last ones to return to base as they need to be out there, preparing for the mission aircraft to join them for the needed fuel. Capt. Knutson continues; "Our flights can be very intense, and we do break a sweat from time to time. We work hard up there, but that is always a fun time for the crew. It is very stimulating with the fighter aircraft coming up to us for refueling. We are constantly evaluating our fuel state and what we can provide to each individual receiver. So, these type of missions during Cobra Warrior, that are short and engaging are typically my favourite missions." Being often at the center of many missions, the KC135's of the 100th ARW are participating in a variety of large–scale exercise that are taking place in Europe. Capt Knutson explains; "Operating out of Mildenhall, we are very fortunate that we get to participate in a lot of exercises. We gain a lot of experience through these exercises. During my two year assignment to the wing, I have been lucky to participate in several exercises. That is a big advantage of being out here. It has been my first time participating during Cobra Warrior. I felt from the tanker perspective we can flow in very seamlessly to the exercise. Both with our foreign partners as well as the different US squadrons. It felt that very well executed planning went into this exercise, because the tactical aspect has been very streamlined. From a tanker perspective, we are there to allow the fighter pilots to extend their time on station or extend their reach. One of the best benefits of the exercise is that we get so used to communicating with each other through different aircraft platforms, but to be able to see foreign partners work with us and create a standardised form of communication or information flow is super valuable. Any opportunity to practice interoperability between coalition partners is an excellent use of time and Cobra Warrior has been a very well executed opportunity for exactly that purpose."

Article and Photos: Erik Bruijns

Two Polish F–16's depart for an afternoon mission during Cobra Warrior. Afternoon missions were flown in small formations only.

Falcon Leap 2024

This year again, the annual exercise Falcon Leap took place at the Dutch air base Eindhoven. In a period of two weeks, intensive training is given in dropping cargo and paratroopers at various locations in the Netherlands. This year, the exercise took place from 9 September until 21 September 2024. The last day of the exercise is traditionally the ceremony on the Ginkelse Heide to commemorate Operation Market Garden, the largest airborne operation of the Second World War.

Over the years, the exercise Falcon Leap has grown into one of the largest airborne exercises in Europe. The exercise is led on the air force side by the Dutch Lieutenant Colonel Linda Lauret. Lauret is normally the Chief Staff of the Air Mobility Command at Eindhoven Air Base. During these two weeks, she is the 'exercise director' (Detco) of Falcon Leap on the Air Mobility side of the exercise. Linda says about her position: "I have a team of staff chiefs under me, who represent the various disciplines within the exercise. In this team there are people who are involved in the operational part of the exercise, manage the ground handling and a team of technicians. But my responsibility is to manage the entire course and flow of the exercise and to facilitate my staff members in this".

During the exercise, Lauret is busy for the entire two weeks with a team of about one hundred people supervising the execution of the exercises. "In the first week and a half we trained a tactical scenario together with the Airmobile Brigade of the Dutch army, to whom we provide support with transport aircraft. The last two days of Falcon Leap

are dedicated to the 'Cross Parachuting' days, where we finally conclude on the last Saturday of the exercise with a contribution to the commemoration of Operation Market Garden. This operation took place exactly eighty years ago this year and it is therefore quite special to reflect on

it". During the exercise, the participants mainly train in sharing experiences and interoperability with the different nationalities. Participants practice parachuting in groups from different countries from aircraft from yet other countries. This has great training value and ultimately also makes a nice contribution to these commemorations on the Ginkelse Heide.

As the exercise has grown in recent years, the number of participants has increased significantly. At the moment, nine aircraft are participating in Falcon Leap and paratroopers from eleven countries are involved. In total, approximately 800 paratroopers are present at Eindhoven. During the exercise, the turboprop aircraft will initially fly two and later three waves per day. After each wave, the aircraft return to Eindhoven. The engines continue to run and a new group of paratroopers is ready to embark to be dropped above both the Ginkelse Heide and Heteren. All major European types of transport aircraft are involved in the exercise, such as the C–130H Hercules, the C–27J Spartan, the CASA C–295M and the Airbus A400M. The participating aircraft come from countries such as Germany, Greece, the Netherlands, Poland, Portugal, Romania, Spain and the United Kingdom. The American participation consists only of C–130 Hercules aircraft from various units and variants.

Linda is clear about the origin and the use of the exercise; "It is quite special to see how this exercise came about in the past. Falcon Leap was actually created with

the idea of Operation Market Garden in mind. The exercise was created with the idea of practicing with as many paratroopers from different countries as possible in one week and jumping together in order to contribute to the commemoration. But in recent years, and certainly in the past few years, the exercise has really grown into a large airborne exercise that is unparalleled in Europe". Falcon Leap is an exercise of the 11th Airmobile Brigade, which is the main part of the exercise, and in addition there is a Mobility part. The 'Mobility' side is led by Lauret and is in principle supportive to the Airmobile Brigade. This army component cannot of course practice if it does not have the right flying assets to carry out the exercises. One party cannot do without the other party. This collaboration is not

unique within defence, because there are multiple exercises and scenarios in which different defense components are interwoven during the deployment.

Since Falcon Leap has grown enormously, the objective has also changed considerably. Where in the past only parachute jumping was central in preparation for the Market Garden commemoration, this is different today. The exercise has grown into an important training in the field of modern airborne deployment and cargo droppings. That this type of training is necessary became clear through the use of Dutch transport aircraft for such missions in the Middle East. Linda gives a recent example of an actual operation: "It is clear that this is one of the exercises with which we can achieve our training objectives. This week we also have two observers at the exercise from a team from Jordan. They do not actively participate in the exercise with aircraft or with paratroopers, but it is a country with which we have cooperated, for example in relation to Gaza. We have dropped various relief supplies with their help for the benefit of the population in a crisis area. Therefore in this way we also look for the partners with whom we actually cooperate in the real world. These are not always just the logical countries such as the United Kingdom, France and Germany. We also look at what is current and relevant and try to involve those countries as well".

Different participants also have different main objectives that they want to achieve during this exercise. For the army and also part of the air force, training interoperability is really a main objective. The same applies to the different international partners that participate here. For the Air Mobility Command, training the airborne concept itself is also an important learning goal. In addition to dropping paratroopers, training is also conducted to drop cargo to support ground troops. This scenario was therefore trained intensively in the first week and a half. Another learning objective was to be able to train an 'engine running offload' well. In this tactical scenario, the aircraft land at a remote location to quickly drop off the cargo with the engines running and then take off again as quickly as possible. The learning objectives are trained daily in practice, according to Lauret; "The first day of the exercise started with the dropping of the soldiers on location who prepared the landing site. Shortly afterwards, cargo could be flown in. It is therefore possible that troops and equipment will be flown in afterwards with the aim of conquering a certain area. We have therefore trained this tactical scenario very well. The last few days we mainly trained in dropping parachutists. This last learning objective is really about training the different countries to jump with different parachutes from different aircraft, and that is really a main objective of this exercise as well".

The entire exercise consists of a number of scenarios, but these scenarios together form a whole main scenario. Lauret explains how these scenarios are constructed; "This year we are working with only one continuous scenario that takes place in phases. Each phase therefore contains the various training objectives for both the Airmobile Brigade and the Air Mobility Command. One of the most important training objectives for us is also simply practice and training in dropping the material that is needed for this. For us it is important to be able to focus on this main task. A scenario that we train is, what if, in this case there is an area in the Netherlands that needs help and we have to bring people there to help in this remote part of the country. For us from a 'mobility' perspective it does

not really matter what type of scenario it is, because the training of the procedures and tactics on itself is more useful to us than the place where we are going to land. What matters to us is that we can quickly prepare for evacuation operations, for example, or when a humanitarian mission or disaster relief has to take place. During Falcon Leap, we trained this way of working at Twenthe Airport. We landed here several times with different aircraft to fly in help. There were already Air Mobile soldiers present on location and for them it is also an important training to secure a landing zone for such large cargo aircraft. At that moment, they are the ones who talk to the flying crew that comes over, therefore at Twenthe we were able to train that well several times. Then again, that interoperability plays a role here between air force and army units".

During the second week, the exercise enters a different phase. From this period onwards, the emphasis will be on dropping the paratroopers during the airborne operations. These scenarios mainly take place on the Ginkelse Heide and in Heteren. This scenario focuses on being able to drop large international groups of paratroopers. Therefore they train with different units from different countries with aircraft from other countries. The main focus on this operation is therefore really on interoperability. The conclusion of this phase of Falcon Leap is the dropping on the Ginkelse Heide during the Market Garden commemoration.

Before a large organisation like Falcon Leap can function, there is also a period of preparation for an exercise of this size. The preparation for the exercise actually starts immediately after the end of the previous edition. Therefore more than a year before the next exercise will take place, actions are already being taken to set up the next edition. On the Air Mobility side, the first thing they do is to set up a plan for the exercise during the Integrated Planning phase. According to Linda, the first plan is mainly practical: "In the beginning, the preparation is still very practical in terms of logistics, but that changes at a certain point a few months before the exercise. We then start working on the exercise script and then we really start working out the scenario together with the Airmobile Brigade. The success of the exercise ultimately depends on the fact that there is a good scenario in which the training objectives of both military disciplines can be trained. Both armed forces provide input here and this is coordinated in this script. All in all, and certainly on the army side, this is just a preparation of about a year before the actual exercise takes place".

During the two weeks of the exercise itself, everything has to come together well, so the preparation has to be well organised in advance. In this preparation, everything is also just really practical logistics, so apart from the scenario, that is just how it is done in practice. According to Linda, the army units also have their affairs well organised every year: "This includes organising the arrival of more than 800 parachutists from all the participating countries. I have been to Schaarsbergen myself, and I can say that the army really has this well under control with a whole system that they have set up for this. For us at the 'mobility' side it is certainly also the execution, it is mainly the preparation of the people who participate in the exercise but who simply work at Eindhoven Air Base. These are the people from air traffic control and the people who manage the platforms, for example. As Air Mobility Command, we must of course also be able to handle all of that".

Only when all internal matters have been properly organised, the participants from abroad are also involved. At the beginning of the year, there are discussions with possible participating countries. It is considered who the logical partners are in the international context, these are the typical countries with whom there has been more frequent action in the past period. A list is made of these countries and ultimately invitations are sent to these countries. If countries decide to participate, their training objectives are also requested here. These often overlap with the already existing training elements, but sometimes new items are added to the list of objectives.

Not only after the exercise but even during the exercise there is an evaluation. Learning from the practiced scenarios is often best done immediately after the debriefing of a specific assignment or mission. During the entire Falcon Leap exercise there is an active process to retrieve all 'lessons identified' on a daily basis. This is done partly during the so–called 'hostmanship' during the exercises. Every day staff members of the various disciplines discuss with each other which things went well, which things could be improved and which things did not receive any attention at all. This is often in communication or coordination, but there is also a moment after the exercise when the units are taken up. During these discussions the scenario is really reviewed once more per day to draw conclusions. Questions are asked about how things will be secured in the future. These items are also included in

the preparation for next year. These are not just slogans on paper, in these aftercare meetings the names of people are also actually linked to actions that they must take up for the next time, so that next year it will go just that little bit better again.

Linda is very clear about the course of this year's exercise with respect to the previous editions: "You can see that the scenario and how we intertwine our interoperability and cooperation has gone quite smoothly so far. You see that every year we go a step further than in previous years. That is good, because then such an exercise also evaluates. It ensures that we integrate a little more in the idea of how could we act together? Therefore you see that the exercise that started ten years ago as a kind of dress rehearsal to do a commemoration, has now become a really well–integrated exercise to really work together and train with each other in the real world. As a result, we are really ready for the real tasks in the real world with our international partners and I am proud that we have achieved this in recent years".

Traditionally, Falcon Leap always ends with the commemorations surrounding Operation Market Garden, which took place during the Second World War. During this major operation, the bridges in the Netherlands were fought over during the Second World War. The goal of this operation was to quickly conquer the Netherlands and Germany in order to end the war quickly. Operation Market Garden was an Allied offensive in September 1944, at the end of the Second World War. It was the largest operation on Dutch soil during the Second World War. It was largely a failure for the Allies and the Netherlands because the final bridge at Arnhem could not be captured. Partly because of this, the west of the Netherlands was not liberated and had to deal with the Hunger Winter.

Market Garden consisted of a large scale airborne operation (Market) and a ground offensive from Leopoldsburg in Belgium (Garden). The British, Polish and American airborne troops were to capture important bridges over the Dutch large rivers, after which ground troops could quickly advance to the IJsselmeer via these bridges. This would have captured the German troops in the west of the Netherlands and at the same time created the opportunity to advance to the Ruhr area. Less well–known is the importance of Operation Market Garden for the encirclement of Antwerp and the area where the Battle of the Schelde would be fought. According to Lauret, this part of the exercise was also important, because for the participating units it was also an honorary deployment with a great sense of history: "We have more aircraft to deploy this year because the exercise has been much bigger than in previous years.

In the end, thirteen aircraft were deployed on to drop the paratroopers in two waves on the Ginkelse Heide where the festivities took place. It also matters which type of aircraft is flying, because in the past we have also seen that for the previous days, many smaller types of aircraft were deployed that fly up and down more often. We don't have that this year, so we fly less often but with larger formations that way. And that also ties in with the tactical scenario of the past few weeks. It is really the larger military aircraft that participate in the Market Garden Memorial. Take the A400 of the British and the Germans, for example, which are parked on the other side of the air base because of the limited platform space. Despite these challenges, the exercise was also a success this year and we have delivered a beautiful scene on the memorial site as well".

Text and photos by: Joris van Boven and Alex van Noye

Canadian Forces play vital role in Cobra Warrior 24–2

Canadian Forces members from 4 Wing board a Royal Canadian Air Force Airbus CC–330 Husky on route the United Kingdom for Ex Cobra Warrior 2024. Photo Taken outside Medley Terminal in Cold Lake, Alberta on 5 September 2024. Photo credit: Aviator Natalie Chilcott, RCAF Imagery Technician.

Exercise Cobra Warrior 24–2, was held in the United Kingdom (UK) during the second half of September 2024. This large scale multi–national exercise provided high end tactical training to all of its participants and, as one of the premier exercises of its type in Europe. The Royal Canadian Air Force (RCAF) played a vital role in the exercise by sending over eight CF–188s Hornets from 409 Tactical Fighter Squadron based at Cold Lake, AB and a single CC–130HT Hercules refueller from the 435 Transport and Res cue Squadron based at Winnipeg, MB.

Air & Space Warfare Centre

Organised twice a year by 92 Squadron, based at the Air & Space Warfare Centre at RAF Waddington, Cobra Warrior is the Royal Air Forces (RAF) capstone large scale flying exercise, where participants employ composite air operations to achieve military objectives in testing and contested threat environments. Numerous nations attend the exercise during each iteration, learning to operate their different aircraft types together, to achieve the effects required on an enemy force which is well equipped and capable of inflicting damage in return. Integration of partner nations' capabilities with those of the UK is a key objective during the exercise. Exercise Cobra Warrior 24–2 is the second exercise of this nature scheduled during 2024, although the first edition in April this year was cancelled. This September edition brought besides a large contingent of Canadian participants, also units from the USAFE, Finland, Norway and Poland.

"The successful conclusion of Exercise Cobra Warrior 24–2 represents a significant achievement and is testament to the hard work of all everyone involved in the Exercise", Wing Commander Sam Williams, Officer Commanding 92 Squadron stated. He then added, "Recent events on the world stage have only served to highlight how important it is that we are ready to operate effectively together

Pilots from 409 Tactical Fighter Squadron step out to their CF–188 Hornets during Exercise Cobra Warrior on 10 September 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

today, and necessary, to fight tonight." All participants were immersed in challenging planning scenarios where the goal was to achieve specific objectives, in the face of a realistic, aggressive, peer adversary. They were ably supported by NATO air assets and UK personnel from the RAF Regiment alongside Battlespace Managers and other key ground based roles as well as maritime units.

Nighthawks

Led by Lieutenant–Colonel Ben Switzer, Commanding Officer 409 Tactical Fighter Squadron (TFS), eight CF–188s and approximately 150 people crossed the Atlantic Ocean and touched down at RAF Waddington in the United Kingdom early September in order to prepare themselves for exercise CW. The squadron, nicknamed Nighthawks, had set high goals prior to the exercise as explained by LCol Switzer: "Ensuring the readiness of the RCAF to counter air threats is one of our most important responsibilities. Exercises like CW provide highly valuable training for our members, our allies, and our partners in practicing working together in a wide variety of tactical combat scenarios. The exercise helped to further develop the RCAF's ability to operate in high intensity, large force, tactical air war fighting operations, while enhancing its proven capability to operate in European airspace."

When asked which achievements the squadron had accomplished during the exercise LCol Switzer elaborated, "We achieved many training objectives; we brought a mix of pilots with different experience levels. Some are four–ship leads, two–ship leads, and combat ready wingmen, in order to spread out the experience gained at all levels. It also allowed us to train and fight alongside other NATO allies that we don't typically fly with day–to–day, sharpening our skills as a combined force. We learned a lot about operating as part of a coalition and about operating in European airspace." As the exercise had a mix of 4th and 5th Gen fighters (including RAF, USAFE and Norwegian F–35s) it gave the 409 TFS also a look into the future as Canada has selected the F–35A to replace their CF–188s. The first four (out of 88) F–35s are set to be received in 2026. Until then 84 CF–188s will undergo an upgrade programme known as the HEP or Hornet Extension Project. This will prolong the service life of the 84 aircraft through 2032.

