VAYU

Aerospace & Defence Review

VI/2023

IAF C–295 inducted

IN's Il–38SD retires

Interview with CAS

Exercises & visits

Aircraft at IAF Day

IN and 3rd carrier?


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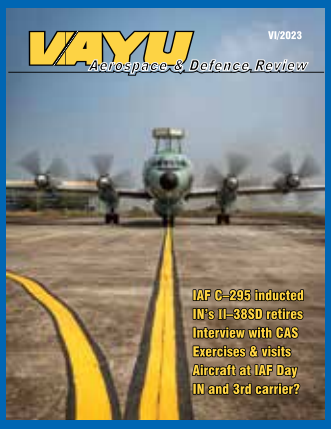

Cover: Il–38SD of the Indian Navy, now recently retired. Photo by Angad Singh (Twitter @zone5aviation)

15 C295 for India; third time's the charm?

Despite a long history of licence building transport aircraft, India has failed to leverage its buying power. The induction and production of the C295 might finally buck that trend. Angad Singh reports.

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HAL handed over the first LCA Tejas twin seater to the Indian Air Force at a ceremony in Bangalore on 4 October 2023.

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Regular features:

Opinion, Viewpoint, Aviation & Defence in India, World Aviation & Defence News, I learnt more than flying from them, Ancient Aviator Anecdotes, Vayu 25 Years Back, Tale Spin.

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Lt Gen Kamal Davar says...

.....There is no Bharat vs India

President of "Bharat" Droupadi Murmu's dinner invitation to the heads of state and other delegates attending the G–20 Summit in New Delhi created a storm in political circles for reasons difficult to fathom. Having worn my nation's sacred olive green uniform for 41 years and participated in many operations across the length and breadth of this great country, the uncalled for pitting of Bharat and India pained me to no end as it would have millions of our countrymen both at home and abroad. That we Indians many times exhibit a propensity of creating unnecessary or irrelevant problems out of nowhere is an old habit. On most occasions, a majority of these controversial actions are the handiwork of politicians.

To all our countrymen, the names – India, Bharat and even Hindustan– carry the same sanctity, appeal, fervour, romance and invoke a feeling to work for and, even if required, willingly die for one's country. For all Indians, these hallowed names bring to memory ancient and historical linkages. Each has its indelible history which has evolved and is widely respected down the ages. It is prudent to recall some salient aspects regarding their background for us to realise their significance to the evolution of Bharat that is India.

The term 'Bharat' finds reverberation in the ancient epic Mahabharata, Upanishads and the Rig Veda as one of the principal kingdoms of Aryavarta which was inhabited by the Vedic tribe of Bharatas. It is named after Bharat, the son of King Dushayanta, while some believe that it is named after King Dashartha's son Bharat as mentioned in Ram Charit Manas.

The word 'India' derives its name from the Greeks as 'Indica' when Greek emperor Darius conquered Sindh in 516 BCE and refers to the land East of the Sindhu (Indus River). The Greeks and Iranians called it 'Hindos' or 'Indos'. The word 'Hindustan' is of much later origin meaning the land of the Hindus and it came up during the Mughal rule and became rather popular in usage in the last four centuries or so. The name India, of course, finds great resonance all over the world and represents unequivocally the name and idea of this nation which is now at the cusp of becoming a global power. In English and other foreign languages, our nation is called as India across the world and in Hindi and other Indian regional languages it is referred to as Bharat. Some Arab nations also call us as citizens of Al Hind. Why should now the nomenclature of our land be part of any disagreement is unfathomable. An institution can have many names, all sacred. In the Hindu pantheon, don't we have our gods with more than one name?

The melodious flute playing Gopala whose birth we observed as 'Krishna Janmashtami', is respectfully and joyously called by countless names.

So why the efforts to find fault with any name associated with our beloved nation?

It is equally important to note that immediately after India's independence on 15 August 1947, when the drafting of the Indian Constitution was on in full swing, the eminent and wise members of the drafting committee did consider many names for the young nation. According to some media reports, many members were keen on the nomenclature of 'Bharat' as the name. However, when it was debated in the Constituent Assembly, the latter, in its infinite wisdom adopted for the country a dual bilingual identity. Thus Article 1 of the Constitution enshrines the golden inspiring words "India, that is Bharat". I do not think it anyways diminishes the sanctity of the term Bharat which is ingrained in all of us who inhabit this vast sub–continent since times immemorial. To put the record straight, many states of South India prefer the name India far more and it will be politically prudent to respect their views too.

Coming back to the hallowed profession I have served, at each Sainik Sammelan or any formal function, all Army units after raising their unit slogan end the event with a full throated 'Bharat Mata Ki Jai.' In India our diversity propels us to take all sections of our society with each other. That is the strength and beauty of this ancient land. For all of us, in uniform and out of it, Mother India and Bharat Mata are the same noble creation. If some feel rather strongly about the so called colonial heritage existing let the use of the name Bharat be gradually increased but without touching or tampering with the existing nomenclature. For me, India is my religion, my reason to be and as the strains of the national anthem 'Bharat bhagya vidhata' bring a lump in my throat, the vigour of 'Chak De India' rejuvenates me in my old age. Our belief remains indelibly enshrined that 'Sare Jahan Se Achha Hindustan Hamara' is an eternal truism.

Admiral (Retd) Arun Prakash says....

.....Promise of Vizhinjam, a blue economy vision

On October 15, the Chinese flagged specialist merchant ship, Zhen Hua 15, arrived in India's new Vizhinjam port, bringing giant cranes from Shanghai, to be installed for dockside cargo handling. The Chinese vessel, being the first to dock in Vizhinjam, marked the port's inauguration, which was described by Kerala's chief minister, Pinarayi Vijayan, as, "a significant milestone" and "game–changer for Kerala's infrastructure development".

Chinese merchant ship Zhen Hua 15 (Image credit on photo)

The Vizhinjam port project was awarded to the Adani Group in 2015 with a target completion date of 2018, but delays imposed by various factors have seen a slippage of at least five years in the completion of the project's first phase. With a dredged depth of 20 metres, Vizhinjam is being advertised as "India's first deepwater port" that can not only berth the largest merchant ships but also cope with a huge quantum of container traffic. But its real significance lies elsewhere.

Currently, most container ships avoid calling at Indian ports due to depth restrictions, poor infrastructure, and high tariffs. A full 25% of India's export–import (EXIM) cargo is, therefore, shipped, first to nearby foreign ports like Colombo, Singapore and Klang, and then trans–shipped to its destination; a process both expensive and inefficient. Located in close proximity to international east–west shipping lanes, Vizhinjam could become a key trans–shipment hub, and obviate the need for India's EXIM cargo to be sent to foreign ports.

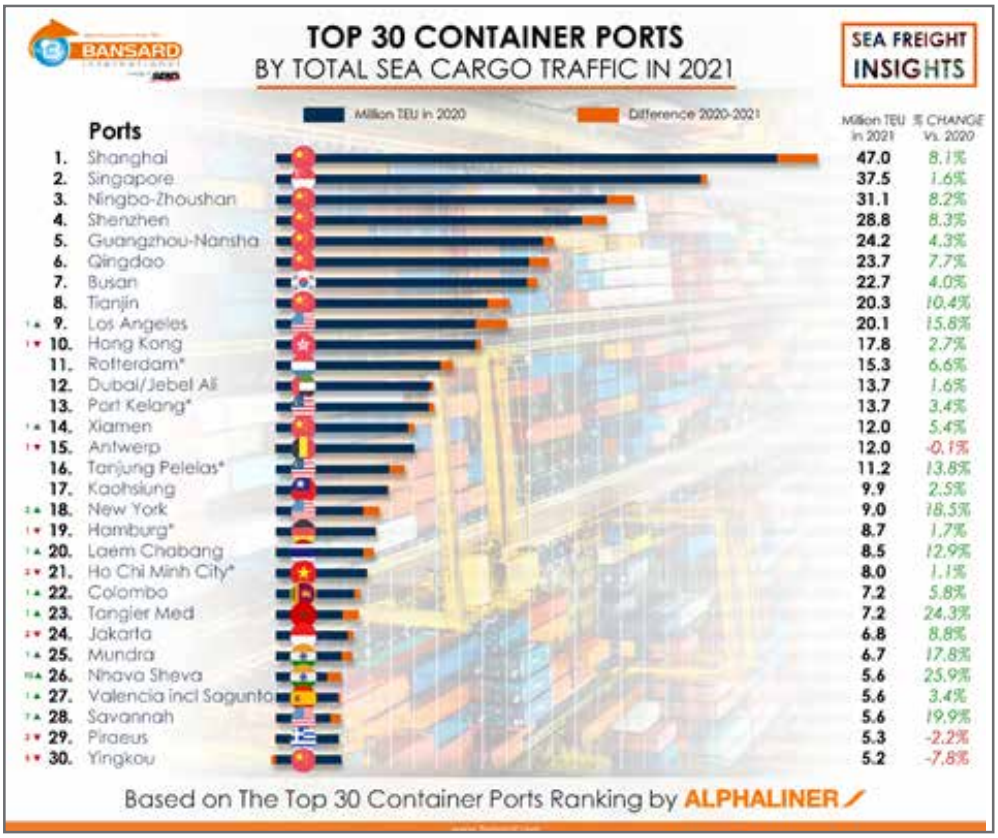
In a larger context, ignorance about its rich potential, combined with indifference has led to egregious neglect of the maritime sector. While India's merchant ship–building industry is moribund, the merchant ship fleet grows at a snail's pace, seabed exploitation has yet to take off, the fishing industry is backward, and human resources for all these are lacking. Nations that were lagging behind India in many maritime indicators have surged ahead in the past few decades because of the vision and dynamism they have demonstrated.

Reverting to the port sector, the less time a ship spends in port the more efficient and competitive the port is considered. Therefore, ports with shorter turnaround times attract more ships. By this criterion, Norway with 697,000 annual port calls is rated No.1, China with 260,000 port calls is at No.3, and neighbouring Indonesia with 181,500 port calls at No.7, but India does not figure in the top 20 nations. In the list of 50 best container ports worldwide, 18 are Chinese (seven of them amongst the top 10) while India has only two, at No.35 (Nhava Sheva) and No.39 (Mundra). There must be lessons, in the fact that unloading of the Zen Hua 15, in Vizhinjam, was reportedly delayed by five days, due to "technical reasons."

Notwithstanding these discouraging indicators, a vague perception has persisted in the government that the port sector does have an important bearing on India's economy. It is this perception that has helped keep alive, in different avatars, the "Sagarmala Programme", whose vision, according to the ministry of shipping Annual Report for 2022–23, is "port led development in the country" by reducing logistics costs for both EXIM and domestic trade "with minimal infrastructure investment". Tracing the trajectory of this project provides interesting insights into the workings of our politico–bureaucratic mindsets.

The first version of Project Sagarmala was announced in August 2003 by the Vajpayee–led National Democratic Alliance (NDA) government. The stated objective of this plan was to ensure that all major ports would be connected to the then proposed grid of highways, the "Golden Quadrilateral", through a network of expressways. The project was, however, abandoned within months, due to early general elections in February 2004.

The United Progressive Alliance (UPA) government that won office in 2004 replaced Sagarmala with the "National Maritime Development Programme" (NMDP) in 2005. While



Graph: bansard.com

the stated aim of the NMDP–2005, much like that of Sagarmala, was to "develop India's maritime sector", it was confined to modernisation of port infrastructure and enhancement of railroad connectivity to these ports.

The progress of the plan, however, remained tardy, and in 2011, the UPA government abandoned the NMDP–2005, replacing it with a new 10 year plan titled "Maritime Agenda 2010–2020" (MA–2020). While the Sagarmala–2003 and NMDP–2005 were focused mainly on port modernisation and enhancing railroad connectivity, MA–2020, ostensibly, had a much broader scope, and envisaged an outlay of Rs. 5 lakh crore to declare some extremely unrealistic targets such as multiplying ship–building capacity by five times and enhancing cargo throughput in Indian ports by four times in just 7–8 years. The breathtaking ambition of MA–2020 remained stillborn since it was overtaken by the next plan before it could achieve anything.

The NDA government that came to power in 2014, terminated MA–2020, and revived the Sagarmala project. The 20–year Sagarmala–2015 is also focused on modernising ports and enhancing connectivity in the country to transform the maritime sector. The five pillars of "port–led development" envisaged by Sagarmala–2015 are port modernisation, port connectivity, port–led industrialisation, coastal community development, and coastal shipping/inland water transportation. This version of Sagarmala holds out more hope because it has a structured, progress–monitoring framework, including a website, titled Sagarmala Project Tracker, which shows that by 2022, out of 241 "port modernisation" projects, 89 had been completed while 151 were under implementation or development.

Sagarmala–2015 still has 12 years to run and its progress will, no doubt, be watched with great interest. However, we must not lose sight of the fact that since 2003, India has seen four "maritime modernisation" plans bearing different names. In their quest for populism, through catchy slogans, successive governments have discarded their predecessor's agenda and created new programmes, containing essentially the same flaws. This stop–start process has not only delayed capability accretion, but also prevented the emergence of a long–term, coherent plan for India's long–neglected maritime sector.

There is clearly a need for the formulation of an overarching vision document which places the maritime domain in context and goes well beyond "port–led development" to address other, grave shortcomings in our maritime sector. Today, there is a dire need to bolster the merchant shipbuilding industry, build a large and diverse shipping fleet, create a mechanised ocean–going fishing fleet and plunge into serious seabed exploitation. The document must, however, be enabled to survive regime changes.

All these are aspects of the "blue economy" which, as China has demonstrated, have a critical bearing, not only on a nation's economic future, but equally, on its holistic maritime security and international standing. The corresponding administrative structures which will enable change and effective implementation of maritime reform should include a ministry of maritime affairs, and a national oceanic administration with cross–ministerial participation.

In the above photo is Admiral (Retd) Arun Prakash

IAF MiG–29s to get upgraded further

Astra Microwave (India) and Rafael (Israel) through their JV Co Astra Rafael Comsys (ARC) Pvt Ltd have received an order worth Rs. 96 Cr for supply of SDR kits (BNET–AR communication system/BNET family of software defined radio SDRs) and testers for IAF's MiG–29s.

The BNET family of software defined radio (SDR) systems provide a robust voice and datalink solution and support simultaneous data, voice and video services with multiple auto relays, according to Rafael.

First, in our Vayu Issue 4/2017 and later in Issue 5/2019 we reported that a Joint Venture between AMPL and Rafael, inaugurated their facility at Hardware Technology Park, Hyderabad on 27 August 2019.

This is to design, develop and manufacture state of the art Tactical Communication systems (BNET) for the Indian Armed Forces.

IAF's No.4 Sqn converts from MiG–21 to Su–30MKI

The Number 4 Squadron (Oorials) of the Indian Air Force (IAF) based at Air Force Station Uttarlai (Barmer) converted from the MiG–21 to the Su–30MKI, marking a watershed moment in the history of the squadron which was operating the MiG–21 since 1966. The formal induction of the new aircraft was marked by a ceremony at Air Force Station Uttarlai on 30 October 23. The ceremony featured a combined flypast by the MiG–21 and Su–30MKI, which marked the last MiG–21 sortie for the squadron. The conversion of this squadron to Su–30MKI implies that the IAF now operates only two squadrons of the MiG–21s. The IAF remains committed to phasing out the MiG–21 by the year 2025.

IAF's Exercise Poorvi Akash 23

Exercise Poorvi Akash 23: A variety of operational, maintenance and administrative activities were conducted to check preparedness and carry out realistic training on 1 November 2023. The indigenously developed Light Combat Aircraft (Tejas) also participated in the exercise. IAF deployments that CAS visited include those

at Farkawn, Mechuka, Pasighat, Tuting and Ziro. During these visits, he was also briefed about the op deployment of the detachments in the ongoing Ex Poorvi Akash.

CAS at India's NE

CAS Air Chief Marshal VR Chaudhari visited various forward area locations in the North East on 1 November 2023 where he interacted with air warriors, complimenting them for their operational preparedness.

IN tests Brahmos

An Indian Navy destroyer of the Eastern Fleet carried out a successful firing of BrahMos missile in the Bay of Bengal on 1 November 2023. The missile achieved all mission objectives.

BEMLs light alloy structures for VSSC, ISRO

BEML has received an order from Vikram Sarabhai Space Centre (VSSC), ISRO for manufacture and deliver 7 types of Light Alloy Structures for Launch Vehicle Mk–3 (LVM3). The first Strap on Base Shroud (SBS) structure has been handed over to VSSC.

Previously, BEML's Aerospace division has supplied fabricated Retro Motor Casings to VSSC, ISRO for the PSLV programme in 2018. So far, BEML has successfully delivered 120 RS1 motor casings to ISRO.