NKAWTG

A well known acronym and motto within the air refuelling community is NKAWTG which stands for Nobody Kicks Ass Without Tanker Gas. Basically it says you can't win a fight if you don't have the gas to support your mission. Exercises like CW can be intense and fuel consuming so to maximise exercise value tanker aircraft are almost always involved in exercises this size. Hence the participation of RCAF's 435 Transport and Rescue Squadron led by Major Devin Rand, a seasoned C–130 pilot with nearly 3000 hours under his belt. He took about 30 members of the sqn with him to the UK and explained why the C–130 can be a useful platform for such exercise: "From my experience, the CC–130HT performs exceptionally well in tight exercise airspaces where we are put into a small corner so as to not interfere with the other missions. The CC–130HT can deliver a considerable offload that works perfectly for a shorter mission. The

Captain Matthew Power, a 409 Tactical Fighter Squadron (409 TFS) pilot (left), salutes Corporal Daniel Perris, a 409 TFS member, before takeoff during Exercise Cobra Warrior on 10 September 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

A Royal Canadian Air Force (RCAF) C130 Hercules sits on the flight line while RCAF CF–188 Hornets taxi down the runway during Exercise Cobra Warrior on 11 September 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

fact that the aircraft can turn quickly and be ready to go for the next mission also adds to its effectiveness." Bad luck struck the squadron when on the Friday prior to the exercise on a local familiarisation mission the aircraft hit a bird (buzzard) which caused for almost a week (out of three exercise weeks) delay in the participation of the aircraft. Major Rand recollects about this set back: "Bird strikes happen and are an unfortunate part of air operations. In this case, it allowed for a valuable learning opportunity for our logistics and maintenance personnel. With the assistance of the Air Task Force supply personnel, parts for the repairs arrived late one evening. Without hesitation, the maintenance crew sprang into action, working through the night, in cold and wet conditions, to replace the wing's leading edge. They were determined to deliver an aircraft to support our CW objectives. We were still able to fly 14 out of 19 planned sorties in which we flew over 55 hours refuelling our CF–188 Hornets, Finnish Air Force F/A–18s, and Royal Air Force F–35Bs."

Conclusion

For the RCAF, the objective of the Cobra Warrior 24–2 exercise was to develop interoperability of tactics and techniques together with allies as part of large force multinational air operations. The exercise involved F–35 fighter jets from the United Kingdom, the United States and Norway, providing an opportunity to develop cooperation between fourth and fifth generation jets. The objective of such Fighter Integration (FI) activity is to optimise the capabilities of two different generations of jets, building on the strengths of each. Major Rand concurred to this: "For us, the RCAF's participation on Exercise Cobra Warrior is part of Operation REASSURANCE, the Canadian Armed Forces contribution to NATO deterrence and defence measures in Central and Eastern Europe. This exercise further demonstrates the RCAF's commitment to interoperate with our allies and partners across all domains of operation." LCol Switzer concluded: "Each exercise brings new lessons given the different locations and participant list from iteration to iteration. It was great for 409 to participate in a European based LFE exercise as we were able to train with allies who we may not previously have been able to train with at a Red Flag or Maple Flag."

Written by Remco Stalenhoef and Patrick Smitshoek

A RCAF CF–188 Hornet exits the runway after a flight during Exercise Cobra Warrior on 11 September 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

Corporal Marshall Erickson, a member of 409 Tactical Fighter Squadron, refuels a RCAF CF–188 Hornet in preparation for a flight during Exercise Cobra Warrior on 9 September 2024.
Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

A Royal Canadian Air Force CF–188 Hornet pilot steps out to his aircraft, walking past the CC–130HT Hercules, to start the daily flying operations during Exercise Cobra Warrior on 17 September 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

A RCAF CF–188 Hornet pilot puts on his helmet in preparation to start daily flying operations during Exercise Cobra Warrior on 17 September 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

Group photo of the Canadian Air Task Force during Exercise Cobra Warrior on 4 October 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

Canadian C–130. Photo by Michael Hiley.

A pilot from 435 Transport and Rescue Squadron flies a CC–130HT Hercules during Exercise Cobra Warrior on 2 October 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

Members of 409 Tactical Fighter Squadron service a Royal Canadian Air Force CF–188 Hornet in preparation for daily flying operations during Exercise Cobra Warrior on 23 September 2024. Photo credit: Corporal Kastleen Strome, RCAF Imagery Technician.

Canadian CF–188. Photo by D. Kennedy

Sanicole Airshow at Leopoldsburg

This year the 44st edition of the International Sanicole Airshow took place on 21 and 22 September 2024. The air show is traditionally held at Leopoldsburg airport in the north of Belgium. In addition to the civilian participants, the ties with the Belgian Air Force are also clearly visible in the flight programme.

History

The Sanicole airshow at the airport of Leopoldsburg (Belgium) has grown over the years from a small event to a true spectacle. The name Sanicole that is linked to the air show has a special background and has nothing to do with the place names or the location of the event. The name Sanicole was invented by the Belgian Lucien Plees. This man is the founder of the flying club at Leopoldsburg airport in the municipality of Hechtel–Eksel in northern Belgium. Mister Plees was the owner of a sanitary facility in Korpsel at the time of its foundation. The name Sanicole is a combination of the word SANItary and the name of his daughter NiCOLE. When the Sanicole Airshow was held for the first time, the event did not represent much. The size of the show contrasted sharply with what the event is today. The air show started to grow in size when Gilbert Buekenberghs started to interfere with the organisation. The Sanicole Airshow grew in the 1980s into a large air show that earned its place in the list of leading air shows. This was quite a special achievement at the time, because almost all successful air shows in Europe were not commercial at that time. Most air shows are usually organised by the Air Force or another branch of defence in most countries. The first international participants to participate in the Sanicole Airshow came from countries such as the Netherlands, France and England. The Sanicole Airshow soon got the brand of an international

airshow and the name was changed to International Sanicole Airshow (abbreviated: ISA). The ISA is nowadays one of the most important airshow that is held annually in Belgium.

The Sanicole Airshow has long been a household name in Belgium. However, it would take until the 90s for the air show to break through internationally as a big name in the world of air shows. The Sanicole Airshow remained the only annual air show in Belgium after tightening up safety rules. People have not been idle in Belgium over the years, because the Sanicole Airshow has become a leader internationally when it comes to safety, quality and innovation in the aviation world. The biggest reward the organisation can receive for the effort made came in 2010. The Sanicole Airshow was then named the best European air show and was rewarded with the Paul Bowen Award by the European Airshow Council. Since 2011, the Sanicole Sunset Show is also held annually. This sunset event is held annually on the Saturday night before Sunday daylight show. During this show, the spectators can photograph and film during the sunset. Over the years, the Sunset Show has also developed into a full–fledged event. During this air show traditionally many flares and also fireworks are used by the planes and helicopters. Against the often dark skies and the weak evening light, this results in spectacular photos for those present. If lucky, the moon will also show itself during the setting, making the result even more beautiful. The planes and helicopters that participate in the Sanicole airshow usually fly from the Kleine–Brogel military airbase not far from Leopoldsburg. Leopoldsburg does not have the right infrastructure, as a result of which many military aircraft cannot fly from this airport.

2024 edition

This year there was again a sunset airshow on Saturday evening and a big show during the day on Sunday. There were 2 themes this year: 80 years of liberation was the theme of the 44th Sanicole show and 50 years of the first flight of the F–16.

The evening show on Saturday started with the flight of the WW2 RAF Lancaster from the Battle of Britain Memorial Flight as the end of the 2nd World War played a major role in Belgium. The area around Sanicole airfield was liberated by the Allies in early September 1944, after which this area formed the starting point for the further operation Market Garden in the Netherlands, targeting for the Arnhem bridge ('too far'). In the air show this was emphasised on Saturday evening by presenting two WW2 bombers: the Avro Lancaster and the Boeing B–17.

As the sun sank further and further to the horizon, demos were given by the Swiss 'Patrouille Suisse' in their Northrop F–5, decorated with the '60 years' patch, USAF VIPER demo pilot in the F–16, for the only demo in Europe in 2024, French demo pilot MIMOUSS in the Dassault Rafale, Finnish Air Force F–18 demo, Danish F–16 demo, Richard Goodwin in his Pitts S2S with 2 additional jet engines and Swedish Air Force US–60 helicopter with popping flares. When the sun was set, the fireworks demos were given by the Flying Dragons from Poland with 8 gliders filled with fireworks, Alternative Duo from France in their two RF–4D Fournier aircraft with fireworks, AeroSPARX – Air Display Team from the United Kingdom and Bob Grimstead from the United Kingdom in his Fournier RF–4D Redhawk.

The day show on Sunday also contained many references to the 2nd World War. The Boeing B–17 and the Lancaster came along again, followed by a Spitfire. Various demo teams gave their demonstrations that included Patrouille Suisse in the F–5, USAF VIPER demo pilot in the F–16, Turkish Soloturk in the F–16, Danish F–16 demo, Finnish F–18 demo, German Eurofighter, special D–Day decorated British Eurofighter named 'MOGGY', Slovenian PC–9, Swedish UH–60 (no flares on Sunday), The Red Devils in the SF260, probably with their last demo ever, although it is not sure yet, civil Fouga Magister and civil P–40 Warhawk.

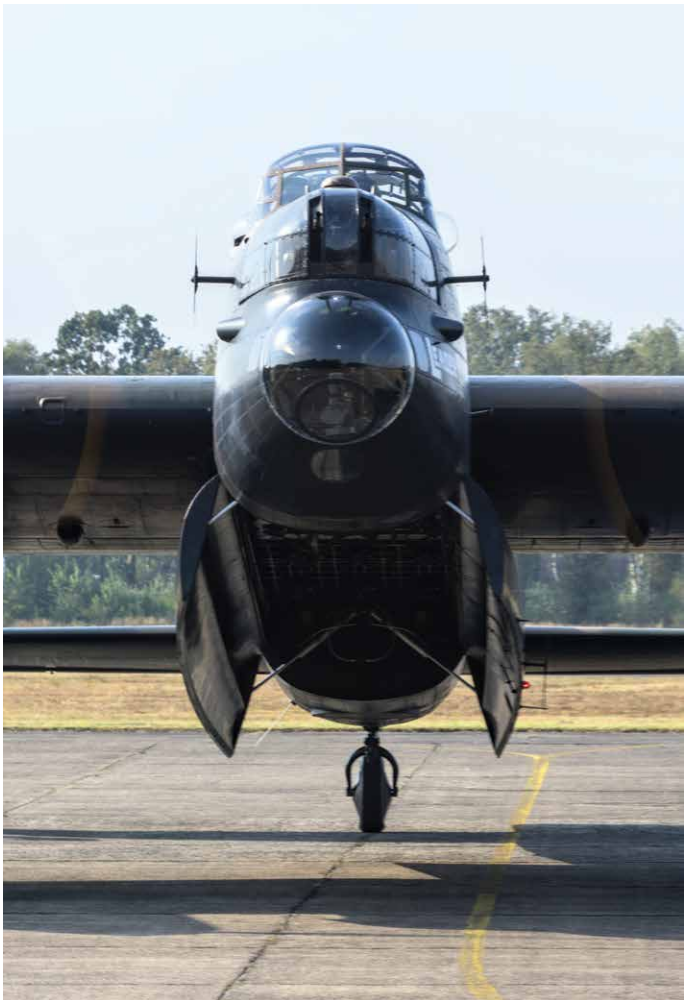
Flyby's were performed by the Belgian A400M, a formation of 3 Belgian F–16s from Kleine–Brogel AB, a formation of 5 F–16s with former Belgian demo pilot Vrieske in the lead, followed by 2 Portuguese F–16s, the Turkish Soloturk F–16 and the Danish demo F–16 and lastly, a formation with a Spitfire and 1 Belgian F–16, with former Belgian demo pilot Vrieske.

The Battle of Britain Memorial Flight

The Battle of Britain Memorial Flight is known for its evocative aerial displays, showcasing the historical significance of these flying legends. It is not just about preserving the past, but it's equally about honoring the sacrifices of the aviators who flew these iconic aircraft during the Second World War.

The queen of the fleet is the world famous Avro Lancaster of the Battle of Britain Memorial Flight (BBMF), which is a four engine heavy bomber that dominated the night skies during the Second World War. With its imposing wingspan and powerful engines, the Lancaster was a formidable force, delivering devastating payloads to strategic targets across Europe.

During Operation Market Garden, the daring Allied airborne invasion of the Netherlands in 1944, Lancasters played a crucial role attacking key targets in advance of the planned parachute droppings. The Avro Lancaster was an appreciated participant to the International Sanicole Airshow in Belgium. The appearance of this legend of aviation is a large contribution to the commemoration of the 80th anniversary of both the liberation of the region around Hechtel–Eksel, where the Sanicole Airshow took place, and the sacrifices made by those taking part in Operation Market Garden over The Netherlands.



Squadron Leader Marc 'Suggs' Sugden has been a part of the Battle of Britain Memorial Flight (BBMF) for more than four years, but is since the season of 2022 the head of this remarkable unit. Mark flew on fast jets throughout his flying career and has successfully managed to avoid a desk job. "My first assignment was on the Tornado F3 at RAF Leuchars in Scotland with the no 43 Squadron. I flew here for four years before joining the British training world. I was an instructor on the Hawk T1 and later also on the Hawk T2. I spent a total of five years at RAF Valley in Wales as an advanced flying training instructor. After this I moved on to the Typhoon. I've flown on the Typhoon since 2013 and flew that for almost ten years prior to taking command of the BBMF. Marc explains about the Lancaster, "The Avro Lancaster really made her mark in RAF Bomber Command and is probably most famous for the part that she played in the Dambusters raid. That raid was of a format which I don't think the Air Force will ever see again. An unproven bomb that was taken against all the odds into the Ruhr and into the industrial heartland of Germany, to drop what was an unproved, ingenious, design from Barnes Wallace to try and breach the dams in the German river valley's. Our Lancaster the only one flying in Europe. And here in Lincolnshire where it is based, she is made all the more special by being in the heart of what we know as Bomber County in the United Kingdom. So back in the 1940s, Lincolnshire was littered

with Bomber Command air bases. From where I stand now here at RAF Coningsby, within a ten mile radius, I could name you ten Bomber Command bases that were used during thousands of bomber raids night in, night out during the latter parts of the Second World War. Therefore this ground feels as her spiritual home and the community here have very close ties to bombers, but most notably the Avro Lancaster. The aircraft is super, super special. The Lancaster is something I'm very proud at that we are still it today, and I really hope you all enjoyed the sight of at the International Sanicole Airshow".

Interview with Patrouille de Suisse leader, Major Duft of the Patrouille Suisse

Q: Can you tell us something about yourself?

A: I am Major Michael Duft (callsign 'Püpi'), leader of the Swiss Air Force demoteam Patrouille Suisse. I joined the team in 2015, so this is my 10th season. Before that, I flew the F–18 in the 11th Squadron (Tigers) out of Meiringen AB. I have a total of 2,450 hours of flight experience, with about 800 hours on the F/A–18 and 800 hours on the F–5. An interesting point to note is that, traditionally, all Patrouille Suisse pilots were qualified F–5 pilots. I was the first to join the team without prior experience on the F–5. Since my entry, every new member has transitioned from the F/A–18 to the F–5. Now, I am the oldest and most experienced member of the team. The F–5 is very easy to fly, with straightforward and direct controls, which makes formation flying especially enjoyable. And, of course, it is a fighter jet, it's incredibly fast.

Q: What do you like about Patrouille Suisse, what we have to bring to you and to the rest of the world?

A: At the end of the day, it's all about teamwork. It's not just about me as the leader; it's about all of us working together. It doesn't matter if I'm leading or if I'm flying as number 2 or 3 on the right or left. The key is teamwork and trust—trusting each other. We fly just three to five meters apart, depending on the formation, so we place our lives in each other's hands. That level of trust makes it incredibly special. It's especially meaningful when we're abroad, like here in Sanicole, representing Switzerland. It's a tremendous honour for me personally, and I believe for all Patrouille Suisse pilots, to represent our country internationally.

Q: How many shows did you fly this year?

A: Normally, we fly around twelve to fifteen shows per year, with about ten in Switzerland and four or five abroad. The last show abroad this year will be here at Sanicole, Belgium. The very final show of the 2024 season is always during the famous Lauberhorn downhill ski race in Wengen, which takes place in January of the following year. Despite being in January 2025, it officially marks the end of the 2024 season. That show will also be my very last one flying with the Patrouille Suisse.

Q: What will you do after leaving Patrouille Suisse in January 2025?

A: After my last show with the Patrouille Suisse, I will continue flying the F–5 as part of RED AIR (opposing forces) and remain active in the Swiss Air Force.

Q: Another pilot and you will be leaving Patrouille Suisse, who will be your replacements?

A: Both Mac (#4) and I (#1) will be leaving the team. As a team, we select our newcomers ourselves; no one tells us who will fly with us. Each active team member has a say in the selection, and any member can veto a candidate, a decision which is respected immediately. We already have two newcomers in the team: 'Mosi' and 'Moe.' Mosi has had the chance to accumulate some flight hours on the F–5 and flew the spare plane to the Sanicole Airshow. He's already part of the team but will officially fly during the demo

season next year. The other newcomer, Moe, completed his transition course on the F–5 during July and August. Both of them are qualified on both the F–5 and F–18. Next year, they will join the flying team. To help them integrate, we have planned a special extra week during our training course, giving them additional hours to focus on specific details of our demo routines.

Q: Can you tell more about the 60th anniversary?

A: This year marks the 60th anniversary of Patrouille Suisse. We began in 1964 with Hawker Hunters as a four–ship demo team during Expo 1964. In 1978, we flew abroad for the first time, in France. That same season, a fifth Hunter was added, and by the end of 1978, we were performing six–ship Hunter shows, a tradition that continued until 1994. In 1994, the F–5 was introduced to Patrouille Suisse, equipped with an integrated smoke system. Each year, we strive to improve our programme, but it largely depends on the team's experience. When we have a stable team over several years, we can enhance our demonstrations. However, if there are significant changes with many newcomers, we simplify the routines and focus on the basics. That said, spectators on the ground usually can't tell the difference between a new team and an experienced one. So, there may be a slight downgrade for about a year until the whole team is fully integrated, after which we can start making improvements again.

Q: How long will the F–5 be available for Patrouille Suisse?

A: Officially, we have the F–5 until 2027, after which there is a deadline due to international regulations. These involve upgrades to radios, ejection seats, and other critical components that must be updated for us to continue flying within European airspace. At the moment, it's unclear if there will be a budget for these updates, so for now, we consider 2027 as the final year of the F–5 for Patrouille Suisse. The only thing we can do is continue delivering safe and excellent demonstrations, as we always have. That's what we can control as a Swiss team—doing the best job possible, which serves as the best advertisement for us.

Q: Can you tell more about the new F–35s and your role here?

A: I will definitely be part of it, though it's not yet decided in which role. Regarding the F–35, some infrastructure in Switzerland needs to be updated. Dedicated buildings need to be constructed and certified for operational use of the F–35, and some of these construction projects are already underway.

Q: Can you tell me about the Sanicole airshow?

A: Sanicole is always a very nice and well organised airshow. While it's smaller compared to larger events like the British RIAT or the Austrian Airpower shows, its organisation is top–notch. Because of this, they consistently attract excellent demo teams from across Europe, which makes it special for us as pilots. This is my fourth or fifth time here, and it's always a pleasure to be in Belgium.

Q: Anything else you want to say?

A: Being part of Patrouille Suisse is a huge honour for me. It means the world to me because it's all about the team and the trust we have in each other.

Text and photos: Joris van Boven and Alex van Noije

Reenactment Eerde 2024

In September 1944, the Market Garden operation was designed by the Allied forces to move in one big thrust from Belgium to the center of the Netherlands, securing several bridges over Dutch rivers.

Nine bridges were to be secured intact by airborne troops (this was called operation MARKET) while ground forces would drive from Belgium northbound over these bridges and eventually cross the last bridge of Arnhem (operation GARDEN). When this was achieved, a further thrust into the German Ruhrgebiet would finish the Second World War in Europe before Christmas 1944. At least that was the plan. Due to several setbacks, this operation was not successful and the Second World War ended only in May 1945 with the capitulation of the German forces. The biggest losses were near Arnhem, which later resulted in a book and in the movie 'A bridge too far'.

On 17 September 1944, the 501st Parachute Infantry Regiment of the D company of the 101 Airborne Brigade

of the US Army landed in the fields near the small village of Eerde; with the target to secure the bridge over the canal in nearby Veghel. After heavy fighting in Eerde and Veghel the bridge was secured by the US Army.

On the morning of 17 September 2024, exactly 80 years later the parachute re–enactment group 'Round Canopy Parachuting Team' (RCPT) jumped in their 1944 US Army outfit on the same field as in 1944. Three flights with a C–47 aircraft dropped the re–enactment paratroopers with their 1944–like round canopy parachutes. And this time the paratroopers were welcomed with applause and flowers by local children.

During the afternoon, the 101 Airborne Brigade ("Screaming Eagles") from Fort Campbell (Kentucky, USA) gave a demonstration of today's helicopter assault. With two US Army UH–60 Blackhawk helicopters and 2 CH–47 Chinook helicopters, the soldiers were flown into the battlefield and after heavy 'fighting', they beat the enemy.

Text and photos: Joris van Boven and Alex van Noije

Simple Design, Complex Deployment

September 2024 is the period in which the Royal Netherlands Air Force will finally say goodbye to the beloved General Dynamics F–16 Fighting Falcon. The aircraft has been the backbone of the air force in the Netherlands for more than 45 years and is very popular among both defence personnel and aviation fans. Together with Lieutenant General and Commander of the Air Force André Steur, we look back on the career of this iconic fighter aircraft in Dutch service.

André Steur (Callsign "Jabba") makes no secret of the fact that the F–16 played an important role. He even met his American wife thanks to the F–16, during his training in the United States. "I started in the Royal Air Force in 1988. What immediately struck me when I joined the Air Force, actually during the entire training process, was the professionalism and discipline that prevailed everywhere. Long days, hard work and learning a lot at a killer pace. When I look at the squadrons of the Royal Netherlands Air Force that is also what I appreciate most: the group dynamics. When it comes to cooperation, the entire aviation

industry in general, and fighter aviation in particular, is sometimes experienced by outsiders as a very harsh world. A deployment where the F–16 in Dutch service really made a difference in an international coalition was of course the

intervention in the war in the former Yugoslavia at the end of the 1990s. Allied Force, the first conflict in which the Dutch Air Force took the lead in the battle, carried out the most risky and complex missions and was responsible for a large part of the missions. Many important moments that took place at that time are still freshly etched in the memories of many civilians and soldiers.

The shift from day to night, the deployment of air–to–surface precision weapons, the deployment of long–range air–to–air weapons and all this while we had only just converted to the F–16 MLU. The combination of a much better weapon system and an even more professional team has brought the Royal Netherlands Air Force to the forefront of the alliance during this conflict during an international intervention in a crisis".

"The most intensive deployment that I have experienced as a pilot was during Operation Allied Force. This was my first gun deployment as well. It was special that we were not that far away from home in Italy. You watch the news and you see all the horrors that are happening there, the rapes, all the atrocities against the local population in Kosovo. That does something to you as a person, you want to do something to stop those horrors. My very first mission was with four CBU–87s, cluster weapons that we still had and were allowed to use at the time, with the target of an entire convoy of armoured vehicles.

Then you notice that the terrible suffering is on the ground, in the back of your mind. Then the drive for good things might even come to the fore.

The feeling that you have been able to make a difference for the people on the ground is moving. You want to prevent more suffering. With the realisation, when you fly back past that column after an hour and you see plumes of smoke rising from the vehicles, that there are people in them too. They are also people who are fathers, brothers or sons. War is a dirty business and that is never nice. Speak softly and carry a big stick".

"Personally, I also see that we have continued to improve the functioning of the team. Over the years, I have really seen a professionalisation in the F–16 community. Partly inspired by the increasingly broader task and the increasing complexity of the missions with the aircraft. When I joined the 312 Squadron as a young wingman, we flew a fairly basic version of the F–16. Dumb bombs, a cannon and short range missiles. That was it. Life as an F–16 pilot was actually very clear at that time. If I compare that with what was later asked of our pilots over the Balkans, in Afghanistan and in the Middle East, that is a world of difference. In that sense, the MLU (Mid Life Update) version of the F–16 has been a real game changer for the entire Royal Air Force. When I saw our people in the Middle East flying missions with the F–16 MLU, with good sensors, smart weapons, mixed weapons packages and sometimes up to ten different attack profiles, it became clear to me that the pilot's responsibility has become much greater as time has passed of the years".

"I believe operations with the F–16 MLU have positioned the Royal Netherlands Air Force as one of the leading Fighter Forces in the world. There are a number of things that underlie this. On the one hand, of course,

the professionalism of the crews on the ground and in the air, but certainly also the cooperation with other countries. When you buy the same stuff and use the same doctrines and the same tactics, there is a lot of synergy in the operations. The Netherlands has played a very important role in this area. Including by setting up the FWIT (Fighter Weapon Instructor Training). I flew on the FWIT where I flew as a Dutchman in a Belgian aircraft with a Norwegian crew chief and a Danish weapons technician, with a Dutch engine in the back of the aircraft. We did everything together. And the great thing is, when we had to deploy together, there were no questions. When we went to Afghanistan with the Danes and the Norwegians, we literally did everything together. The same story with our Belgian colleagues above the Balkans. This synergy was an unprecedented force that was unleashed. No questions and no discussions on the radio".

"After years of loyal service, the F–16 finally needed to be replaced. After my posting to the Block 50 in the USA, I was assigned to work in The Hague, where the Defense Material Organisation, now COMMIT, was located at the time. To work there in the F–16 replacement project team as Chief of Operations. I did that for three years, focusing on the F–35 and no longer on the F–16. Due to its age, the F–16 became an aircraft that really needed to be replaced. So we started looking for an all–rounder, an aircraft that can operate independently in the highest spectrum of violence on the front line. And we conducted a Candidate Evaluation on this. And it turned out that the F–35 met our requirements and wishes by far the best. I found it striking that the very latest F–16 still scored very high! But the core of what we were looking for is that it should also be possible to act autonomously in the highest spectrum of violence. With these wishes taken into account, the F–35 was the only suitable candidate. With this aircraft you can fully concentrate on everything that not only your aircraft sees, hears and smells, but what all those other aircraft perceive and do, and that is all shared among themselves. This is not the case with the F–16. Where you see that in an F–16 the pilot actually has to create information from data, you see that the F–35 really provides information that you can act on immediately".

"It has also been quite a discussion about how we should select to hire new pilots for the F–35. Nowadays, the fighter pilot is mainly a system operator, in addition to being able to fly well. Flying is easier in an F–35 than in an F–16. But managing all those systems, including the weapon system, in addition to being able to get the maximum potential out of them, that is really a whole different world. I still see the values we discussed at the beginning, especially in the F–35 squadrons. We really had to be careful that we did not try to do everything we did with the F–16 with the F–35. This also requires a change of mind, out of the F–16 straitjacket. I thought it was nice to see when we went to the F–35 simulators in Fort Worth in America for the first time with the F–16 pilots. I was then an Ops Lead at the

DMO. We had the discussion; "What should we do now, should we bring all the weapons instructors and guests who have flown through? Then I also said: Maybe it would be useful to bring a few experienced guys, but also a few young guys with 200 hours on F–16? I am therefore pleased that we have quickly brought the younger generations into the transition".

"Introducing new types and phasing out old aircraft has always been the case in aviation. Also with the F–16, and that does something to you! Truly a fighter plane par excellence, a razor in the air, a Fighter Pilot's dream as we sometimes say. And the phasing out of the F–16 is of course very closely related to the introduction of the F–35. Of course, we could only phase out the F–16 once the F–35 had taken over all tasks. And this applies not only to the conventional task, but certainly also to the nuclear task. That was also an important benchmark in the project at the time. And as a small air force, you naturally want to operate with two different weapon systems simultaneously for as short a time as possible. And we recently reached that moment with the IOC status of the F–35. All tasks of the F–16 have been taken over by the F–35. And so at the end of September we will finally say goodbye to the F–16 operations in the Royal Air Force. Of course, we will continue to support the activities in the training center in Romania with Dutch F–16s, but that is the end of the matter".

"The final farewell to the F–16 is of course quite an emotional moment for a lot of people, but not least for myself. For 36 years, the device was one of the important threads in my life, with which I experienced all kinds of things. Weapon deployment, broadcasts all over the world, exercises and always as part of a wonderful club of people: the Airpower team! At a moment like this, all those memories flash by, the things you have experienced, the capabilities of the aircraft, but especially our staff who have kept the aircraft ready for use for years, the people who have ensured that I am still here can always tell this story. 30 years of safe flying and safe return home thanks to them! That really means something to me as a person. And of course it was not only a beautiful and sexy aircraft, but also a dream to fly in. An iconic device in every respect. With that drop canopy, you sit on top of the plane. It just gives you a powerful feeling of technology and it is the most beautiful office to work in. So saying goodbye to this plane in the Netherlands is going to cost me a tear. And that as C–LSK I can be part of this special farewell is an honour".

"And I think a lot of people are going to miss that box. Despite the critical attitude of some in the beginning, an unprecedented success in all respects for BV Nederland. Not only where national and alliance security is concerned, but what about our position in the alliance, within Europe, employment, the Netherlands as a knowledge country, our native industry, the revenue model. We now see the same pattern again with the F–35. Just as with the introduction of the F–16, there are now critics who have often paid little attention to the crucial role that this aircraft will play on the world stage in the coming decades. I would like to have a cup of coffee with those people in 40 years time. The F–16 was an absolute highlight for the Netherlands, for our security and that of the Alliance and will live on forever in our memories and in the stories of the people who worked with it".

"From this place I would like to thank from the bottom of my heart everyone who has contributed to peace and security with the F–16 in recent decades. Proud of you, proud of what you have achieved together year after year! Vipers forever!" concludes Jabba.

Dutch F–16 history, 213 aircraft in 45 years

In the 1970s, the Lockheed F–104G Starfighters of the Royal Dutch Air Force (Koninklijk Luchtmacht) reached the end of its lifespan and a successor was needed. After the selection process between the Northrop F–17, the Dassault Mirage F1, the Saab Viggen and the General Dynamics F–16; the latter won the competition. And in 1979 the first F–16 entered service at Leeuwarden AB. When in the 1980s the Dutch Air Force Northrop NF–5 aircraft needed a replacement too; the F–16 was chosen as successor as well, resulting in a total of 213 Dutch F–16s. After a Mid Life Update, the remaining F–16s could fly to fulfill their 45 years of flying service. And in 2014, the last F–16s were retired as the Lockheed F–35s received their Full Operational Capability in September.

International missions

For the F–16, these missions started in April 1993, shortly after the Cold War officially ended in 1991. Tensions were rising between different population groups in the former Yugoslavia. It lead to NATO operations Deny Flight and Deliberation Force. Dutch F–16s from Villafranca initially participated in enforcing a no–fly zone and subsequent bombing flights. From Amendola in Italy, the Netherlands contributed to Operation Allied Force with, among other things, F–16s. After deployment over the Balkans, F–16s operated in Afghanistan from 2002 to 2014. First for Operation Enduring Freedom, then for the International Security Assistance Force (ISAF). The Netherlands also deployed F–16s from Sardinia for Unified Protector in Libya in 2011.

Ultimately, F–16s from the Netherlands served for several years from Jordan for Inherent Resolve. This operation focussed on combating the terrorist organisation ISIS in Iraq and Syria.

Last operational flights

On 24 September 2024, the last operational Dutch F–16s flights took place at Volkel AB (ICAO: EHVK). Four F–16s flew in the afternoon and for the occasion a small static show was set up with F–104G Starfighter (predecessor of the F–16), F–16 with the "50 years F–16" tail, F–16 with the "45 years Dutch F–16" tail and Lockheed F–35 (successor of the F–16).

Final farewell

On 27 September 2024, the F–16 farewell flights were planned to overfly the airbases where the Dutch F–16s were located. But after departure from Volkel AB (ICAO: EHVK), the weather deteriorated on their way north and the north/western part of the Netherlands overflight was skipped. After a final pass overhead Eindhoven AB, the formation flew to Volkel AB for the final landing.

During the overhead pass, the formation flew with 3–1–2 F–16s, representing the last F–16 squadron 312 "BONZO".

During the flight, the ADSB/MODE–S callsigns of the F–16s were: Final, Viper, Flight, 312, Sons, Of, Bonzo. A Belgian F–16B flew alongside the formation for photos and videos.

During the final F–16 flight, Lieutenant General and Commander of the Royal Netherlands Air Force Andre Steur held a speech where he mentioned the important role of the 45 years F–16 in the Dutch Air Force.

Text and photos by: Alex van Noye and Joris van Boven

HISTORY: FROM VAYU ISSUE–IV JUL/AUG 2008

LORE OF THE PIFFER GORKHA

150 Years of the 5th Gorkha Rifles [Frontier Force]

The First Battalion of the Fifth Gorkha Rifles celebrated the150th Anniversary of their raising on 22 May 2008 in familiar environment, foothills of the Doon Valley not dissimilar to the foothills at Abbottabad, in the NWFP where for long existed their Regimental Centre. After 15 August 1947, this was moved to Dehra Dun and some decades later, to Happy Valley in Shillong.

Going back to the drab and desolate hills of the old Frontier of India began the story of the 5th Gorkha Rifles (Frontier Force), a fascinating record of 150 years, of bold and bloody battles fought in fantastic conditions; of valour and courage seldom equalled and hardly ever surpassed in military history; of silent and stealthy skirmishes in pitch darkness over grim gorges and winding trails; of heads carved up and throats slit with khukris; of numerous bayonet and butt fights and of bullets finding their mark at incredible ranges; and always of a valiant and wily foeman fought cleanly and chivalrously. Truly a story of far and fast marches, through mud, snow, rain and scorching heat, culminating in lightning thrusts; of crossings over rapid rivers and of climbing over perilous peaks; of cunning ambuscades and audacious attacks; of dogged defences and grim withdrawals; of relentless pursuits and patrols and of yet more bolder attacks—all so that honour and glory continue to bless the name and the fame of the Piffer Gorkhas.

Originally known as the 28th Punjab Infantry, or the Hazara Goorkha Battalion, they were raised in Abbottabad by Major HFM Boisragon as a ten company battalion—to be added to the Punjab Irregular Force—from transfers of their Gorkha personnel by twenty one regiments including police battalions plus the Hazara Mountain Battery. Over 90 per cent of the transfers were from the Punjab Irregular Force Infantry Regiments; and it was thoroughly understood that this Corps was primarily raised for `prompt and active service' in the Punjab and the Trans–Indus Provinces, as well as beyond their limits should the exigencies of the service so require it. Thus came into being the only Gurkha Corps belonging to both the famous Gurkha Brigade and the renowned Punjab Frontier Force.