Tri–Services Commanders' Conference 2023

Tri–Services Commanders' Conference (TSCC)–2023 (Western Grouping) was held at Subroto park, New Delhi on 3 and 4 October 2023 under the aegis of Western Air Command. The two–day conference was hosted by Air Marshal PM Sinha, Air Officer Commanding–in–Chief, Western Air Command. General Anil Chauhan, Chief of Defence Staff presided over the event.

General Officers Commanding in Chief of Northern Command, South Western Command, Southern Command and Western Command; Flag Officer Commanding in Chief, Western Naval Command, Air Officers Commanding in Chief of South Western Air Command and Southern Air Command; Chief of Integrated Defence Staff to Chairman Chief of Staff Committee, Director General Defence Intelligence Agency and Deputy Chief of Integrated Defence Staff (Operations) attended the conference.

Planning for multilateral naval Exercise MILAN–24

The Mid Planning Conference (MPC) of MILAN 24 (Multilateral Naval Exercise 2024), to be hosted by the Indian Navy at Visakhapatnam from 19–27 February

2024, was conducted by the Eastern Naval Command (ENC) with participating friendly foreign Navies over video conference on 17 Oct 23. MILAN 22 was conducted at/off Visakhapatnam from 25 February–4 March 2022 and witnessed participation from 39 countries. Scheduled from 19 to 27 February 2024 at/off Visakhapatnam, MILAN 24 is likely to witness the largest ever participation to date with invites being extended to over 50 countries.

INS Khanjar is 32

Indian Navy's INS Khanjar, an indigenously built Khukri class missile corvette celebrated 32 years in commission on 22 October 2023 and "proudly living up to her motto 'Better than the best', she continues to execute all missions with vigour".

'Lions' are 60!

No. 31 Squadron 'Lions', Premium Fighter Squadron of IAF, celebrated Diamond Jubilee historical milestone in its service to Nation, on 21 October 2023 at AF Stn Jodhpur. Air Mshl SP Dharkar AOC–in–C, EAC & Commodore Commandant 31 Sqn, graced the occasion as Chief Guest. Series of events like spectacular show by Akash Ganga sky diving team of IAF, thrilling low level aerobatics and other displays by fighter aircraft and helicopters, and a static display of aircraft and equipment made the event more memorable.

IAF at 91 and a new Indian Air Force Ensign

8 October 2023 will go down as a momentous day in the annals of IAF history. On this historic day, the Chief of Air Staff unveiled the new IAF ensign.

Going back in history, the RIAF Ensign comprised of the Union Jack in the upper left canton and the RIAF roundel (Red, White and Blue) on the fly side. Post Independence, the Indian Air Force ensign was created by replacing the Union Jack with the Indian tri colour and the RAF roundels with the IAF tri colour roundel in the lower right canton.

A new lAF ensign has now been created to better reflect the values of the Indian Air Force. This reaffirmation will now be reflected by the inclusion of the Air Force Crest in the top right corner of the Ensign, towards the fly side.

The IAF Crest has the national symbol, the Ashoka lion on the top with words in Devanagari below it. Below the Ashoka lion is a Himalayan eagle with its wings spread, denoting the fighting qualities of the IAF. A ring in light blue colour encircles the Himalayan eagle. The motto of the IAF is inscribed below Himalayan eagle in golden Devanagari. The IAF motto has been taken from verse 24, Chapter 11 of the Bhagavad Gita and means "Radiant Thou Touchest Heaven" or in other words "Touching the sky with Glory".

ENC Chief reviews operational readiness of Eastern Fleet

Vice Adm Rajesh Pendharkar, Flag Officer Commanding–in–Chief, Eastern Naval Command reviewed the operational readiness of the Eastern Fleet at sea on 9 October 2023. He witnessed various surface, sub–surface, air and anti–air operations by ships of the Eastern Fleet under the command of Rear Adm Gurcharan Singh Flag Officer Commanding Eastern Fleet. Un–altered exercises, successful weapon firings including anti–submarine weapon firings, as well as amphibious operations were the highlights of the readiness inspection. The C–in–C ENC embarked and interacted with the crew of participating ships and expressed his satisfaction at the combat readiness of the Eastern Fleet to tackle maritime threats in all dimensions. He also appreciated the hard work, dedication and morale of the men and women onboard ships and encouraged them to continue excelling in their roles.

Weapon firing during Operational Readiness

Helicopter operations during the Operational Readiness

Helicopter operations during the review

Weapon firing review

Weapon firings

Fifth Positive Indigenisation List

The Fifth Positive Indigenisation List has been prepared by DMA after several rounds of consultations with all stakeholders. It lays special focus on import substitution of components of major systems besides important platforms, weapon system and sensors and munitions which are being developed and likely to translate into firm orders in the next five to ten years.

Prominent items include Futuristic Infantry Combat Vehicle, Articulated All–Terrain Vehicles, Remotely Piloted Air Borne Vehicles upto 25 Km with 2Kg Payload for Army, Naval Shipborne Unmanned Aerial System, Medium Upgrade Low Endurance Class Tactical Drone, Electric Light Vehicle for Army, Medium Range Precision Kill System for Artillery, Next Generation Low Level Light Radar for Army, Automatic Chemical Agent Detection & Alarm System, Armoured Fighting Vehicle (AFV) Protection and Counter Measures System, Integrated Mobile Camouflage System, AI Based Satellite Image Analysis, Test Equipment for Guided Weapon System for Tank T– 90 S/SK, Quantum Key Distribution System for Optic Fiber based Networks (Upto 200 Km range), Very High Frequency Radar, Electro Optic Fire Control System for Naval Platforms, Armour Plates for Cabin Nose Section for Mi–17 Helicopter, Automated Mobile Test System for OSA–AK–M Missile System; Multifunction Aviation Ground Equipment for Air Force, Gravity Rollers for Mi–17V5 helicopter and flares of P–8I and MiG–29K aircraft.

Brahmos tested at A&N

The Brahmos Missile Regiment of the Indian Army carried out a successful launch of the extended range BrahMos supersonic cruise missile striking target with pinpoint accuracy in the Andaman & Nicobar Islands on 10 October 2023.

GRSE results

GRSE at DSEi in London, September 2023

The 107th Annual General Meeting (AGM) of Garden Reach Shipbuilders and Engineers (GRSE) Ltd was held on 22 September 2023. FY23 has been the most successful year in the Company's history in terms of key performance parameters. Revenue from Operations increased by 46% from Rs 1,754 crore in FY22 to Rs 2,561 crore in FY23. Total Income grew from Rs 1,916 crore of FY22 to Rs 2,763 crore in FY23. This increase of Rs 847 crore over the previous year was a growth of 44%. The Profit After Tax (PAT) increased by 20% from Rs 190 crore in FY22 to Rs 228 crore in FY23. GRSE began the year with an order book of Rs 24,103.60 crore and was working on seven projects. Apart from three Project 17A Frigates, four Survey Vessels (Large), and eight ASW Shallow Water Craft for the Indian Navy, the shipyard is also building a Fast Patrol Vessel (FPV) for the Indian Coast Guard. Export orders included an ocean going passenger cum cargo ferry for Guyana and six patrol boats for Bangladesh.

GSL results

During FY 2022–23, Revenue from Operation clocked at Rs 869 Cr compared to Rs 741 Cr in FY 2021–22 and Profit Before Tax grew to Rs 205 Cr as against Rs 135 Cr in the previous year, registering an impressive growth of

52%. GSL CMD stated, "for the first time GSL is executing 20 platforms concurrently. Amidst disruption in global supply chain, construction of two highly technologically advanced frigates for the Indian Navy is progressing well. Further, the construction of two Pollution Control Vessels and eight Fast Patrol Vessels for the Indian Coast Guard and prestigious export contract for construction of 4000 T Floating Dry Dock are also advancing satisfactorily".

CSL for mid life upgrade of INS Beas

The Ministry of Defence signed a contract on 16 October 2023, in New Delhi for Mid Life Upgrade and Re–Powering of INS Beas with Kochi–based Cochin Shipyard Limited (CSL) at an overall cost of Rs. 313.42 Cr. INS Beas is the first of Brahmaputra Class Frigate to be re–powered from steam to diesel propulsion. After completion of mid life upgrade and re–powering in 2026, INS Beas will join the active fleet of the Indian Navy with a modernised weapon suite and upgraded combat capability.