The gensis of these Companies was that, after the Second Anglo–Sikh War of 1849 and occupation of the Khalsa Kingdom, a large number of these Gurkhas (who had served in the Sikh Army) had settled in the Punjab and, when the uprising of 1857 broke out, they or their descendants became members of the Punjab Irregular Force infantry regiments.

Celebrating the 'First' 150 Years.

Battle Honours of the 1/5 Gorkha Rifles (FF).

The Punjab Irregular Force was the original title in 1851. Considerably later, on 19 September 1865, this became the Punjab Frontier Force until Lord Kitchener, on becoming Commander–in–Chief in India, transformed the proud title. After indeed great efforts all regiments, who had belonged to this famous force, were allowed once again to add to their name the magic words Frontier Force as also the abbreviated suffix 'FF' to their titles; but the '13' was gone forever. This distinction, together with the privileged use of the well–known Puffer colour ribbon, has endured fortunately for all time to come.

In 1861 the Punjab Infantry or the Hazara Goorkha Battalion were designated as The 5th Goorkha Regiment (or the Hazara Goorkha Battalion) Punjab Irregular Force and first saw action in Lumsden' s Force at Palosin in Waziristan on 23 April 1860, fighting again at Ambela in 1863, on the Black Mountain in 1868 and against the Jowakis through 1877–1878.

In 1877 under Field Marshal (`Bobs Bahadur') Roberts VC of Kandahar, then Sir Frederick and later to become its first illustrious Colonel, the Regiment played a distinguished part in the Second Afghan War, notably at the storming, side–by–side with the 72nd Highlanders, of the key position of Peiwar Kotal. The painting by Vereker Hamilton of the Battle of Peiwar Kotal–which is commemorated by the Regiment each 2 December is displayed at the Royal Military Academy Sandhurst. In 1891 the title of 'The 5th Gurkha (Rifle) Regiment' was first assumed although, from its very inception the Regiment has worn rifle green (with black facings).

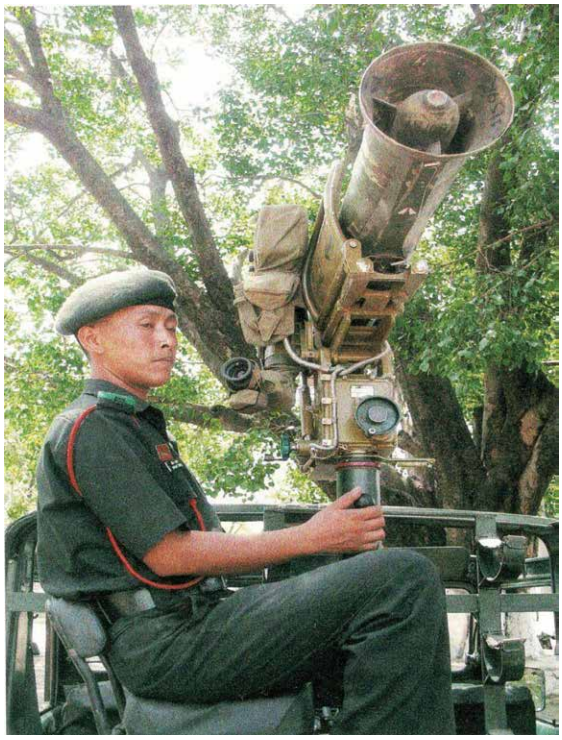
Between the long years 1860 to 1898, the 5th Gurkhas took part in more campaigns than any other Gurkha or Indian Army regiment. The Regiment's 'life was hard as its muscles', as evidenced by the lists of honours and awards. During the Hunza–Nagar Expedition, across the Greater Himalayas, was storming of the 'impossible' Nilt Fort in December 1891 where Lieutenant GH Boisragon (son of the founder) and Lieutenant J Manners–Smith both gained the Victoria Cross. Between 1878 and 1879, Kishenbir Nagarkoti won the Indian Order of Merit three separate times, then the highest award for valour open to those not of British birth. Ten years later, as Subedar, this intrepid warrior Nagarkoti gained that honour for the fourth time in the form of a special gold bar to his Order–a distinction quite unique in annals of the British Indian Army. Another very distinctive feature of the Regiment is that in the year 1899 there were present no less than eleven individuals holding the same coveted Order of Merit, which was then, as stated before, an equivalent of the Victoria Cross.

It was in 1903 that, after great efforts with the higher authorities, the Regiment was given back its old and honourable title and became the 5th Gurkha Rifles (Frontier Force), now with two battalions. Early years of the twentieth century were uneventful, a quiet prelude to the holocaust to come. In turn both Battalions did a tour in Chitral and one fought in, what was dubbed, the `week-end' Frontier War of 1908. Some officers saw active service in China whilst others served in Tibet and on the North East Frontier.

The 5th Gurkha's sterling battle-field services in Gallipoli, Mesopotamia and the North West Frontier during the First World War gained them the great distinction of 'Royal' being awarded in 1921 and of the proud privilege of every single member wearing, by special command, the Red Lanyard on the right shoulder.

The post–war Frontier unrest, in which the 5th Gurkhas played a prominent part, produced fighting of the nature that was far more severe than ever before. The enemy was well–armed, skilful, numerous and very determined. From 1922 till the war drums of the Second World beat again, the Regiment took its turn on the roster of Frontier garrison duties–Waziristan, Kurram, Khyber, Malakand–taking its share of the frequent 'incidents' common to those restless areas.

During the Second World War, the 5th Royal Gurkha Rifles (Frontier Force) expanded to a Regimental Centre and four Battalions attaining at one time a strength of over 12,500 (fifteen times the numbers just over 80 years before). The Third Battalion was raised for the second time in 1940 and the Fourth Battalion was raised in 1941. Theatres of service were Iraq, Iran, Palestine, Burma, Italy (from the 'heel' in 1943 to the foot hills of the Alps in 1945), Java, Malaya and Siam. Four Gorkha Ranks, two of whom gave their lives in action, won the Victoria Cross of which three were gained by the 2/5th RGR (FF). The total number of decorations awarded during that war exceed that of any other regiment of the Gorkhas or of the Indian Army. In recognition of the part it played in Burma, 1/5 RGR (FF) were selected for the Occupation Force in Japan as also honoured by a selected detachment participating in the great Allied Victory Parade in London in 1946.



Piffer Gorkha manning the anti–tank missile vehicle.

Quarter Guard of the 1/5 GR (FF).

In 1947 came Independence of the nation when, according to agreement, the 5th Royal Gurkha Rifles (Frontier Force) were to continue to serve in the Indian Union. Its sister regiment at Abbottabad, the 6th Gurkha Rifles, however was allocated to serve with HMG Gurkhas and moved away to Malaya. The change over from British to Indian officers was carried out smoothly in an amazingly short time towards the end of 1947. Gorkha officers, who were commissioned from within the Regiment, formed a most useful link with the past. Similarly most of the Indian Piffer officers, from the 12th FF Regiment and 13th FF Rifles, that had been since allotted to Pakistan, were posted to the 5 RGR (FF).

In early 1948, two more Battalions were added to the 5th Royal Gorkha Rifles (Frontier Force). 3/6 GR, which did not go to the HMG Gurkhas became the 5/5 RGR (FF), and were one of the original `Chindits' . Personnel of 2/6 GR who opted to stay in India, formed the nucleus of 6/5 GR (FF). Both these battalions, the 5/5 GR (FF) – with its glorious war record when as 3/6 GR won two Victoria Crosses at the Battle of Mogaung on the same day while fighting as part of Wingate's Chindits—and the men of the 6/5 GR (FF)—with their rich and brave traditions of almost a hundred years—were most welcome additions to the Piffer Gorkhas.

On 26 January 1950, when India became a Republic, the Regiment stopped using the distinction 'Royal' with its name. The unique Imperial crown with the lion on the badge was replaced by the Ashoka State Emblem to symbolise the old tap roots of traditions and of sacrifices for which the title 'Royal' had been conferred on the Corps in the field of battle.

Independence saw the 1/5 GR (FF) engaged in Internal Defence duties in Delhi. Lieutenant Colonel AS Pathania, MC took over as the first Indian commandant and, after a brief period of reorganisation, took the Battalion to the Jammu and Kashmir Operations. 1/5 GR (FF) kept their traditions, spearheaded the successful attack on the 'Impossible' Zojila Pass where many an earlier attack was thwarted. This fantastic action, carried out in sub–zero temperatures in the world's highest mountain range, indeed showed once again the formidable fighting prowess of the Piffer Gorkha. The Battalion later captured Kargil in arctic winter conditions.

2/5 GR (FF) were at Avadi when Lieutenant Colonel Amrik Singh MC took over as the first Indian Commandant. Soon afterwards it took part in the Hyderabad Police Action, where indeed it advanced so fast that it out–marched a famous tank formation: normal standard for this great Battalion. Thereafter the Battalion formed part with distinction of a Lorried Infantry Brigade and later served at Ferozepore, Mathura and Jammu and Kashmir.

3/5 GR (FF) were at Bombay when Lieutenant Colonel Padam Singh Thapa MC took over as the first Indian Commandant. The Battalion distinguished itself in the Hyderabad Police Action where they had the signal honour of receiving the first surrender flag of the Hyderabad Forces on the very second day of the action.

5/5 GR (FF) (then 3/6 GR) were at Bangalore when Lieutenant Colonel CE James MBE took over the unit. Soon after that this Battalion, by a special order, became the 5/5 RGR (FF). The Battalion took part in the Hyderabad Police Action where, in keeping with its 'two VCs–in–a–day tradition', Naik Nar Bahadur won the first Ashoka Chakra Class One of Free India–the highest award and almost the parallel of PVC in peace. After a brief pause, the Battalion was moved to Jammu and Kashmir where it took part in the last few days of operations.

2/6 GR were at Delhi mounting guard at the Government House when Independence came. Most of this Battalion's personnel, while the parent unit itself was transferred to HMG Gurkhas, opted to continue to serve in India.

Maj Gen Bhupinder Singh Ghotra, Colonel of the Fifth Gorkha Rifles (FF).

Families came from Nepal, including this elderly lady who presented the medals of her late husband.

Lieutenant Colonel Atma Singh MBE took over these men and raised the 6/5 RGR (FF). After a brief spell at Delhi, the Battalion moved to Jammu and Kashmir in 1949.

And so with confidence and elan, the great and happy Corps of The 5th Gorkha Rifles (Frontier Force) marched on, celebrating their Centenary on 22 May 1958 when Major General Mohindar Singh Chopra, first Indian Colonel of the 5th Gorkha Rifles (FF) took the salute at Dehra Dun. It was here that the youngest subaltern, 2/Lt Ashok Mehta (later Major General) raised a toast to the 200th Anniversary of the Piffer Gorkhas to be celebrated on 22 May 2058.

Meanwhile, the Piffer Gorkhas have remained at the forefront of soldiering. 1/5 GR (FF) were inducted into the Kameng frontier to bolster defences during the November 1962 frontier war with China just before the cease fire took place. In September 1965, the battalion saw action at Dera Baba Nanak (DBN) and Khem Karan. For its sterling performance in the December 1971 Operations, the unit was presented a trophy by HQ XI Corps for "achieving the best results" gaining the Battle Honour of Sehjra and Theatre Honour 'Punjab'.

1/5 Gorkha Rifles (FF) have thereafter been deployed in high altitude areas, on the Line of Control and taken part in Operation Pawan, Operation Battle Axe, Operation Bajrang, Operation Orchid, Operation Hifazat, Operation Rakshak, Operation Meghdoot and with the United Nations Mission in Sudan (UNMIS).

Of the 60 years after Independence, the Battalion has been in operational field areas for 38 years, during which period it has won 75 awards including two Maha Vir Chakras and has been conferred with numerous honours.

So, on 22 May 2008, 1/5 GR (FF) celebrated their 150th Anniversary with customary élan, a ceremonial drill and march past at Birpur Stadium, Dehra Dun, led by their Commanding Officer Colonel Gurwant Jit Singh Baghiana, the salute being taken by the present Colonel of the Regiment Major General Bhupinder Singh Ghotra.

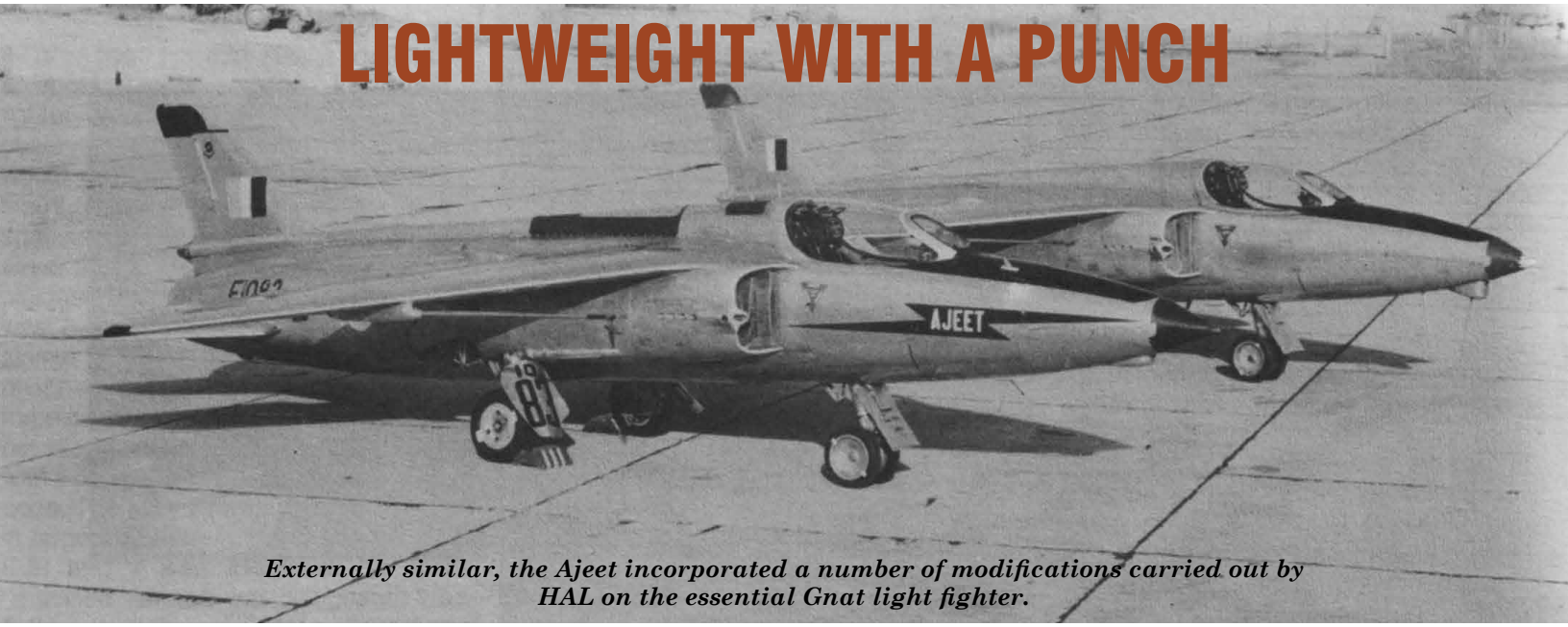
Pensioners from Nepal at the celebrations in Dehra Dun.

Earlier, at the well attended Sainik Sammelan, the troops were addressed (in perfect Gorkhali) by an earlier Colonel of the Regiment, Lt General SK Sinha, then Governor of J&K.

Amongst the distinguished gathering were Lt Generals Jagmohan Rawat and Richard Khare, Major Generals Ashok Mehta, Ian Cardozo, Vinod Bhadwar and Vinay Bhatnagar as also a large number of serving and retired officers, JCOs and men from near and far, India and Nepal.

50 years on, Major General Ashok Mehta repeated his oft quoted toast, cheering the Piffer Gorkhas on towards their year of destiny, 2058.

LIGHTWEIGHT WITH A PUNCH



Externally similar, the Ajeet incorporated a number of modifications carried out by HAL on the essential Gnat light fighter.

THE GNAT AND AJEET IN IAF SERVICE

By the late eighties, when the last of the Ajeets are phased out of frontline service with the Indian Air Force, the world's first–and only–true lightweight jet fighter will have completed nearly three decades of operation with the country's air arm. In these thirty years, over three hundred of these fighters have sported the IAF's roundals, almost all of which were built by HAL at Bangalore.

Genesis of the Indian Air Force's interest in the lightweight fighter can be traced to the mid–fifties when expansion and modernisation of the IAF was being planned as well as the Government of India's resolution to attain self reliance in the field of defence production. HAL's technical and financial resources were limited and the concept of a light fighter (and one relatively inexpensive by implication) was attractive and practical.