Contract for 1st ICG Training Ship with MDL

The Ministry of Defence signed a contract for the construction of one Training Ship for the Indian Coast Guard (ICG) with Mazagon Dock Shipbuilders Ltd (MDL), Mumbai at a cost of Rs 2,310 crore under the Buy (Indian–IDDM) category in New Delhi on 17 October 2023. This is the first dedicated training platform with integral helicopter capabilities that will provide basic sea training to 70 Coast Guard and other international under–trainee officers to prepare these budding mariners on the multi–dimensional maritime aspects of Coast Guard life.

KCP's Module Structure to ISRO for Gaganyaan Mission

The Chennai based KCP, Heavy Engineering Unit handed over the first Integrated Air Drop Test – Crew Module structure (IADT–CM) to Indian Space Research Organisation (ISRO).

ISRO had earlier placed an order with KCP for the fabrication of two IADT crew module structures, both meant for the demonstration of its Technology Preparedness levels before carrying out Gaganyaan spacecraft, India's first human space flight programme.

The first IADT–CM is fabricated at KCP's integrated facility for heavy casting, machining and fabrication in Thiruvotriyur. The second one will be supplied to ISRO by March 2024.

ISRO's Gaganyaan Mission envisages launching a crew of two to three members to an orbit of 400 km for a 3–day mission and bringing them back safely to the earth by facilitating the landing in Indian sea waters. The spacecraft mainly consists of Crew Module and Service Module. The CM structure, fabricated at KCP, simulates the shape and size of the actual Gaganyaan crew module.

Zen Technologies order for tank training system

Zen Technologies Limited has secured a Rs 100 crore order from the Ministry of Defence for its advanced force–on–force tank training system, enabling tank units to train in real terrains without live ammunition. The force–on–force tank training system, designed and developed inhouse, received approval from the army after extensive trials, indicating potential demand in domestic and international markets.

Launch of DSC A 21 (Yard 326)

The launch of 'DSC A 21', the second ship of 5 x Diving Support Craft (DSC) project, being built by Titagarh Rail Systems Ltd (TRSL), Kolkata for Indian Navy, was undertaken on 30 October 2023 at Titagarh, Kolkata (WB) onto Hooghly River. These ships are designed to undertake diving operations at harbours and coastal waters and are being fitted with state of the art diving equipment. They are 30 m long catamaran hull ships, with a displacement of approx 300 tons. The contract for building 5 x Diving Support Craft (DSC) was signed between MoD and Titagarh Rail Systems Ltd (TRSL), Kolkata on 12 February 2021.

Launch of 25T BP 'Mahabali'

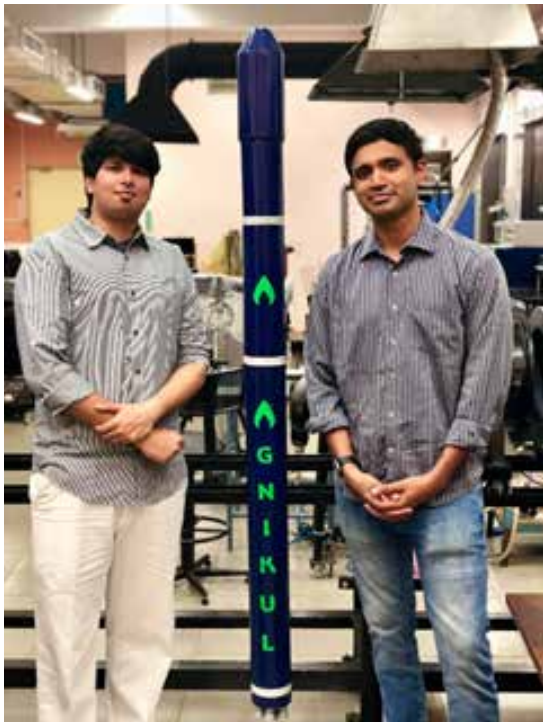
25T Bollard Pull (BP) Tug, 'Mahabali' was launched by Cmde Sunil Kaushik, NM, WPS(Mbi) on 28 October 2023 at Shoft Shipyard Pvt Ltd, Bharuch, Gujarat. Contract for construction and delivery of three 25T BP Tug was concluded with Shoft Shipyard Pvt Ltd (SSPL), an MSME, in consonance with "Aatmanirbhar Bharat" initiative of the Government of India.

Launch of 3rd ACTCM barge, LSAM 17 (Yard 127)

Third Ammunition Cum Torpedo Cum Missile (ACTCM) Barge, LSAM 17 (Yard 127) was launched by Cmde V Pravin, AWPS (Mbi) on 27 October 2023 at Suryadipta Projects Pvt Ltd, Thane. Contract for construction and delivery of 11 x Ammunition Cum Torpedo Cum Missile (ACTCM) Barge was concluded with Suryadipta Projects Pvt Ltd, Thane, a MSME, in consonance with "Aatmanirbhar Bharat" initiatives of the Government of India.

Agnikul announces Rs. 200 Cr Series B fundraise

Agnikul Cosmos, an IIT Madras–based Indian space–tech startup democratising space exploration by making it accessible and cost–effective, has announced the



successful closure of its Series–B fundraise of $26.7 million, increasing its total capital raised to date to $40 million. In August 2023, Agnikul commenced the integration process of its cutting–edge launch vehicle, Agnibaan SOrTeD (SubOrbital Technological Demonstrator), with its private launchpad located at Satish Dhawan Space Centre (SDSC) SHAR at Sriharikota. Agnikul has previously launched 'Agnilet', the world's first single–piece 3D printed engine fully conceived and manufactured in India, successfully test firing it in early 2021 and marking a significant technology milestone for the company and securing a patent for its engine from the Government of India in 2022.

Skye Air and Jeebly drone delivery trials in Dubai

Skye Air Mobility, India's SaaS based autonomous drone delivery company and Jeebly LLC, a UAE based logistics service provider along with Dubai Silicon Oasis and Dubai Integrated Economic Zones Authority (DIEZ), hosted a three week long Beyond Visual Line of Sight (BVLOS) drone delivery trials.

Digilogic Systems and SATIM in MoU

Digilogic Systems Pvt. Ltd. (DSPL) has signed a Memorandum of Understanding (MoU) with SATIM (Poland). This collaboration aims to engage in the development of Synthetic Aperture RADAR – Environment Simulator (SAR–ES). Under the terms of the MoU, SATIM has agreed to provide DSPL with the SAR module libraries. DSPL, in turn, will leverage these resources to integrate, design, and develop the SAR Environment Simulator (SARES) in India. SARES is designed to enable scientists to simulate a wide range of SAR characteristic data in the Radio Frequency.

Data Patterns strategic ToT with IN–SPACe

Data Patterns (India) Limited has announced a Licensing and Transfer of Technology (ToT) agreement with IN–SPACe, a single–window, independent, nodal agency that functions as an autonomous agency in the Department of Space (DoS). This agreement will provide Data Patterns with miniature SAR Radar capability. The technology has been developed at Space Applications Centre (SAC), ISRO and is the forerunner of ISRO's upcoming high resolution SAR satellite, the NISAR and made available for ToT to the industry by IN–SPACe.

CSMIA commissions DARK to recover aircraft

Chhatrapati Shivaji Maharaj International Airport (CSMIA) has commissioned its specialised Disabled Aircraft Recovery Kit (DARK) and becomes the first airport in Asia to have the DARK facility with High Pressure lifting bags. With a maximum weight of 390 metric tons, DARK can swiftly recover large commercial and transport aircraft, including the Boeing 777–300ER. DARK will enable CSMIA to respond swiftly and efficiently to runway excursions and aircraft incidents, minimising operational disruptions.

Air India opens maintenance warehouse in Delhi

Air India has commissioned a warehouse facility in Delhi to facilitate storage of over 1,000,000 engineering spares. The spares facilitate maintenance, checks and repairs of aircraft and ground support equipment. Located in proximity of Terminal 3, at the Cargo complex of Delhi Airport's Air Cargo Logistics division, the centralised warehouse sprawling 54,000 sq. ft. will improve quick turnaround of the airline's flights operating out of Delhi.