William Edward Willoughby Petter in England, whose genius was to give form to the light fighter conception, first envisaged, in September 1951, a design which was the direct ancestor of the Gnat as it was to be eventually known. The British Defence Research Policy Committee had approved the basic concept of the aircraft, to be powered by a Bristol BE.22 Saturn jet engine but the latter was a non–starter and the Ministry of Supply dropped the programme in the autumn of 1952. Undeterred, the concept was nurtured by Folland Aircraft at Hamble who continued to develop the aircraft as a private venture. While construction of the Viper–powered machine, then called the Midge, was proceeding during 1953, a Bristol engine project was revived, also as a private venture, and the larger and more powerful Orpheus emerged. In their crusade to arrest the upward size–weight–complexity–cost spiral, Mr. Petter and Follanos were certainly encouraged by the interest eventually shown by oversees Governments, notably India. To the Indian air staff, straining under a skin tight budget, the Gnat lightweight fighter with its outstanding economics and simplicity, appeared at the right time on the horizon. The IAF, which had been reduced to seven fighter squadrons in August 1947, was involved in a shooting war a few months after and a veneer of modernity was only really introduced in 1950 with the formation of Vampire squadrons and, in 1954, Ouragan units. Even so, by 1955, the IAF could boast of no more than a dozen fighter Squadrons, two still equipped with the Spitfire XVIII and XIX. About the same time, Hindustan Aircraft Limited at Bangalore were assembling Vampire F.B.52s and HT–2s and the Indian Government were looking for a manufacturing programme to fit in with the limitations that existed. If the law of diminishing returns was applicable to aircraft manufacturers in advanced countries, progress would all together cease at HAL because of the galloping complexity in producing advanced combat aircraft that could fly faster, higher and possess greater hitting power.

WEW Petter has since admitted that the conception of the lightfighter was at the time due more to the limited conditions existing at Folland's both in terms of skill and financial resources, than the suggestion by Air Commodore Baker–Carr, RAF, that large numbers of rocket firing "expendable" light fighters be manufactured to neutralise the Tu–4 bombers then being produced in large numbers in the Soviet Union.

At any rate, HAL with its less elaborate manufacturing facilities could well handle the production of this advanced fighter, make more numbers available at a quicker rate.

The Indian interest was definitely kindled after the Midge first flew at Boscombe Down in August 11, 1954, confirming that intense research, fine precision engineering, new thinking and a bold approach could produce a weapon system that was more cost–effective than anything then flying. The potential Gnat would cost only a third of other fighters in capital outlay and operating expenditure per flying hour while also because of its radical economics and relative simplicity, tooling time for production was reduced.

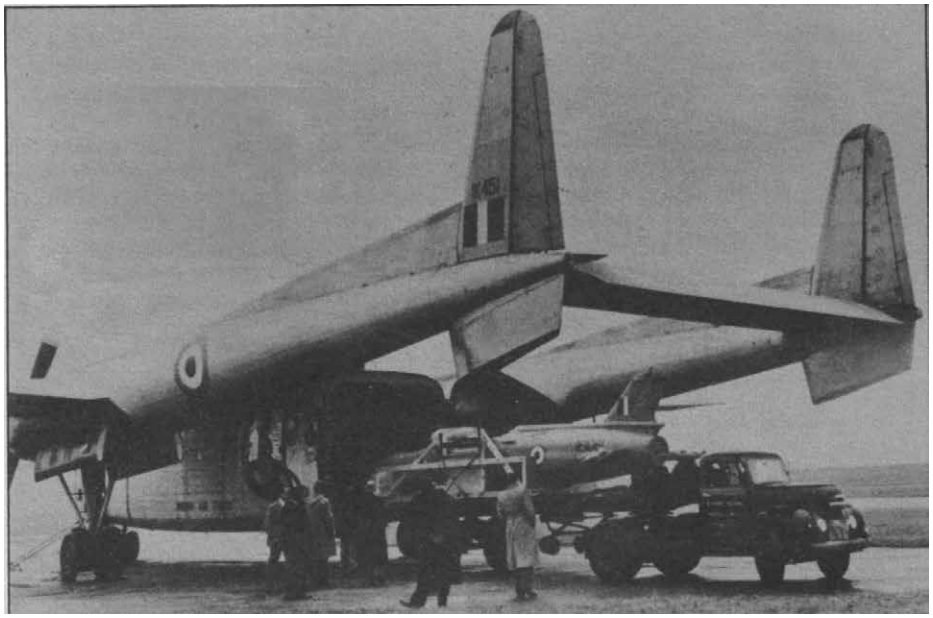
Indian teams were closely following the development. By 1955, Bristol had produced the initial Orpheus engine, then rated at 4000 lb.s.t. and the resultant change from the Midges' 1640 lb. Viper ALV5 Mk.101 was startling with an "astonishing display, amazing speed and manoeuvrability" demonstrated by the prototype Gnat at an impressive debut at Farnborough in September 1955, Sqn. Ldr. EA Tennant having first flown the Gnat prototype (G–39–2) on 18th July 1955 at Chilbolten.

Indian interest firms up

It was officially announced in October 1955 that negotiations between the Indian Government and Folland Aircraft Limited were at an advanced stage for the supply of a number of Gnats as well as a licence for the manufacture of the type in India. Meanwhile, the British Ministry of Supply had ordered six Gnats for evaluation (one was subsequently diverted against the Indian contract) and the test programme got underway at Chilbolten with each of the five Gnats being allocated programmes such as gun firing, engine development, flight flutter and instrumentation.

An Indian test pilot, Wing Commander Suranjan Das, was nominated to Chilbolten and attached to the Gnat Flight Development team.

On 15th September 1956, the Government of India concluded an agreement with Folland for production of the Gnat under licence at Bangalore, the agreement covering an initial supply of 23 complete Gnat Mk.1s and 20 sets of components for progressive assembly by HAL. Meanwhile, flight testing of the Gnat continued at Chilbolten and nearly five hundred flying hours were completed. Late in



One of the early batch of Gnats transported from Folland Aircraft in England by an IAF Fairchild Packet.

1957, the sixth MOS Gnat (G–39–3) was transported to India in an IAF Fairchild C–119G Packet. This first Indian Gnat, sporting the IAF serial 1E1059 was to be used as a development aircraft, W/C S. Das, S/L E.A. Tennant and others from Chilbolten initiating tropical trials at Kanpur. On Republic Day, 26th January 1958, the Indian public had their first glimpse of the Gnat when the blue–painted aircraft pulled up from 1000 feet over the Rajpath parade to hurtle near–vertically into the sky.

Taming the Gnat

At the Aircraft and Armament Testing Unit (A&ATU) at Kanpur was formed the Gnat Handling Flight in the spring of 1958, with four Folland–built Gnats and six IAF officers. The complete test programme at Chilbolten and Kanpur had resulted in a final development of Gnat which had all the modifications incorporated—from the adoption of power operated in–board ailerons, modification of the tail to a fully powered slab, to final cockpit plan and incorporation of gun

Twenty four Gnats, with their pilots and ground crew at Palam during a Republic Day in the sixties.

blast reducers. But for the very first time, the IAF had to work out its own Standing Operating Procedures (S.O.P.) for an aircraft without relying on a foreign operator's experience, establish syllabuses for training and evolve maintenance techniques.

The Gnat at this stage was still very "raw" and had to be moulded by the IAF into a fully proven service aircraft. The major problem encountered involved the flying control system. For horizontal tail control, the Hobson–design consisted of a hydraulic motor driving twin screw jacks which rotated the all–flying tailplane through an epicyclic reduction gear. The Hobson system was initially unable to take the loads required under service conditions for any restriction in the flow of hydraulic fluid would result in back pressure and low hydraulic power output with the motor not generating the required force to operate the tailplane.

Excessive friction in the screw jacks needed to be eliminated and the quantum of maintenance checks had to be increased to far beyond the manufacturer's recommendation. Contamination of the hydraulic oil in dusty Indian conditions was later analysed to be 1,25,000 times more than that experienced in Britain!

The Gnat Handling Flight were to go through a somewhat trying period in coming to terms with the light fighter and, as at Chilbolten, fatalities were suffered as the ingenious, yet unconventional, systems were harnessed.

Hydraulic power, built up by a Lockheed Mk.9 engine–driven pump, drove the fluid at 3000 p.s.i for operating the ailerons, under–carriage jacks and tailplane, with manual reversion in the event of hydraulic failure. The rear portions of the tailplane could then be unlocked to act as elevators with tailplane trimming still available from a standby electric motor in the Hobson unit. Stick forces in manual were not heavy, but because of the small size of the elevators, their response was only about one–fifth of that of the tailplane. Pilots had to learn to immediately respond to the loss of pressure and use the remaining pressure of the hydraulic accumulator to restore the tailplane to a suitable angle for effective manual control. Further, to continue in manual control, the pilot would have to pull a lever on the left side of the cockpit in order to disengage the elevator locks, also locking the telescopic rods to close mechanical control–loop. From that moment the pilot had direct mechanical control of the elevators with normal aerodynamic feel, with stick loads then fairly heavy.

Another unconventional system provided for the in–board ailerons to droop 20° by a direct mechanical linkage with the main undercarriage legs and act as flaps when the undercarriage was lowered. The link was so mounted on the geared wheel that the rotation of the under–carriage from the "up" to "air–brake" position imparted a negligible droop to the aileron usually, but the datum–varying arrangement did fail on occasion with fatal results if the aircraft was flying low and for a while low–level sharp manoeuvering was proscribed.

Ajeets of No. 18 Squadron over the vale of Kashmir.

Flying Control System

The simplicity of the Gnat flying control system further involved the undercarriage to provide air brake surfaces, the airbrake position being reached after 20° of main leg and 50° of nose leg travel. However, when used at high speeds, a strong nose down trim change resulted. Former Hunter pilots, now flying Gnats, quickly got used to the control column shift to neutral position while trimming. Tailplane trimming was via an electric actuator and thumb switch on the control column grip, arranged to drive the annulus of the epicylic gear, the trim motor moving the tailplane through its full range without effecting stick datum. A fore and aft movement of the stick operated a butterfly segment carrying the cable loop running in the underfuselage to a quadrant on the rear fuselage floor. This quadrant carried a specially cut cam which imparted non–linear response to a pushrod working the hydraulic valve of the Hobson unit, the cam so profiled that tailplane response to stick movement was reduced near the neutral position. Thus at very high speed when small angular movements were required, low tail plane response made the system less sensitive, response greatly increasing over the highly stick deflections.

The lively and nimble Gnat had a high rate of roll, provided excellent handling at high speeds with stick forces per "g" still very light above 400 kt. The phenomenal manoeuvrability brought upon by a high thrust weight ratio, powered controls and low lateral inertia called for pilots to be more specific in the stick movement. Converting pilots were made to sweat out their initial flights as the aircraft demanded higher capabilities of the pilot and flying to accuracies, the pilot having to monitor flying conditions all the time. Since there was no stand–by duplicating system and only a rudimentary emergency system, the pilot was required to be alert to react in time to any potential malfunction.

The officers deputed to the Gnat Handling Flight were mostly ex–Hunter, who found the most startling aspect to be the Gnat's phenomenal

climb performance, racing to 45,000ft. in a little over 4 minutes from "brakes off." With an acceleration of 3kt/second in a small aircraft there was some tendency to unstick prematurely with a resultant momentary asymmetric lift developing and the aircraft rolling rapidly.

Another service problem concerned the Aden Mk.4 cannon feed arrangements. The trouble was inherent in the gun feed empty link cross transfer system and as part of the modification the r.p.g. of each gun was reduced. The Gnat, otherwise, proved a steady gun platform and a Gnat unit won the air–to–ground gunnery trophy the first time it competed with Hunter and Mystere Squadrons even though it had been earlier considered a "jittery" type.

"Sports Car and the Family Saloon"

Despite the Gnat's compactness, its cockpit was surprisingly comfortable but, although the pilots height was not a consideration in the early days it was later felt that an ejecting pilot's knees could hit the gun sight or windscreen frame and only pilots under 5ft. 10 inch in height were usually selected. All in all, as an ex–Hunter pilot has described, "Flying the Gnat was like driving a high speed sports car as compared to the family saloon".

By mid 1959, it was decided to form the first Gnat operational unit and No.23 "Panther" Squadron, then flying Vampires at Poona, was selected as the first formation to equip with the light–fighter, receiving a batch of six Folland–built Gnat Mk.1s on 18th March 1960 at Ambala. A dozen selected pilots proceeded to work–up the type under operational service conditions, evolving service maintenance and flying techniques. In 1958 an Indian Gnat had been "borrowed" by the RAF to assess its usefulness as a tactical ground attack fighter but the trials, rather unfortunately in Aden, showed the Gnat off somewhat poorly in direct comparison with the Hunter and although Indian staff had initially proposed the Gnat as a complement to the Hunter for both air defence and ground attack, only the former role was eventually assigned. The range and "searching out" power of the Gnat were smaller than the Hunter in the air defence role but in return, it was more nimble, just as fast although equipped with a light engine, and adequately armed.

Meanwhile at Bangalore, HAL was preparing for the manufacture of the Gnat and a batch of 20 engineers and assembly superintendents were deputed in Folland for a six–month attachment in late 1958. Some new factory buildings for the project were completed in 1959 but with the 281st and last Vampire F.B 52 delivered to the IAF in December 1960, Gnat production lines were planned in the former Vampire assembly hangars. Two hangars were allocated for structure with a third for assembly and final erection. A batch of eleven Gnats, received in "fly–away" major assembly form, were assembled in 1959, initially under the general supervision of Folland representatives. The first HAL built Gnat (GT001 with IAF serial 1E1072) was one of 20 assembled from CKD form and delivered on 18th November 1959 but it was not till 1962 that the first Gnat, produced from raw materials, flew this event taking place on the 21st May (GTO 21, with IAF serial 1E1205). A number of modifications had been carried out in between, the most basic being a change in the radio compass (from Marconi ADF to DME) and the provision of an additional 25 gallons in internal fuel (11.5 gallon to starboard, 13.5 gallon to port in saddle tanks aft of the fuselage break joint).

The early sixties were the learning years for HAL. Although Folland engineers remained on call, HAL set about solving problems with an oriental patience, slowly and painfully, but methodically and gained experience in working out solutions. The Indian Air Force had formed its second Gnat Squadron (No. 2) early in 1962 with a mixture of Folland–built and HAL assembled Gnats and the service now demanded some urgent solutions. Problems still centred around the flying controls and hydraulic system and, on an average, after every two test flights, each early Gnat was dismantled once to check on reported difficulties with the hydraulics, rigging or the tail plane. HAL workers, cautiously taking one week to put back a grounded Gnat into the air, were soon able to remove the rear fuselage & engine, reassemble them and clear it for flight within six hours. To obviate snapping of flying control cables, cable rerouting was worked out and the fair leads of control tuns changed from leather PTFE seals. Innumerable hydraulic changes were necessary including work on the Hobson unit and cut–outs. Accumulator problems were usually a result of a decaying rubber diaphragm which contaminated the system. Safety mods introduced included a tail place cross trim and provision for a drogue chute in the ejection seat (Folland Type 2G light–weight seat). Although low pressure tyres were installed in early Folland Gnats—operation from rough airstrips was envisaged by Petter—HAL converted to high pressure types (at 135 p.s.i.) as all IAF operations were in fact made from asphalt and concrete runways.

From 1963 HAL went into full production of the Gnat Mk.1, the Indian Air Force having ordered 100 aircraft in addition to the 43 delivered directly by Follands or progressively assembled at Bangalore. An average of two Gnats were produced each month and in April 1964 a third squadron, No. 9 was re–equipped with the light fighter. A fourth Gnat unit No. 18 Squadron, was in the process of formation when tension on the borders erupted into full–scale hostilities in September 1965. In that month, HAL rose to the occasion and working around the clock through the three weeks, sixteen Gnats were completed. Test flying by day, butt testing at night, HAL delivered two Gnats to the IAF each day from September 15th to the 22nd, No. 18 Squadron becoming the feeder and ferry unit for the three fully operational squadrons.

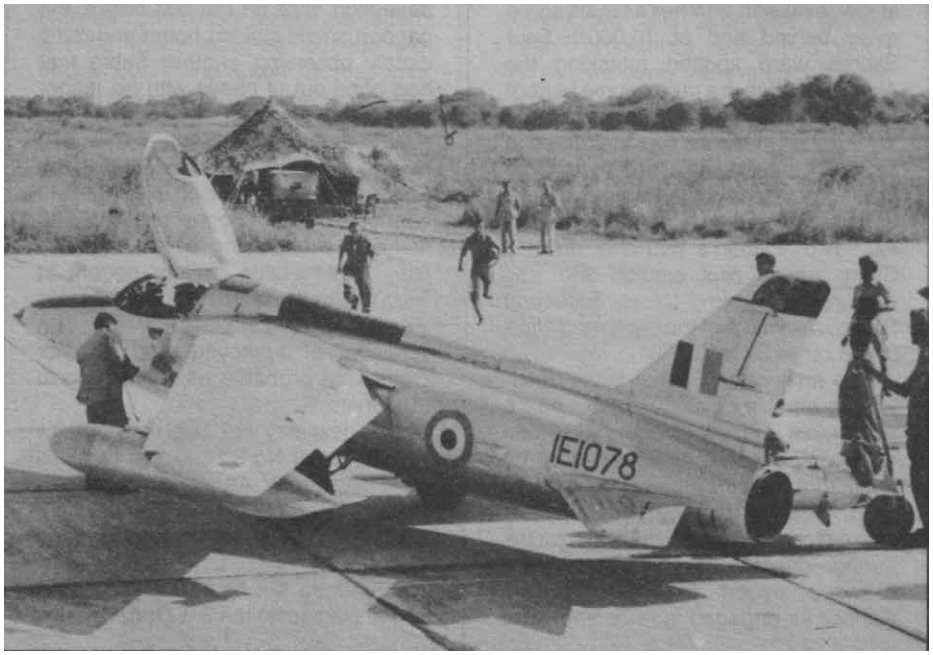
Gnats at war

The first adversary to fall to the light fighter's guns was cine–recorded as disintegrating early morning on 3rd September 1965 over the Chhamb area in Jammu province. The PAF F–86F Sabre was shot down by a No.23 squadron Gnat flown by Sqn. Ldr. Trevor Keelor who had led a section of Gnats from Pathankot to provide cover to IAF Mysteres on ground attack missions. It was almost exactly ten years after the first Gnat prototype had flown at Chilbolten, a continent

away. In the intervening period, the Gnat light fighter had been nearly still–started, rejected by the Royal Air Force, adopted by the Indian Air Force, refined and forged into India's prime air defence weapon. By the time of ceasefire, twenty days later, the light fighters had chalked up an impressive tally of kills, earned their pay and the spontaneous appeallation "Sabre Slayer" by a confident Air Force and a grateful nation the Gnat had certainly vindicated the trust reposed in it by the Indian Air Force and if W.E.W Petter, the Gnat's conceiver, could not have forecast the likely situation of first combat, he would certainly have been well satisfied with his brain–child's spirited performance.

Demonstrating that Trevor Keelor's success on the 3rd September was no flash in the pan, Gnats quickly followed up by two quick victories the next day. The PAF had that morning employed new tactics, 4 Sabres intercepting an Indian Mystere raid with two F–104s perched 3000ft. above to guard against Indian top cover; in response an afternoon sortie by 4 Mysteres on a low level ground attack mission in the Chhamb area was escorted by 4 Gnats at low level with another 4 Gnats some miles behind and at 10,000ft. Four Sabres were spotted attacking the Akhnoor bridge in a race course pattern and the second Gnat section, led by W/C Johnny Greene was instructed to intercept the Sabres. The Gnats were able to get behind the Sabres virtually undetected and with only ten rounds, F/L. W.S. Pathania had shot down a Sabre whose pilot ejected and was captured by ground forces; a second Sabre was victim of the combined effort of the other 3 Gnats.

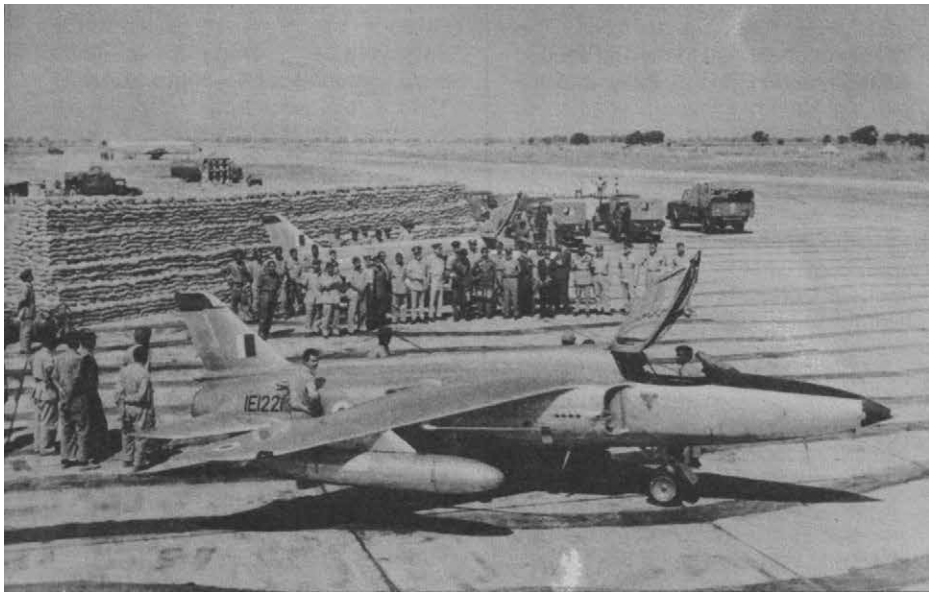
The artillery and aerial duels developed into regular warfare on 6 September and IAF Gnats assumed prime responsibility for air defence, the main threat by day being considered from Sabres, with Gnats regularly scrambled for CAP over air bases during daylight hours. Gnats also provided escort to Mysteres and Canberras engaged in raids and were themselves cleared for limited–range seek–and–destroy sweeps over Pakistan, under Indian radar control in a bid to draw up PAF interceptors. The bait was, however, rarely taken and Gnat pilots had to await incoming



Scrambled pilots race to their Gnats during the 1965 conflict with Pakistan.

raids. One such action took place on the 18 September when 4 Gnats of No.9 Squadron were scrambled on to a hostile track, making contact with 4 Sabres at 15,000ft. The Sabres dived towards the Gnats from 10 O'clock high the Gnats going into a tight turn to the right and simultaneously jettisoning their drop tanks. The Sabres carried out their usual defensive split and were positioning themselves behind a Gnat subsection which was promptly instructed to "last ditch" (half roll, build up speed and climb out) by "Black–Leader", the ace S/L A.J.S. Sandhu who was leading the Gnat section, Sandhu feinted to the right for a deflection shot on the first Sabre, the cannon shells striking home and immediately observing another Sabre that had gone out of phase with his leader during a scissors maneouvre, he reversed to the left and within 270 degree of turn, was line astern with the Sabre. A measured burst from the twin cannon had the bogey erupting into flame and exploding a few seconds later. The action which began at 15,000ft. had ended at 5000ft; 50 miles west of Pathankot over Pakistan, with one Sabre destroyed and another claimed as probable, all without loss to the Gnats.

The next day (19 September), saw four Gnats of No.9 Squadron followed by 4 Mystere IV as at low level on a close support sortie to Chawind, where a great tank battle was raging. Over the target–area, dense enemy flak was encountered but this abruptly ceased and at the same time S/L Denzil Keelor, leading the section, was warned of 4 Sabres approaching the Mysteres from 10 O'clock and above them at 4000ft. The Gnats, at only 300ft., went into a shallow left hand climbing turn so as to place themselves behind the Sabres. The distance closed rapidly and the sub–section led by F/L Vinay Kapila adroitly latched on behind a Sabre who took violent evasive action, a hard turn to the left, with Kapila following him, still out of range. Suddenly the Sabre reversed, going into a steep turn to the right. Kapila immediately reduced the distance to 500 yards and fired a short burst which struck the Sabre. The engagement starting at 1550 feet was getting lower and lower as the Sabre in a bid to get away was executing descending turns. The damaged Sabre was a little erratic now and Kapila fired again from 300 yards and then disengaged while only 300ft. above the ground. The Sabre was seen to spin and explode into the ground. Just as Denzil Keelor transmitted the kill confirmation, he saw a Sabre which had been separated in the melee, trying to get away from the scene. The Sabre apparently had not seen Keelor's Gnat as it did a hard turn to the right. This manoeuvre gave Keelor the opportunity of slipping in behind



Gnats at their ORP at a fighter base in north India.

the Sabre, reducing the distance to less than 500 yards and, at tree top height, he fired a couple of bursts which hit up the Sabre, sending it crashing into the ground.

Even before the cease–fire, announced on 23rd September, the Gnat's sterling performance was being applauded throughout the country. The mighty mini had humbled the combat–hardened F–86F–40NA Sabre and thumbed a metaphorical nose at the enigmatic F–104A Starfighter and the nation was in a mood to identify the Gnat as the most important aspect in the 1965 military operation. Almost revered as a kin to a "devta" (celestial being) by the simple villager, with postage stamps issued in its honour and consumer products given its brand–name, the Gnat had earned a special place of pride in an Indian's heart (the light fighter would get special status at airshows and static–displays).

The three–week conflict had confirmed the traditional values of acceleration, climb rate, manoeuvrability and turning radius in aerial combat. The Gnat proved superior to the Sabre in all air combat characteristics except low speed handling, the Sabre's slats reducing its stalling speed drastically. This was to be guarded against by the Gnat pilots who ensured that they fought in the vertical plane and before the Sabre could take advantage, the Gnat was usually already behind, and firing.

"No aircraft", according to a battle–tested pilot "is more enjoyable to fly into action than the Gnat and all pilots will re–live the exhilaration of flying this aircraft in combat long after the battle is over." The pilot is virtually integrated with his fighter and although at times he would wish for more advanced flying aids and avionics, the lack of these made him work harder for a living. As an example, the radar ranging installation became ineffective at a rapid rate of turn and the pilot was back to eyeball to eyeball scrapping where qualitative skills alone mattered. As against the considerable ball ammunition carried by the Sabre for its six 0.5 in. guns, the Gnat had limited rounds for its twin cannon and, therefore, required to get closer to the target. Gnat pilots developed keen reflexes and alertness and an average pilot who joined a Gnat unit left with higher–than–average rating if he had learnt to master the Gnat's characteristics.

The diminutive Gnat was difficult enough to keep a sight on, let alone hit and during most aerial dog fighting, the Sabres were shooting well below the Gnat. This was attributed to the fact that the Gnat's wing span, at 22 ft. was below the 25ft. minimum span setting required in manual ranging adjustment for the Sabre's gunsight, the Sabre pilot feeding incorrect parameters and consequently opening up before range. IAF pilots revelled in the Gnat's unsurpassed manoeuvrability and reserve power, being well able to evade any air–to–air missile launched against them. The Gnat was a true air superiority aircraft of the transonic class, albeit with limitations in range. For low level point air defence, the Gnat made it mandatory for any class of attacking aircraft to limit itself to one pass over target, for during any attempted repeat pass, vulnerability to the Gnat would be severe. This was appreciated by the Pakistanis with their Starfighters (coded "Badmash" or the wicked one by the IAF). Content with a single high speed firing pass over Halwara air base, two Gnats surprised a low flying F–104A and the Pak AF aircraft had a narrow escape flat on deck after being 'singed' by a Gnat at 500 yards. With excellent aerodynamic characteristics, the Gnat is a silent aircraft, not the least because of its small airframe and appropriate aerofoil section of wing. Coupled with its virtual noiseless appearance and small size, the Gnat appears very fast, giving an erroneous impression to enemy antiaircraft gunners who consequently laid off more.

The Indian Air Force, upgraded in status equal to that of the Indian Army in 1966 took the praise heaped upon its light–fighter in its stride and, even while confirming requirements for further Gnats to form additional fighter squadrons, the service and HAL/Folland got down to ironing out the remaining technical irritants. The sporadic failure of the longitudinal control system received priority attention and intense research and trials resulted in more modifications incorporated, mostly in an effort to reduce screw jack friction. By 1968, the improvements were firmed and all Gnats retrofitted accordingly. Follands, who had been producing the trainer–version for the RAF; appreciated that the fighter was subjected to far more stresses and loads and the quantum of maintenance checks insisted upon by the IAF went a long way in ensuring the system's reliability. The simplicity of aircraft services and smaller amount of equipment did cut down servicing time but this was double–edged for it required more meticulous and qualitative maintenance effort. This paid off, however, as was demonstrated by an almost 90% serviceability rate in Gnat squadrons even with aircraft flying upto 5 sorties a day.

Obviously, "it was an aircraft that liked to be flown hard and gave its best during active combat". With the improvements, the Gnat's hydraulic systems returned a reliability factor of 99.88% (2 failures per 10,000 flying hours). Both pilots and ground crew had enormous respect for the systems concept that had produced such an aircraft. The ground crew praised the aircraft especially as all items needing routine attention are sited where they could be reached without trestles or staging. The Orpheus 701–01 engine, which power the Gnat proved reliable and tough; on one occasion even after severe damage owing to bird strike (with all compressor stages damaged), a Gnat was recovered to base with engine continuing to give full response.

Additional order and a new role

In 1966, HAL was given orders for more Gnats, this being followed, in 1968, by another batch of 50 and the IAF not only made up attrition as also formed another four Gnat Squadrons (Nos. 15, 21, 22, 24) during the years 1966–68. Pilots now posted to Gnats in considerable numbers were initially attached to the Gnat Mobile Conversion Flight for a month's training on the aircraft and its systems, followed by ground tests and checks and one taxying sortie before first flight. After 8 and a half hours flying time with the MCF, the pilot would be posted to an operational squadron. The new squadrons achieved operational status rapidly.

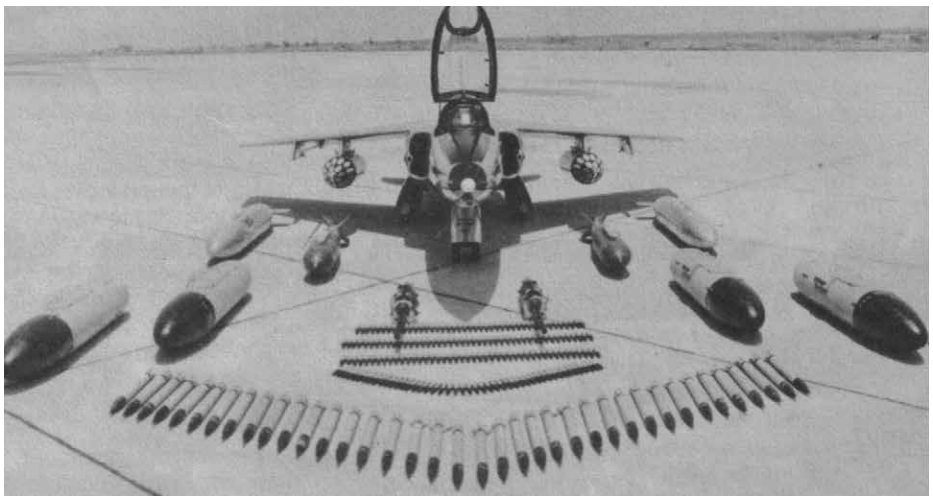
HAL briefly studied the possiblities of "navalising" the Gnat for the INS *Vikrant*. Folland had themselves once proposed a Gnat with extensive high lift devices on both leading and trailing edges of the wings for possible carrier operation but the task of strengthening the Gnat Mk.1s undercarriage within weight restrictions made the proposal impractical. Besides, the limited range and endurance made it unsuitable for the Indian Navy.

In September 1965 the Indian Air Force had only a half formed squadron of limited–weather MiG–21Fs which took no part in the war but by 1968, the IAF had expanded its supersonic all–weather force to six squadrons of MiG–21Fs and the Gnat light–fighter handed over the prime responsibility for manned air defence of the country to the Mikoyan–designed fighter. Many an interesting and lively encounter took place in mock combat between the Gnat and MiG–21, the light–weighter consistently proving its ability to stay out of the MiG's reach. One combat–experienced MiG pilot with "Master Green" proficiency rating told VAYU that comparitively inexperienced pilots on Gnats could hold their own against the MiG–21s at low level fast manoevuring combat and the Soviet–designed fighter had frequently to resort to reheat to pull out from a tight spot with the agile Gnat behind.

In Combat Again

HAL's Gnat, akin to nature's insect, though attributed with blood sucking tendencies was considered to be of insignificant annoyance to the MiG pilot in aerial exercises but the deadly blood sucking tendency came to the fore when the target was unfriendly as will never be forgotten by a Mirage III EP pilot of the PAF. The restless subcontinent had again gone to war in December 1971 and even while the Indian Army's relentless drive through what was then East Pakistan, converged towards the capital Dacca, the Western front was ablaze from Kashmir to Kutch. The Gnat light fighter was no longer responsible for air superiority in the changed environment, but Gnats were assigned the air defence of VPs and tactical areas, maintaining battlefield air superiority with a secondary close air support role. Gnats were flying CAPs over all major air bases in the West and were a formidable deterrent at low heights. The Mirage III EP, for example, was one of a pair making a high speed attack on Pathankot air base. After a hasty firing pass along the main runway (incidentally missing two MiG–21s lined up at the ORP), one Mirage pulled up only to find a firing Gnat a little over 500 yards behind and even while the Mirage resorted to reheat, the Gnat's sting had made its impression and the Mirage, trailing smoke and sinking, was seen by ground troops to crash beyond the FDL. The objective to discourage a determined first attack and certainly prevent a second attack was successful; another example were the Gnats CA Ping over Amritsar who also "nicked" a F–104 and a Mirage during low level attacks on soft skin targets in the vicinity.

It is known that the PAF had issued a directive for its pilots to avoid dog fights with the Gnat—an intercepted signal, later confirmed by ex–PAF Bengali officers. Still, the Gnat met its old adversary on a number of occasions, the first, even before war began, bringing it three quick victories. On 22nd November 1971, 4 Gnats of No. 22 Squadron were scrambled on an interception course by the Signal Unit who reported 4 bogies over Indian Army position in the Boyra area 60 miles north of Calcutta. The Sabres were spotted 3 miles away and approaching head–on, the Gnats making contact at about 2500ft. The Sabres (Canadiar–built Mk.6s of No. 14 Squadron, PAF) split into defensive sub–sections but instead of taking a sandwitch course, shied towards two Gnats flown by F/Lt Ganapathy and F/O Donald Lazarus.



Ajeet with armament, earmarked for the close air support role.

The Gnats were behind their opposition in one tight turn and both Sabres had been destroyed in under 30 seconds. "Everything happened in a flash", Lazarus later said, "I shot him". A third Sabre fell to the Gnat from F/L Roy "Mouse" Massey, the entire action, being over in about one minute. There were no other occasions for aerial dogfighting in the Eastern Sector and a few days after the war had begun, Gnat squadrons operating from Dum Dum, Agartala and Bagdogra were switched from air defence to short range interdiction and close air support tasks. Gnats rocketed and strafed the retreating Pakistani army columns and concentrated on riverine traffic South of Dacca.