APPOINTMENTS

Vice Admiral Tarun Sobti is new DCNS

Vice Admiral Tarun Sobti assumed charge as Deputy Chief of the Naval Staff on 1 October 2023. Vice Admiral Tarun Sobti was commissioned into the Indian Navy on 1 July 1988 and is a Navigation and Direction Specialist. In his career spanning over 35 years, he has held a variety of Command and Staff appointments both ashore and afloat. The Flag Officer has commanded INS Nishank, a Missile Boat, INS Kora, a missile corvette, and guided missile destroyer INS Kolkata. In his staff tenures he has served in the Directorate of Staff Requirements and Directorate of Personnel, and as the Naval Attache at the Embassy of India at Moscow.

Vice Admiral K Swaminathan is Chief of Personnel, IN

Vice Admiral Krishna Swaminathan assumed charge as Chief of Personnel on 6 October 2023. The Flag Officer was Commissioned into the Indian Navy on 1 July 1987 and is a specialist in Communication and Electronic Warfare. He is an alumnus of National Defence Academy, Khadakvasla; the Joint Services Command and Staff College, Shrivenham, United Kingdom; the College of Naval Warfare, Karanja; and the United States Naval War College, Newport, Rhode Island, USA. The Admiral has held several key operational, staff and training appointments in his naval career including the command of missile vessels INS Vidyut and Vinash; the missile corvette INS Kulish; the guided missile destroyer INS Mysore and the aircraft carrier INS Vikramaditya.

MP's visit HAL

Members of India's Parliament Standing Committee on Defence visited HAL manufacturing facilities in Bangalore to get firsthand HAL's current and future aerospace programmes for the Indian Armed Forces in early November 2023.

They were briefed by HAL Chairman on the current programmes that include the LCA Tejas, Light Combat Helicopter, variants of Dhruv ALH, the new turboprop trainer HTT–40 etc.

Rear Admiral R. Dhankhar takes command of Eastern Fleet

Rear Admiral Rajesh Dhankhar, took over command of the Eastern Fleet, the Sword Arm of the Eastern Naval Command, from Rear Admiral Gurcharan Singh, on 10 November 2023. RAdm Rajesh Dhankhar was commissioned into the Indian Navy on 1 July 1990 and is a specialist in Navigation and Direction. The Flag Officer is an alumnus of the prestigious Naval Academy, Defence Services Staff College, and has done his Higher Command Course in Japan. During his illustrious career spanning 33 years, the Flag Officer has tenanted specialist appointments onboard warships Pondicherry, Godavari, Kora and Mysore.

First C–295 formally inducted into the IAF

The formal induction of the first C–295 MW transport aircraft into the IAF took place on 25 September 2023 at Hindan Airbase. The ceremony consisted of a 'Sarv Dharm Puja' and a brief on the capabilities of the aircraft. This medium lift tactical aircraft, which is capable of taking off and landing from unprepared landing grounds, will replace the HS–748 Avro aircraft.

Through a post on X (formerly Twitter), the Raksha Mantri exuded confidence that the induction of C–295 will bolster medium lift tactical capability of the IAF. He termed the defence and aerospace sectors as the two important pillars for making India self–reliant in the coming years.

As mentioned over the past issues, the first 16 of the 56 contracted aircraft will be delivered to the IAF in a 'fly–away' condition, the remaining 40 would be manufactured in India by Tata Advanced Systems Limited at their facility in Vadodara. The first IAF squadron to be equipped with the aircraft, 11 Squadron (The Rhinos), is also based at Vadodara.

India's Defence Minister Mr. Rajnath Singh stated, "This medium lift tactical aircraft is capable of taking off and landing from unprepared landing grounds and it will replace the HS–748 Avro aircraft. The induction of C–295 will bolster medium lift tactical capability of the IAF. The Defence and Aerospace sectors are the two important pillars for making India self–reliant in coming years".

During the event, the Raksha Mantri and the dignitaries were also briefed on the latest in–house innovations of the IAF at an exhibition which featured projects such as a Hybrid Drone Detection System, AI Engine for fault diagnosis, a Fly–By–Wire Tester, Stabilised Power Supply Trolleys, QR Code based Tool Crib management system and also modern teaching aids.

Photos: Samarth Mahajan
(Instagram @indian.spotter05)

C295 for India—Third time's the charm?

Despite a long history of licence–building transport aircraft, India has failed to leverage its buying power. The induction and production of the C295 might finally buck that trend.

No less storied than the hundreds of fighters produced by Indians hands–on Indian soil since the 1940s, are the humble transports. The Indian Air Force's Aircraft Manufacturing Depot (AMD) at Kanpur began producing the Avro 748 turboprop as a replacement for the WWII era Dakota in 1961. In 1964, AMD was transferred to a newly reorganised PSU formed by the merger of Aeronautics India and Hindustan Aircraft, forming Hindustan Aeronautics Limited (HAL). HAL would continue production, eventually building nearly 90 of the type for the IAF as well as Indian Airlines.

By the 1980s, the Indian government was shopping around for a short–haul airliner to enable regional connectivity, and the IAF was looking to replace its Devons and Otters in the passenger/utility role. The Dornier 228 was selected for this combined requirement, and the programme expanded to include the Coast Guard and Navy. The first German built Do 228 was delivered in 1984, and the first HAL built example was handed over to government owned Vayudoot in 1986. The contract, like the Avro before it, ensured that the Dornier 228 would be a near completely indigenous aircraft. Crucially, however, unlike the Avro agreement, HAL had nearly unrestricted marketing and export rights for the Do 228. Unfortunately, no arm of the government ever took advantage of this flexibility, and even though HAL produced over 150 of the type in different variants, only a small handful were ever operated outside India.

Finally, in September 2021, the Indian government signed a contract with Airbus for 56 C295MW (MW for the winglet equipped military transport variant) transport aircraft, under the so–called 'Avro replacement programme'. The first of these formally entered service with the IAF on 25 September 2023, and after Airbus delivers the next 15 from Spain, 40 more will be produced in partnership with Tata at a facility in Vadodara, Gujarat.

That it has taken over 60 years to begin replacing an aircraft design dating back to the 1950s is now entirely par for the course and does not merit further examination or excoriation. However, the C295 procurement offers other opportunities to learn from the Avro and Dornier programmes.

First, the Dornier programme did address one major shortcoming of the Avro, and this should be repeated with the C295—adapting it for more roles. While the Avro was

essentially an airliner, some attempts were made to modify it for military transport, with an enlarged door to allow the loading of cargo, including vehicles, as well as para–dropping troops and materiel. However, the design of the aircraft was inherently unsuitable for these tasks, and it is typically used for passenger transport and light cargo to this day. A single aircraft was modified for airborne radar development, but a fatal crash in 1999 ended the project. The Dornier, on the other hand, benefited from starting life as a civilian aircraft that was always intended to be modified for military customers. India was an enthusiastic adopter of the maritime variant, with various specialised configurations being used extensively by the Indian Navy

and Coast Guard.

The C295 offers similar flexibility off the shelf, with enhanced payload, range, and endurance though admittedly these do come at a premium compared to the venerable Do 228. However, with a C295 assembly line and substantial detail manufacturing planned in the country, it would make sense to leverage this capacity and standardise this platform for as many roles as possible. Replacing at least a portion of the Navy and Coast Guard's Dornier fleet would be a start, but it is also important for the Services to begin considering other special missions that have hitherto been under–served or relied on a menagerie of different aircraft types. The obvious low hanging fruit beyond the maritime domain include overland surveillance (communications and electronic intelligence), dedicated search and rescue, and electronic warfare.

With some of these modifications (principally maritime but also applicable to surveillance and jamming) already certified by the OEM, the focus should be on ruthless cost optimisation across variants by prioritising either commercial grade or military grade off the shelf (COTS/MOTS) mission hardware to start with. This will allow for the services' paltry modernisation funds to afford these C295 variants. Phased indigenisation of imported mission equipment, if needed, would allow for greater sovereign control and exportability down the line. All this development, integration, testing, and production by Indians in India will also begin creating parallel capabilities and capacities in the private sector. With these hitherto concentrated only within the public sector, an expanded set of roles for the C295 in India will also stress test the private sector (or at least Tata) as a viable second option to the PSUs.

This finally brings us to where the rubber meets the road (or runway, in this case). The biggest letdown of Indian aerospace in the past 70 odd years has been its inability to move beyond its captive customer. Defence PSUs produce almost exclusively for the Defence Ministry, which owns them—not just an unholy exercise in self–gratification, but also a self–defeating enterprise that relies solely on stunted capital spending from a defence budget overburdened by revenue expenses. Defence exports, though markedly improved in recent years, are still far

short of the government's own targets. The Dornier case is instructive, where competitor aircraft have sold globally in the hundreds, if not thousands, while HAL built Do 228s have struggled to find a market outside a tiny handful of exports to regional militaries.