Other Gnat squadrons were deployed in the West, flying over 1000 combat air patrols but recording only a handful of enemy aircraft sightings. It was a young Flying Officer, Nirmaljit Singh Sekhon, of No. 18 Squadron who earned, posthumously, the nation's highest gallantry award also being the first Param Vir Chakra of the Indian Air Force. A small detachment of Gnats, deployed for the air defence of Srinagar in the Kashmir Valley came under attack on 14th December 1971 when six Sabre Mk.6s attacked the airfield. The single Gnat on ORP, flown by Sekhon, got airborne even while the Sabres were strafing the installations and, in low level combat against overwhelming odds, scored hits on two enemy aircraft before being shot down.

The Gnat light fighter had distinguished itself in two shooting wars and had certainly "earned its pay". The last Gnat Mk.1 (215th) was delivered to the IAF on 31st January 1974 and HAL "took a break" from the light fighter's production for a short while before it was to get re–engaged with its successor.

With a simple and rugged structure, the Gnat's airframe had been subjected to extensive, if sometimes improvised, repair and overhaul but the fatigue life determined by the National Aeronautics Laboratory proved that the basic airframe was sturdy and, with improved TBO of the engine, the type could continue in service for at least another decade.

Enter The Ajeet

In the post–1971 perspective the Indian Air Force assigned for its Gnats tasks commensurate with the defence environment on the sub–continent, namely point air defence, combat air patrol and close air support. HAL had some 15 years experience with production of the Gnat and its Orpheus 701 engine and manufacturing facilities with all jigs and toolings remained intact. A policy decision was taken in mid–1972 to go ahead with the development of an improved Gnat, incorporating new systems and improving on the identified problem areas. Some test modifications were incorporated in individual Gnats before the programme was finally approved. The Gnat Mk.2, or Ajeet as it was christened in November 1983, was to have a similar performance envelope as the Mk.1 but would incorporate major internal changes, essentially the provision of integral wing fuel tanks (to hold 110 gallons); new fuel booster pump; an improved Hobson–unit ratio changer for longitudinal control; pressurised hydraulic tank; higher capacity accumulator and a variable datum engine driven pump. Avionics were to be updated, with a TA/RA–22 VHF transmitter receiver and a ADF–73 system replacing the earlier Bendix models. The radar ranging installation was deleted and the GGS Mk.8 gunsight replaced by Ferranti's ISIS F–195. The Folland/ Saab Type 2G ejection seat was replaced by a custom–designed Martin Baker GF4 zero level seat (0–90) plus new wheels and brakes were fitted.

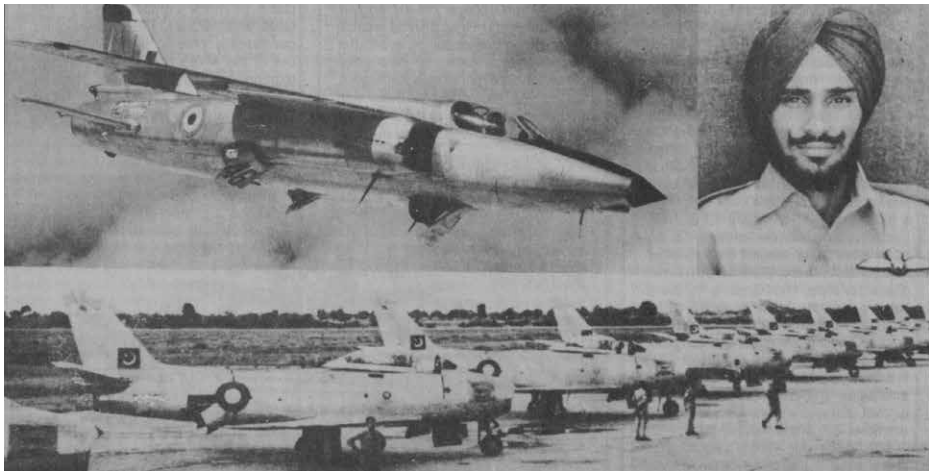
A host of other modifications and improvements were incorporated and the first Ajeet prototype (E 1083, actually the 214th Gnat modified by HAL) made its maiden flight on 6 March 1975 with a second prototype (215th HAL Gnat) first flying on 5 November 1975. Preceding the Ajeet prototypes were two hybrid Gnat Mk.1As, two standard Mk.1s (1E 1071 and E 1080) being utilised at Bangalore for the development of hydraulics and avionics. A "Cat E" Gnat became a ground specimen for destructive tests.

Test flights were completed within six months and the first production Ajeet flew on 30 September 1976 and by the end of 1977, sufficient Ajeets had been produced for handing over to the IAF.

First formation earmarked for conversion on to the new Ajeet light fighter was No. 9 Squadron, in March 1978, but for want of sufficient aircraft was called the "Ajeet Handling Flight" as it thus remained till January 1980 when it was declared fully ops. Within a short while, the Ajeets established gunnery and flight safety records and No. 9 won the Flight Safety Trophy for the best fighter squadron in 1981. With HAL's production line delivering Ajeets at the required rate, three other, former Gnat–equipped squadrons, were reequipped with the Ajeet, being Nos. 2, 18 and 22, these formations carrying the light fighter tractions well into the third decade of the type's service with the IAF.

The Ajeet trainer

By 1981, some eighty Ajeets had been delivered by HAL and the production–line was run down. Design effort was now directed for developing a tandem two–seat operational trainer version

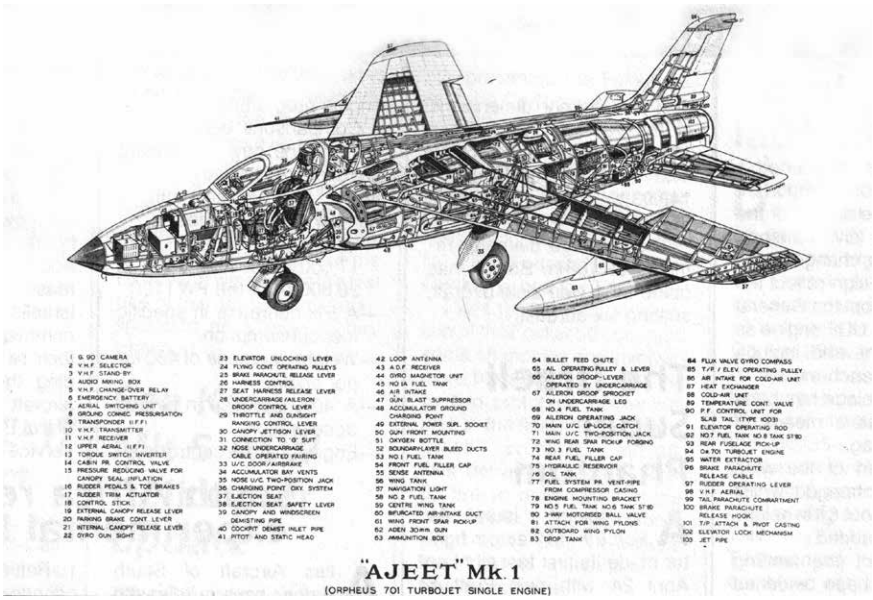


Flg. Off. Nirmaljit Singh Sekhon, PVC and the Gnat and (below) line up of PAF F–86 Sabres.

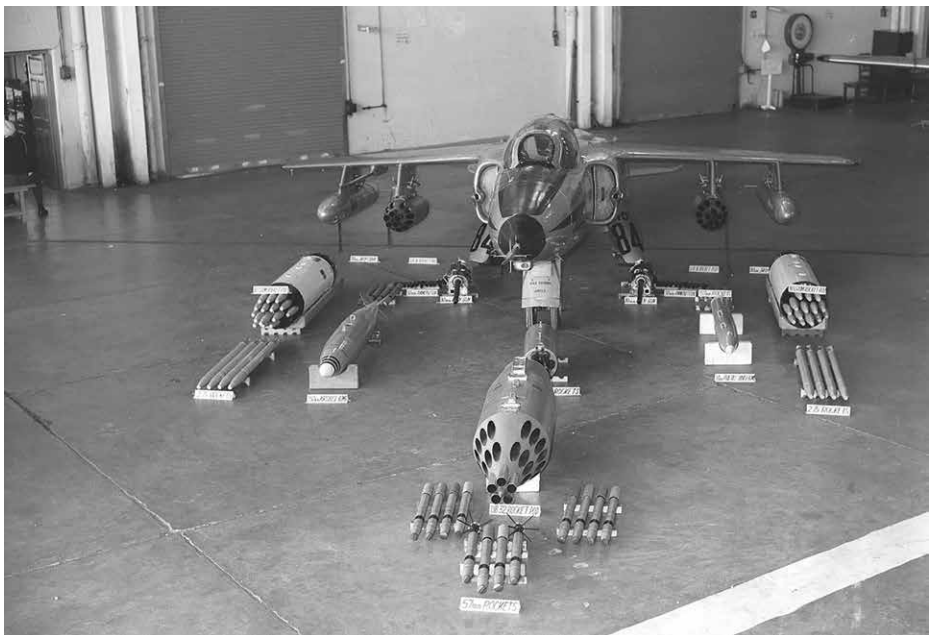
of the Ajeet and the first prototype (E2426) was flown in September 1982. This was, unfortunately, lost in an accident (not from technical causes) some months thereafter and a second Ajeet trainer prototype flew in September 1983. Development of the Ajeet as a two–seater involved deletion of some fuselage fuel capacity as well as stretching the fuselage by 1.4 m. (4ft. 7in.) to 10.44m. (34ft. 3in.), although overall weight of the trainer remained similar to that of the fighter. Initial requirements were stated as 20 for the IAF and Navy but a final decision has remained pending and with interest being firmed in a advanced jet trainer for fulfilling a different requirement, the future of the Ajeet trainer is uncertain.

Niche in aviation history

Three generations of Indian fighter pilots have trained, flown and fought in the Gnat and the light fighter is assured of its place in the annals of aviation history. Its successor, the Ajeet, has fulfilled its task unobtrusively and manfully, but must give away to the high–technology, advanced–generation combat aircraft which the IAF is presently receiving, types which may physically tower above the dimunative fighter but whose time has yet to come.



Special features—Ajeet.



Romanian Aviation and the Romanian Air Force

Romanian Postage Stamp Day, celebrated for the first time in 1932 on the occasion of the first Romanian Philatelic Exhibition, was included in the list of events of national importance following the Law no. 62/2024, establishing 15 July of each year as "Romanian Postage Stamp Day".

The first Romanian military airplane, designed and piloted by Aurel Vlaicu, built at the Army Arsenal, flew on 17 June 1910. The first military school for the training of pilots was established in 1912, and a year later the Aeronautics Organisation Law was passed, officially establishing Romanian military aviation. It is worth mentioning that the Romanian Aviation and Air Forces have also set 20 July as a day of celebration. On the same date is celebrated the feast of the Saint Prophet Elijah the Thesvite, considered the patron saint of aviators. Saint's Day became an official holiday of military aviation by Royal High Decree No. 1343 of 17 April 1931 signed by King Carol II.

The postage stamps, the souvenir sheet illustrates several event moments in the history of Romanian aviation, including portraits of three personalities in the field, namely Traian Vuia, Aurel Vlaicu and Henri Coanda. It also presented a premiere moment of the first flight around the world, 55 years ago, performed by Tarom Company. Romanian airplane manufacturers are honoured with two important achievements: the first fighter plane (1939) and the first jet airplane made in Romania (1974). Traian Vuia, world aviation pioneer (postage stamp with the face value of Lei 4) designed and piloted the first autonomous

take–off airplane. The demonstration flight took place on 18 March 1906 at Montesson (near Paris).

Aurel Vlaicu, engineer, builder and pilot of the first airplane designed and manufactured in Romania (postage stamp with the face value of Lei 5) whose maiden flight took place on 17 June 1910, is recognised as a leading representative of national and world aviation. His last project, the Vlaicu III airplane, the world's first metal airplane, was completed after his death (1913) by his friends Constantin Silisteanu and Giovanni Magnani, in 1914.

Henri Coanda, world class inventor, specialist in aerodynamics, is present in the history of aviation as the builder of the first jet airplane, realised in 1910 (postage stamp with the face value of Lei 33 within the souvenir sheet). The IAR–93 airplane whose picture is reproduced next to the portrait of Henri Coanda is known as the first jet airplane manufactured in Romania, having the Increst programme as a guide (whose director, starting in 1969, was Henri Coanda) and which had its first flight in 1974. The IAR–80 fighter (postage stamp with the face value of Lei 6) was designed and built at I.A.R. Brasov, and its maiden flight took place on 12 April 1939. The serial airplanes participated in combat actions during World War II.

In 1969, the Tarom Company marked an important milestone in its existence by making the first flight around the world with an Il–18D aircraft (postage stamp with the face value of Lei 13). The flight, conducted between 11 December 1969 and 7 January 1970, totalled more than 50,000 kilometres, covered in almost 80 hours of actual flight time.

Romfilatelia thanks the National Museum of Romanian Aviation for the development of this postage stamp, which was designed by Mr. Mihail Vamasescu and issued into circulation on 15 July 2024 this year, being dedicated to Romanian Aviation and the Romanian Air Force.

By Vijay Seth

Aerospace Heritage Trust

Images courtesy: Romanian Post and National Museum of Romanian Aviation

Air Marshal (R) Harish Masand says...

I learnt more than flying from them: Jeff D'Souza

I came across this unsung luminary of the Air Force pretty early in life when I was in Adampur on my second tenure in 101 Squadron in late 1976. My first tenure in 101 was on Su–7s in 1972–73 and this time I came back to 101, then commanded by Pratap Rao, in 1976 on MiG–21Ms as an instructor and a Flight Lieutenant. Jeff D'Souza was then in 1 Sqn on MiG–21 FLs. We didn't spend much time in Adampur together and didn't really get to know each other, in the sense that he didn't know me but I knew of him and his wife Betty since we saw them around in socials and exchanged brief greetings.

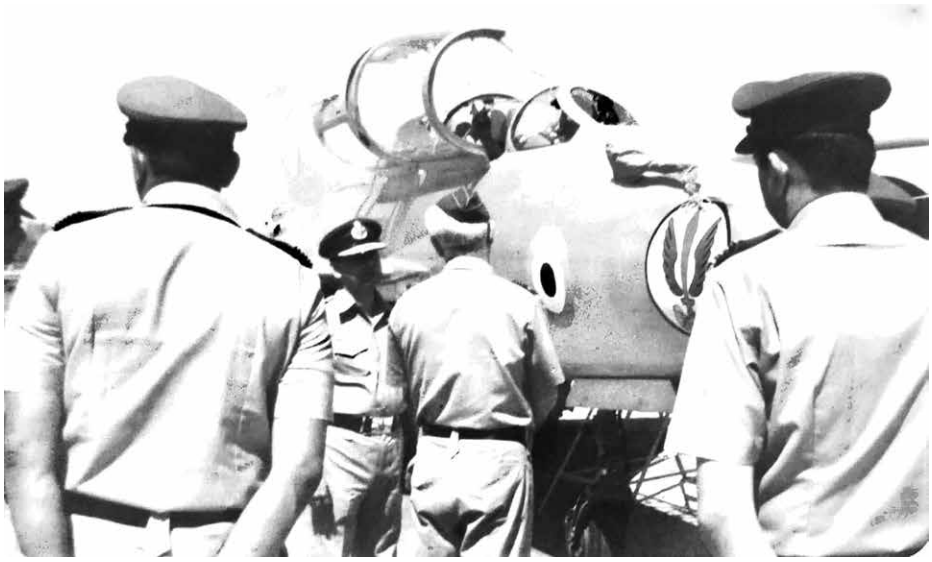
Soon, though, we were destined to be together for the Fighter Combat Leader's Course in TACDE when I was detailed for the 11 FCL Course starting January 1978. Unfortunately, that was not to be since I was taken off that course, as described in my article on Air Marshal Denzil Keelor published earlier, available at https://www.vayuaerospace.in/article/835/air–marshal–r–harish–masand–says–i–learnt–more–than–flying–from–them–denzil–keelor. In any case, our tryst was not overly delayed since I came to Jamnagar in March 1978 for the 12th FCL by which time Jeff was on the staff of TACDE having won the Jam Sattaji Sword of Honour for standing first in the order of merit in 11 FCL. While I was on the Course, Jeff Sir was a bit reserved with me like all other staff in TACDE due to reasons again mentioned earlier in the article on Denzil Keelor but Betty D'Souza was very friendly in the socials and I recall, even very enthusiastic in learning the new group dances like "Slosh" etc that I had learnt from Malini and was demonstrating these to the ladies like Linda McMahon and Betty D'Souza in TACDE. In any event, Jeff was a man of few words and spoke in a laconic manner with short and crisp sentences which sufficed to convey the meaning, particularly in debriefs for the sorties we carried out during the course. Though reserved in that manner, he was always polite with everyone and always had a gentle hint of a smile even while giving out his one–liners with a great sense of humour.

It was after the course when I got back on the staff of TACDE in September 1978 when Malini and I got to know Jeff Sir, Betty and their three lovely daughters, Sandy, Christine and Carol well. Betty and Jeff were then staying in the temporary accommodation called Honeycomb quarters due to lack of married accommodation in Jamnagar those days while Malini and I were given two–room accommodation on the other side of the Officers' Mess called Honeymoon quarters. Some other staff were staying in reimbursed houses in Mahavir apartments in town. Staying close–by meant we met fairly regularly, generally in the Officers' Mess since none of our

accommodation had the space or the wherewithal to entertain anyone. Even though Jeff Sir was more than four years senior to me in service, he was very easy going with all of us though that did not mean that professionally, we could take any liberties or adopt any short–cuts. This wonderful balance between professional and social interactions is what impressed me the most about Jeff and Betty those days. Unfortunately, once again our stay together was quite brief, and while we both went to Iraq together in July 1979, Jeff went to Tikrit as an A2 QFI while I was in Al–Kut on the FCL ticket; so our meetings were infrequent.