The C295 already has the advantage of widespread acceptance around the world and the credibility of a global aerospace OEM, Airbus, behind it. A wider range of variants with the backing of the Indian Armed Forces will only enhance the platform's appeal. Strong domestic adoption of the aircraft will underpin its export potential, but the Ministry of External Affairs and its missions around the world will also need to take up marketing and promotion activities much more robustly than they ever have to date. The multi–national nature of the programme will mean working with geopolitical partners to ensure the Indian assembly lines are humming at capacity for decades. If the C295 is to succeed, for the OEM, for the Indian production partner, and for India's aerospace ambitions, the government must throw more weight behind it, both at home and abroad.

Article and photos by Angad Singh
(Twitter @zone5aviation)

The author is an independent defence analyst with over a decade of experience writing on national security. This article first appeared in www.orfonline.org on 27 September 2023.

News from HAL

1st of 6 new HAL Do–228s for IAF

The IAF has inducted the 1st of 6 new Dornier Do–228 aircraft manufactured by Hindustan Aeronautics Ltd. This new version is equipped with new engines, composite propellers, upgraded avionics and a glass cockpit.

Safran and HAL in MoU for LEAP engines parts

Hindustan Aeronautics Limited (HAL) and Safran Aircraft Engines, the French global leader in aero engine design, development and manufacturing, signed an MoU (Memorandum of Understanding) announcing their intent to develop industrial cooperation in forging parts' manufacturing for commercial engines.

Under the terms of the MoU, HAL will produce LEAP engine parts for Safran Aircraft Engines in its facilities in Bangalore, supporting Government of India's "Make in India" policy as well as the LEAP programme unprecedented ramp–up. Safran Aircraft Engines' long–term ambition is to develop a comprehensive aero engines ecosystem in India. Safran already hosts three production facilities in the country (between Hyderabad and Bangalore), which will be completed by a fourth site at Hyderabad dedicated to the LEAP MRO activities by 2025. The Helicopter Engine MRO (HE–MRO) facility being developed in Goa jointly with HAL will be the fifth Safran facility in India, to be operational by 2025.

LCH tests progress

The inaugural firing of 70mm rocket and 20mm turret guns of Light Combat Helicopter LCH Prachand, was successfully executed, both by day and night on 30 October 2023. Lt Gen AK Suri, DG Army Aviation witnessed the firing from the leading helicopter of the three attack helicopter formation for real time validation of the armament capability of an LCH Squadron. Having revalidated the firing of its 20 mm caliber gun and 70 mm rockets, the IAF Light Combat Helicopter Prachand recently carried out operations from a helipad located at an elevation of nearly 10,000 ft in forward areas.

HAL hands over LCA Tejas twin seater to IAF

HAL handed over the first LCA Tejas twin seater to the Indian Air Force in the presence of Rakha Rajya Mantri, Mr. Ajay Bhatt at a ceremony in Bangalore on 4 October 2023. It is a huge boost to self–reliance, said the minister in his address to the packed audience. "I am proud to be part of this historic occasion and salute the spirit of HAL which has been spearheading Swadeshi manufacturing in defence", he said. He unveiled the twin seater LCA. "In all, the development of LCA Tejas has also brought about a shift in our approach to defence procurement. It has demonstrated that India has the talent, knowledge and capability to design, develop and manufacture world–class fighters", he added.

Speaking on the occasion, Chief of Air Staff Air Chief Marshal VR Chaudhari said that the IAF would be going forward to procure 97 more LCAs and with this it would have 220 LCAs in its inventory.

Mr. C B Ananthakrishnan, CMD (Addl. Charge), HAL said that the company was committed to deliver all the twin seater aircraft pertaining to IOC and FOC contract to IAF in the current financial year. With this, we are moving one step closer towards achieving self–sufficiency on the fixed wing segment. These trainers also ensure smooth transition for the pilots from trainer to fighter aircraft in this class", he added.

The event was graced by Chief of Air Staff Air Chief Marshal VR Chaudhari, Mr C B Ananthakrishnan, HAL CMD (Addl. Charge), Mr Girish S Deodhare, Director General, ADA, Mr APVS Prasad, CE(A), CEMILAC, officials from IAF, MoD, DGAQA, DRDO, HAL and production partners. The Release to Service Document (RSD) and the Signalling out Certificate (SOC) were also handed over during the event.

The LCA Tejas Twin Seater is a light weight, all weather multi–role 4.5 generation aircraft. It is designed to support the training requirements of the IAF and augment itself to the role of a fighter in case of necessity. It is an amalgamation of contemporary concepts and technologies such as relaxed static–stability, quadraplex fly–by–wire flight control, carefree manoeuvring, advanced glass cockpit, integrated digital avionics systems and advanced composite materials for the airframe. The production of the LCA twin seater variant adds India to the list of very few countries who have created such a capability and have them operational in their Defence Forces, another feather in the cap of "Aatmanirbhar Bharat" initiative of Govt of India.

Test flight success of ISRO's Abort Mission–1 (TV–D1)




Test flight success of Abort Mission–1 (TV–D1) on 21 October 2023 morning heralds successive sequential trial flights before the final "Gaganyaan" launch, said Union Minister of State (Independent Charge) Science & Technology, Dr Jitendra Singh in his first response soon after the entire exercise was accomplished as expected, with a single engine rocket carrying an early depressurised version of "Gaganyaan" Crew Module (CM) to an altitude of around 17 kilometre followed by final descent using a parachute for its splash down.

The Minister of State for Space stated, "this is a critical step in the ISRO journey to launch a crewed human spacecraft through "Gaganyaan" mission. Today's exercise tested the performance of the Crew Escape System on the Crew Module of the Gaganyaan mission. Basically, it tested the safety mechanism that will allow the crew of the "Gaganyaan" mission to escape the spacecraft in case the mission is aborted due to a malfunction. Coming less than two months after the successful Moon landing by Chandrayaan–3, today's event has paved the way for a series of tests of systems and procedures with the aim to ultimately launch an Indian astronaut in space, possibly around the year 2025".

Dr Jitendra Singh said, this test flight would set the stage for the remaining qualification tests and unmanned missions, leading to the first Gaganyaan mission with Indian astronauts. The Minister further said, "human safety is of paramount importance in the "Gaganyaan" mission. Crew Module (CM) is the habitable space with Earth like environment in space for the crew, while Service Module (SM) will be used for providing necessary support to CM while in orbit".


Indian Navy units recovered the crew module; path paved by extensive planning, training of naval divers, formulation of SOPs and joint communication by combined teams of Indian Navy and ISRO.

MDL delivers 3rd destroyer of Project 15B to Indian Navy

(Images for representational purposes only)

On 20 October 2023, Mazagon Dock Shipbuilders Limited (MDL) delivered the third stealth destroyer of Project 15B Class Guided Missile Destroyer i.e. Yard 12706 (Imphal) to the Indian Navy. The Acceptance Document was signed by Sanjeev Singhal, Chairman and Managing Director, MDL and RAdm Sanjay Sadhu, CSO (Tech) at MDL in the presence of Commanding Officer (Designate) Capt KK Choudhury, MDL Directors, WOT(MB) and Navy personnel.

The ship is constructed using indigenous steel DMR 249A and is amongst the largest destroyers constructed in India, with an overall length of 164 meters and a displacement of over 7500 tons. The ship is a potent platform capable of undertaking a variety of tasks and missions, spanning the full spectrum of maritime warfare. It is armed with supersonic surface to surface Brahmos missiles and Barak–8 Medium Range Surface to Air Missiles (MRSAM). Towards undersea warfare capability the destroyer is fitted with indigenously developed anti–submarine weapons and sensors, prominently the hull mounted sonar Humsa NG, heavy weight torpedo tube launchers and ASW rocket launchers.

Significantly more versatile than the previous classes of destroyer and frigates in Naval inventory, the Imphal's all–round capability against enemy submarines, surface warships, anti–ship missiles and fighter aircraft will enable it to operate independently without supporting vessels, and also to function as the flagship of a Naval task force.

Imphal has been delivered to the Indian Navy more than four months ahead of the contractual time as the most combat worthy platform to date. This reaffirms MDL's commitment towards continuous improvement and mostly/exceeding global benchmarks. This ship has completed all sea trials in 3 CSTs (Contractor's Sea Trials) including firing of major critical weapons in the very first CST. The ship is the first amongst all P15B ships which is to be fitted with upgraded Brahmos missiles having dual role capability of Long Range and Land attack. Further, Imphal is the first naval warship being commissioned with accommodation of women officers and sailors.

The ship can accommodate a crew of 312 persons, has an endurance of 4000 nautical miles and can carry out a typical 42 days mission with extended mission time in out of area operation. The ship is equipped with two helicopters onboard to further extend its reach. The ship is propelled by a powerful Combined Gas and Gas Propulsion Plant (COGAG), consisting of four reversible Gas Turbines, which enables her to achieve a speed of over 30 knots (approx 55 kmph). The Ship boasts of a very high level of automation with sophisticated digital networks such as Gigabyte Ethernet based Ship Data Network (GESDN), Combat Management System (CMS), Automatic Power Management System (APMS) and Integrated Platform Management System (IPMS).

The indigenous content in P15B Class Destroyers is 72% which is a notch above their predecessors P15A (59%) and P15 (42%) Class Destroyers, reaffirming the Government's focus in 'Atmanirbhar Bharat' Programme along with large eco system development of sub vendors.

The first Ship of P15B (Visakhapatnam) was commissioned on 21 November 2021.

The second ship (Mormugao) was commissioned on 18 December 2022. The third ship (Imphal) has been delivered to Indian Navy on 20 October 2023. The fourth ship (Surat) was launched on 17 May 2022 and is at an advance stage of outfitting.

MDL officials stated: We have always been at the forefront of the nation's progressive indigenous warship and submarine building programme. With the construction of the Leander and Godavari class Frigates, Khukri class Corvettes, missile boats, Delhi and Kolkata class destroyers, Shivalik class stealth frigates, Visakhapatanam class destroyers, Nilgiri class frigates, the SSK submarines and five in number Scorpene submarine under its belt, the history of modern day MDL almost maps the history of indigenous warship and submarine building in India there by deservedly earning the soubriquet 'Warship and Submarine Builders to the Nation'.

Indian Navy bids farewell to Il–38SD LRMPA



Above photos: Indian Navy

The Indian Navy's Ilyushin–38 Sea Dragon Long Range Maritime Patrol aircraft bid farewell after 46 years of service to the nation. The decommissioning ceremony was held on 31 Oct 23 at INS Hansa, Dabolim. The Chief of the Naval Staff, dignitaries, and veteran officers and sailors of the Il–38 squadron graced the event with families, reminiscing about the yeoman service.

INAS 315 was commissioned on 1 October 1977 with the induction of Il–38 aircraft heralding a modern era of airborne Long Range Maritime Reconnaissance and Anti–Submarine Warfare in the Navy. With its unique capabilities, striking prowess and extended reach covering the vast Indian Ocean region, the Il–38SD has over the years proven itself to be a formidable force multiplier.

The mighty 'Winged Stallion" that adorns the squadron crest has been living up to the squadron motto of 'Victory is my Profession', keeping a sharp vigil over and beneath the seas, in its relentless pursuit to secure nation's maritime boundaries.

The dedicated men and women manning and maintaining these mighty aircraft ensured persistent mission readiness and efficient exploitation of the aircraft and mission systems. In her last legs, the aircraft enabled 'Aatmanirbhar' capability enhancement by successfully integrating indigenous Sahayak Air Droppable Containers (which provide critical logistics support to units deployed at sea) and a trial platform for torpedoes. The aircraft was also featured in the 2023 Republic Day Flypast at New Delhi.

Speaking on the occasion Adm R Hari Kumar CNS conveyed his felicitations "to 'Team 315', the present and the past; to your predecessors, guides and mentors and not to forget, to those who are not amongst us today".

Appreciating the strength, focus, energy and the hardwork of the crew which overcame the numerous constraints, so that the stallions could dominate the skies the CNS stated, "And yet, you prevailed; the aircraft performed; the squadron peaked; and the Navy pivoted to an era of normalising sustained LRMR operations across our primary areas of interest".

The de–induction ceremony of Il–38SD marked the end of a glorious era that heralded path breaking capabilities in maritime reconnaissance and anti–submarine warfare operations.

The operational role of Il–38SD in a constantly evolving and dynamic IOR as 'Eyes in the Sky' and its contribution during various mission critical deployments would remain forever etched in the history of Indian Naval Aviation.

While flying will come to an end, two of these aircraft will remain stationed permanently at the National Maritime Heritage Museum, Lothal, Gujarat and at Nipani in Karnataka, inspiring the future generations.

Text: Indian Navy

Above photos taken by Vayu Aerospace and Defence Review in 2018

Piotr Butowski recalls the "First flight, last flight" of the Il–38SD

In the summer of 2003, I happened to be in Moscow when a friend called me and told me that I absolutely must appear at the Khodynka airfield, nearly in the centre of the city, on 3 July.

The Khodynka airfield was established in 1910; it was a test airfield for the Soviet Air Force (1920–32), a government airfield and then an airfield for the Ilyushin design bureau and the Znamya Trucla production plant, manufacturing, among others, the Il–38s.

All Ilyushin aircraft, starting from the first TsKB–26 of June 1935, made their maiden flights from Khodynka. At the beginning of the new millennium, the airfield was already inactive; an elite housing estate was being built and on the abandoned runway, hot–headed youngsters were organising car and motorbike races.

An upgraded Indian Il–38SD takes off for its maiden flight from Khodynka airfield in Moscow on 3 July 2003. The ESM superstructure was removed for the first flight. (Photos by Piotr Butowski)

The man himself! Piotr Butowski at Aero India Yelahanka in February 2019

On 3 July 2003, Khodynka returned to aviation life for a few hours. The first upgraded Indian Il–38SD, IN305, was rolled out of Ilyushin's hangar and then the preparations lasted for about an hour.

The aircraft took off with the minimum fuel load and without the dorsal box of ESM to shorten the take–off roll. Passing round Moscow, the aircraft flew to Zhukovsky, where it was finally equipped.

The Il–38SD crew in this flight comprised the aircraft commander Vladimir Irinarkhov, co–pilot Nikolai Kuimov, navigator Valeri Grechko, flight engineer Alexei Zhuravlov, communication operator Sergei Orlov and electrician Vladimir Lipkin.

After this flight, the Khodynka airfield was ultimately closed. As such, I became one of few witnesses of the maiden flight of the Il–38D aircraft and the last flight from the famous Khodynka airfield.

Boeing outlines Aatmanirbhar Bharat future for P–8I

L to R: Salil Gupte, President, Boeing India; Scott Carpendale, Vice President Asia–Pacific, Boeing Global Services – Government Services; Dan Gillian, Vice President and General Manager, Mobility, Surveillance and Bombers, Boeing Defense, Space & Security; Ashwani Bhargava, Senior Director, supply chain, Boeing India; Shekhar Sardessai, Managing Director, Kineco Group; H G Chandrashekar, Founder & Managing Director, Sasmos HET Technologies and Kunal Bajaj, President, aerospace & defence division, CIM Motherson.

Boeing on 21 September 2023 at New Delhi, highlighted the substantial indigenisation achieved in the manufacturing and sustainment of its P–8I maritime surveillance aircraft and briefed media on the outlook for the platform, suggesting an increase in investment and economic impact as part of its Aatmanirbhar Bharat strategy. Twelve P–8Is already serve the Indian Navy's reconnaissance and surveillance needs in the Indo–Pacific region.

Boeing has already generated a substantial economic impact, amounting to $1.7 billion to support the current P–8I aircraft fleet in service with the Indian Navy. Furthermore, Boeing envisions that increasing the P–8I fleet to 18 aircraft will increase investments, approximately $1.5 billion, while creating further indigenisation opportunities within India's aerospace and defence sector by 2032.

"Boeing's commitment to advancing the Aatmanirbhar Bharat vision drives our dedication to the P–8I fleet. As we respond to the Indian Navy's need for more P–8I aircraft, we're actively looking to enhance engineering, manufacturing, and sustainment capabilities in India, for India, and the world, benefiting both Indian and global customers," stated Salil Gupte, President of Boeing India.

Since its induction in 2013, the P–8I aircraft, based on the 737 Next Generation platform, has become an integral part of the Indian Navy's fleet and has surpassed 40,000 flight hours with high mission readiness rates. Boeing played a pivotal role in establishing the Ashok Roy Training Simulator Complex at INS Rajali, and the Kochi training complex, inaugurated in April this year, features a state of the art simulator for P–8I aircrew and technical team training. This ground based training reduces on–aircraft training time, boosting mission proficiency and aircraft availability for the Indian Navy.