Our paths crossed again soon when Jeff was the Chief Operations Officer in Air Force Station, Lohegaon Poona, or Pune now, under the command of Air Commodore JP Singh and I was posted there to convert 28 Squadron on the MiG–29s in June 1987. Even before our squadron received the aircraft in October 1987, I had been selected to demonstrate low level aerobatics on the MiG–29 and was given a few sorties to practice my profile under the watchful eyes and control of Jeff Sir. Jeff and I had sat together a few times over the demo profile that I had formulated myself keeping in mind the capabilities of the aircraft. After the sorties, the debriefs of these practice sorties were always pleasant and Jeff sir was always very encouraging while pointing out what the demonstration looked like from the ground from the eyes of a lay spectator as well as a professional fighter pilot with an eye for detail on what was being demonstrated. I still recall that I had formulated the on–base demo starting with a loop immediately after take–off and had found in my practice maneuvers at a safe altitude that 850 meters above ground on top of the loop at Poona was adequate to complete the maneuver and finish the loop over the runway with the bottom at 100 meters above ground. Jeff Sir advised me to aim for an altitude of 1000 meters on the back on top so that I had more of a safety margin for recovery and any emergency. One time, I did do the maneuver a little more tightly than I should have and found myself at 850m on top. While I completed the maneuver safely, Jeff Sir's R/T call when I pulled out was, "That was impressive but close". I kept that in mind in all my future demonstrations and always aimed for 1000 meters later making my own breathing a little easier during the demonstrations.

In off–base demonstrations, the profile started with a run–in on the back for the last 2 km of the run–in. In one of those practices, Jeff Sir warned me about a bird in my path when I was



over the dumbbell and while I quickly came upright and tried to evade the bird to the left, it did graze the leading edge of my right wing and we abandoned the practice. Fortunately, after landing we found no damage and just a graze. Much later, when I was doing the demonstration over Tilpat for the Air Power demonstration in February 1989, I recall the briefing given to me that I was to continue with the demonstration unless it was a major bird–hit which affected the performance of the aircraft or flight–safety with me being the sole judge to decide. In those moments, I always recalled Jeff Sir's advice to keep safety as Priority–1. Fortunately, I never had to take that call in any future demonstration.

Operationally, Jeff Sir was always very supportive of the Squadron's efforts to operationalise as soon as possible and made very facility available to us whenever we wanted to fly regardless of the constraints on him in terms of holidays, manning et cetera. Soon, by January 1988, I had got a major portion of the pilots operational and we were being pulled away for various exercises in the Command and even detachments outside the Command. Both the AOC, Air Commodore JP Singh on whom I will write separately, were truly supportive of the fledgling squadron attempting to rapidly operationalise and extended every possible help, operationally as well as administratively. The environment in Poona those days was one of good will and trust which made my task much easier than if I had to struggle in a tense environment watching my six all the time. The social scene was also very lively with a lot of bonding between the station officers and squadrons. Even when we formulated fresh tactics for the employment of the aircraft, Jeff Sir was totally supportive and made the controllers

and staff in the GCA help us perfect our intercept profiles.

In April 1988, 28 Squadron was completing 25 years of formation on the MiG–21, being the first to induct the aircraft, thus rightly earning the sobriquet of "The First Supersonics". Quite frankly, when I first proposed to my own guys in the squadron around January 1988 that we celebrate the silver jubilee of the squadron in some style, the response was quite lukewarm since most pilots were busy with being operational on the aircraft while even the technical crew had their hands quite full setting up the maintenance facilities and SOPs while also servicing the aircraft for our daily flying training. All of us were also moving around quite a bit on detachments since the new aircraft was in great demand. This is when both the AOC, JP Singh, and Jeff guided and encouraged me to start planning the silver jubilee celebrations since both were also ex–28 Squadron. Fortified by their encouragement, I laid it clearly to the squadron that silver jubilees don't come every year and if we don't mark this occasion in the manner befitting. The First Supersonics, we would be losing a great opportunity to showcase the squadron and also paying tribute to our predecessors who had brought the squadron to the level of professionalism and excellence that we had inherited.

Fortunately for us, just before we finalised the dates and sent out invitations, Air HQ issued preliminary warnings about evaluation trials against the Mirage 2000 planned in late–March to early–April 1988 with me designated as the leader for the MiG–29 fleet and Jeff Sir as the umpire and planner/moderator, assisted by three TACDE staff pilots as flying umpires. Considering this exercise, we just shifted the dates for the silver jubilee celebrations from the 1st of April by about two weeks. Unfortunately, JP Sir got posted out just before the exercise and Silver Jubilee celebrations and we had Air Commodore IS Bindra as the new AOC which somewhat changed the dynamics on the ground.

Anyhow, Jeff now got down to planning the conduct of evaluation exercise, named "Lightning" by HQs and since I was with him for most of it, I got to see the meticulous way he went about it from real close quarters. I have described the exercise in a lighter vein in an article entitled "Rivals from the Same Team" published in an old Vayu Issue, which includes the verse penned down by Joe Bakshi entitled "Countdown at Lohegaon" describing the western style gunfight between the Mirage and MiG fleets, but for those who may not have read that article, I would repeat some of it with the intent of highlighting the planning and decision–making abilities of Jeff Sir.

Fortunately, Jeff was a reputed professional, as clearly evident from my mention of the Sword of Honour in the FCL Course, and at the same time liked and respected by almost everyone due to his gentle and smiling ways; not that he couldn't be firm and forceful when the situation so demanded. The AOC, Air Commodore Bindra, had left it completely to Jeff to run this exercise, having just taken over the base and with little familiarity with the MiG–29, and was hardly ever seen even during the debriefs for the sorties.

In the welcome address to the Mirage team under CO 1 Squadron from Gwalior, "Pudding" Ahluwalia, and the initial exercise briefing Jeff had made it clear to everyone that ego and one–upmanship would not be tolerated and while each specifically planned mission would be flown realistically to the limits

of the aircraft performance, the set rules of engagement and flight safety limits were not to be violated. Also, considering the sensitive nature of the information gathered during the exercise, single handwritten reports would be generated by each side and would be collated, finalised and forwarded to higher HQ personally by him.

Since the story of the exercise is given in more detail in the previous article that I have referred to, I would not dwell on the conduct itself except to make a mention of the cool and calm manner in which Jeff handled the debriefs, particularly when Pudding was upset with the results and would try to influence the conclusions in favour of the Mirage and also ask for repeat shoots. What happened at the conclusion of the exercise is where Jeff came into his true being and my respect for him grew manyfold. The exercise got over on 14th of April and I invited Pudding to dinner in the most expensive hotel/restaurant in town those days, the Blue Diamond, to soothe ruffled feathers and the bruises and also convey that there were no hard feelings. Quite obviously, Jeff was also invited for this farewell dinner, of sorts. After a few drinks, Pudding got carried away and said words to the effect, "Khapusky, the Mirage is actually better, at least in the instantaneous rate of turn but you did not let anybody else fly the MiG–29 for this comparison. Let's do a 1vs1 before we leave tomorrow, just you and me, engaging each other straight after take–off right overhead the airfield. You take–off on 28 and I will take off at the same time reciprocal on 10". Jeff was enjoying this conversation with his usual wisp of a smile and winked at me to encourage me to go ahead and take him on. Obviously, taking off reciprocal simultaneously even on different lanes was crazy and considering that AOC Bindra was already not too fond of me, after a bit of talking around this issue, I proposed that we take–off separately with a break between each of us so that it sounds like two aircraft taking off for an air test or the ferry. I proposed a short profile timing each aircraft from wheels roll. The profile was loop after take–off, a 360 degree turn ending with another loop with

the whole sequence being timed from start to finish with a time–keeper from each fleet and Jeff being the Chief Umpire. The aircraft with the lesser timing to do the whole profile would have proven its performance along with the skill of the pilot. A case of Black label was agreed as the bet. As I wrote earlier, Pudding still owes me eight bottles but the main issue here is the risky decision that Jeff took to close this argument once for all by permitting us to do all this. If AOC Bindra had found out about such a fly–off, Jeff would surely have been in a lot of trouble. I already was with the AOC.

Months whizzed past in the numerous detachments for the Squadron and Jeff left us for Air HQ in what seemed too fast for me. However, in the time that we spent together in Poona, Malini and I spent some good times with Betty and Jeff while also getting to know their three lovely daughters, Sandra, Christine and Carol better. Thereafter, we lost touch for while; remember those days there was no internet, mobiles or WhatsApp and other messaging services and our contact was essentially through exchanging greetings on Christmas/ New year. However, we did meet, as it happened infrequently, when Jeff Sir was in Western Air Command and then NDC whenever I passed through Delhi. As it happened, Jeff Sir led a team of foreign students from NDC to Poona when I was the AOC in February 1998. I received and welcomed the team in the early evening but there was some confusion since CME, Poona was supposed to look after the visit but their liaison officers and transports did not turn up. After a short wait, I invited Jeff Sir and the team to be our guest in the Officers' Mess for a while till the issue was resolved. While we were having drinks, our PMC and others were resourceful enough to organise 30 odd rooms, including some with families who volunteered to keep these guys for the night, to accommodate the lot in case CME did not turn up at all. That turned out to be a good party because the liaison officers and transports from CME only showed up at about 10 pm when we were finishing dinner. Some of the foreign students did not want to leave at that time of the night

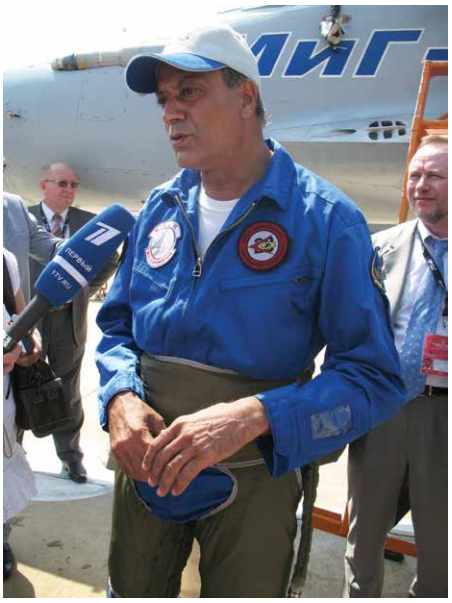
and asked if they could stay with us, the Air Force, at least for the night. Once again, Jeff Sir just smiled and winked at me to keep them if I could which I did. The party carried on for much longer after that with the students who had stayed back. After their visit, I got a great letter from Jeff Sir appreciating the hospitality and resourcefulness of the Air Force Station. I believe he also sent a copy of the report highlighting this to Command HQ, to little effect though. In this episode, the manner in which Jeff encouraged his subordinates to do more than what was normally expected of them was something I would carry with me forever.

Soon after in March 1998, Jeff Sir retired and settled down in Poona while I was still there so Malini and I got to see Betty and all of them more often. The D'Souzas were great hosts and always ran an open house welcoming all their friends with open arms and warm hospitality. They also joined us in the base, particularly on Air Force Day and other personal events. As it happened, after I got posted out to Air HQ in June 1999, Malini had to stay back because of our daughter, Ruheene's, school term and Board exams for the 12th. When Malini went into hospital soon afterwards for treatment and I was attached back to Poona to take care of her, we spoke often though I could not socialise much and meet the D'Souzas often. However, the D'Souzas were always concerned about Malini's ailment and came to see her and give us moral support.

Unfortunately, Malini passed away in 2012, after six years of my retirement and a few years later, even Betty passed away. While the loss obviously hit Jeff Sir hard, he was stoic enough to take it in his stride and take whatever life had handed out to him with equanimity and noticeable

fortitude. Whenever I pass through Poona even these days, I always spend at least one evening with Jeff Sir and I always find him warm and friendly with his usual smile and some jokes when we reminisce about old times.

I had once mentioned even to AOC Bindra that his second in command, Jeff D'Souza, was sure–shot Chief material; unfortunately his age was against him. While Jeff Sir retired as an Air Vice Marshal, I always felt that with his professional acumen and personality, he could have been an asset to the Air Force if he had had his date of birth right for his course. Even today, some folks, who served under him in 45 Squadron or Gorakhpur, both of which he commanded, still call on him to pay their respects and partake a bit with him. Commanders like that who are still respected years or even decades after retirement are rare and this fact speaks for itself as to why and how I learnt so much from Jeff and Betty D'Souza.



The author of this series: Air Marshal (R) Harish Masand seen here at Aero India 2009 at Yelahanka, Bangalore.

25 Years Back

From Vayu Aerospace Review
Issue VI/1999

"AJT: A Pressing Need"

Addressing the Air Force Day parade at Palam on 8 October 1999 the Chief of Air Staff, Air Chief Marshal Anil Tipnis stated, "I am happy to report that the long awaited acquisition process for the Advanced Jet Trainer (AJT) is underway".

The Indian Russian Defence Protocol

After a week of discussions with visiting Russian delegations to New Delhi, a protocol was signed between the two countries on 5 November. According the Russian Deputy Prime Minister, "for the first time a comprehensive document involving all kind of military co–operations between the two countries was signed."

Coast Guard Orders 7 More HAL–Dornier 228s

The Transport Aircraft Division of HAL has signed a new contract for the supply of seven more Dornier 228 maritime patrol aircraft to the Indian Coast Guard. The total contract value is estimated at Rs 188 crores or US $ 45 million.

IAF Plans Modification of Mi–17/ 25/ 35s

The IAF is understood to be incorporating modifications on some Mi–17 transport and Mi–25/35 attack helicopters for more effective utilisation in high altitude operations. During Operation Safed Sagar, Mi–17s were initially employed for direct attack with unguided rockets on enemy positions of the Dras–Kargil sector.

Post Kargil: SAR and UAVs Needed

Experts from the DIPAC have reportedly told the Subrahmanyam Committee (appointed to examine the situation which led to the Kargil near–war) that Indian Remote Sensing satellites can provide only broad terrain information and changes but cannot be retired upon to provide any vital intelligence.

2–stage IA Disinvestment Plan

The Ministry of Civil Aviation are reportedly working on a two stage disinvestment programme for Indian Airlines, involving sale of equity to financial institutions through competitive bidding and a public issue on the basis that the company reports profits for the current financial year.

"214 New Indian Airliners Till 2020"

A global market forecast made by Airbus Industries has indicated that India will invest up to $16 billion in the next 20 years to acquire 214 new aircraft. Of them, 119 will be bought to meet the growing passenger traffic while another 95 will be procured to replace aging aircraft currently in service.

Rolls–Royce to establish 100% subsidiary

Rolls–Royce is to set up a wholly owned subsidiary in India to manufacture gas turbines and diesel power generating systems as also establish joint ventures for providing technical expertise to power plants.

Defexpo '99

Defexpo'99 India's first land and naval systems exhibition, took place at Pragati Maidan, New Delhi from 12 to 16 October and was organised by the Department of Defence Production and Supplies in association with the Confederation of Indian Industry (CII).

Malaysia Keen On Su–30

The Royal Malaysian Air Force (RAMF) is reportedly now interested in procurement of Sukhoi Su–27 variants, particularly the two–seat Su–30, thereby following the trend set by the IAF which too foreclosed its plans to procure more MiG–29s and instead opted for the Su–30s.

More Mirage 5s For Pakistan

The first eight Mirage 5 fighters, of a total of 40 contracted for and refurbished in France some years back, were finally "released" for delivery to Pakistan, arriving at their designated base on November 14.

C–130s for Sri Lanka

Two former RAF C–130 Hercules transport aircraft are being refurbished for the Sri Lankan Air Force by Marshall Aerospace of Cambridge. The first of these is due to delivery on 19 January 2000, followed by the second on 15 February.

Tale Spin

The Bee–130J!

The all new Lockheed Martin Bee–130J: some "sweet" news for the day! The US Air National Guard MC–130J briefly becomes a "Bee–130J"; a swarm of honeybees gathered on the inflight air refueling pod. Beekeeper Jim Davis plans on giving the Middletown Airmen the resulting honey next year! (Photo courtesy: 193rd Special Operations Wing & airandspaceforces.com).

Reprieve from Delhi's roads?

The PAL–V Liberty, the world's first FlyDrive vehicle (flying car), has successfully completed its first Ministry of Transport (MOT) periodic inspection, 4 years after its groundbreaking road certification. We want it! Traffic jams a thing of the past?

A world record!

Over 15 lakh (1.5 million) people from various parts of Chennai (India) and neighbouring districts thronged the shores of Marina Beach and its neighbourhoods on 6 October 2024 to witness the spectacular IAF Air Show, conducted as a part of the 92nd Indian Airforce Day

celebrations. A total of 72 IAF aircraft and helicopters participated. This event has officially entered the annals of The Limca Worid Record book. (Images: X)

Not science fiction at all!

SpaceX successfully launched the latest test flight of Starship on 13 October 2024, the most powerful rocket system ever constructed, which could one day be used to carry humans to the moon and Mars. On its return and descent, the Super Heavy was successfully caught midair with a pair of massive metal pincers, which SpaceX calls "chopsticks." All we can say is: Unreal, super and just fantastic. What strides, innovation and development we are witnessing! (Images SpaceX)

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