"We're proud to partner with the Indian Navy on the exceptional capability that the P–8 delivers as a proven multi–mission aircraft while enhancing the interoperability and maritime security requirements for India and the Indo–Pacific," stated Dan Gillian, Vice President and General Manager, Mobility, Surveillance and Bombers, Boeing Defense, Space & Security. "Boeing is also committed to expanding its P–8 supplier network in India, which presently includes 15 public and private Micro, Small & Medium Enterprises that are part of Boeing's global supply chain and are delivering critical parts, components, and services for the P–8."

The globally proven P–8 fleet, over 160 aircraft in service that have accumulated more than 500,000 mishap–free flight hours around the globe, includes allies such as the United States, the United Kingdom, Australia, New Zealand, Norway, South Korea and Germany.

Make in India for P–8

In–service P–8I incorporate a high degree of complex and mission critical components that are made in India by over fifteen private and public supplier partners including MSMEs that are located across the nation. Over the years, the quality of the work has won P–8I suppliers Boeing's Global Supplier of the Year award and several India–made

items are exported for use in production of the P–8. In addition, as the P–8 is a derivative platform of the Boeing 737, common parts made by Indian suppliers are exported for use in production of new variants of the 737 like the 737–MAX – truly Make in India for the World.

P–8 Family: High degree of indigenisation and Make in India

Boeing has promoted indigenisation by working with Indian manufactures to supply parts for the P–8I in India as well as common parts that are used by both the P–8 and the 737 family: Radar Fingerprinting System, IFF (I/T) and Datalink by BEL; Speech Secrecy System by ECIL, Mobile Satcom System by Avantel; P–8I Cabinets made by Dynamatic Technologies; Mission Crew Workstation Console by Kineco Kaman; Wire Harnesses by FESIL/ Rossell; Stub beams by Wipro and Interior panels, Tail Cones, Main Landing Gear Doors, Front Access Doors, Weapon Bay Doors and APU door frames by Tata.

Boeing continues to expand its manufacturing presence in India. In 2021, our Joint Venture, Tata Boeing Aerospace Limited (TBAL) in Hyderabad, inaugurated a new production line dedicated to manufacturing 737 vertical fins for both the Indian and global markets. This intricate structure is crafted using cutting edge manufacturing techniques, and TBAL initiated delivery of these components in early 2023. Additionally, Mahindra Aerostructure began delivering 737 Inlet Outer Barrel parts to Boeing starting in March 2023.

P–8I indigenous fleet sustainment and support

Boeing India Defence Pvt Ltd (BIDPL) leads the sustainment support of Indian Navy's P8I fleet by providing training to Indian Navy flight crews, spare parts, ground support equipment and field–service representative support. Boeing's integrated logistics support has enabled a high state of fleet readiness at the lowest possible cost.

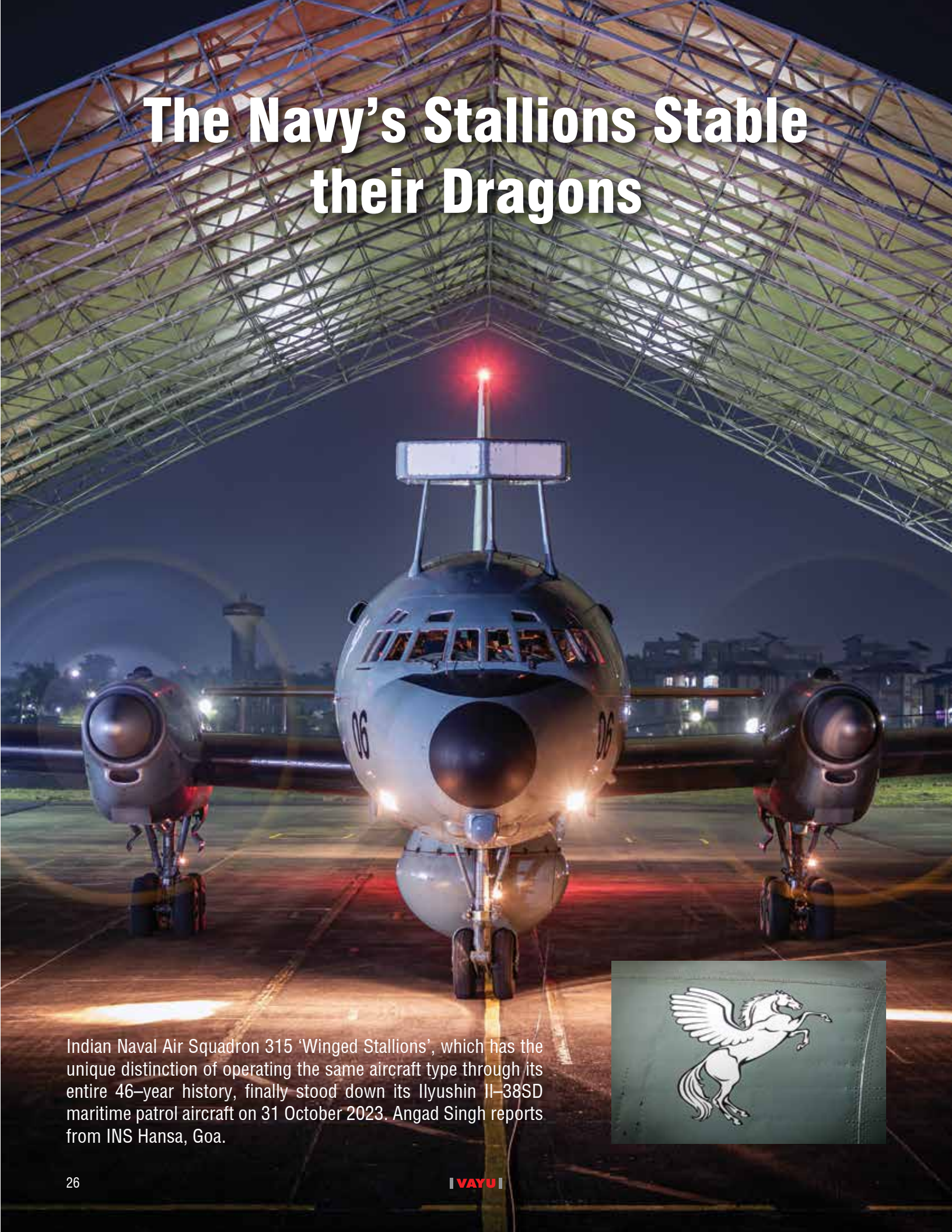
Boeing India Repair Development and Sustainment (BIRDS) Maintenance Repair and Overhaul (MRO) hub: BIDPL is leveraging the Boeing India Repair Development and Sustainment (BIRDS) Maintenance Repair and Overhaul (MRO) hub to grow indigenous capabilities in India in the areas of heavy maintenance and component repairs. P–8I represents the foremost example of BIRDS success with local capabilities being established and several planned in the future.

- P–8I Phase 32 checks: Phase 32 are extensive heavy checks on P–8I akin to overhaul of aircraft. Boeing has partnered with Air Works India to carry out this important activity in India. This partnership has been a success story of P–8I fleet sustainment in India. Phase 32 checks for 8 out of the 12 aircraft have been successfully completed till date accomplishing the Phase 32 maintenance cycle of the first 8 aircraft delivered under the main contract.
- Wheels and Brakes: Maintenance and repair of P–8I wheels and brakes are now conducted in India through Horizon Aerospace in Gurgaon, significantly reducing repair turnaround time and ensuring efficient inventory management.
- Aircrew Headsets: Boeing has partnered with Air Deccan to repair headsets, manufactured in the USA, improving inventory management efficiency.
- Logistics: Last mile import/export, supply chain, transportation and logistics for supporting the P–8I fleet is provided by our partners Expeditors and RE Rogers.
- Facilities at INS Rajali: Several indigenous capabilities have been established to date at INS Rajali through the P–8I sustainment contracts. These capabilities have improved P–8I squadron and base support in areas of trouble shooting and on–site repair of components.
- Boeing India Engineering and Technology Centre (BIETC): BIETC supports the P–8I programme through Sustainment/MRO planning tools, development of training systems (e.g. with a completely indigenous design for the Ordnance Training Device), Technical Supplier Management, and engineering of wire harnesses.
- P–8I Sustainment Warehouse at INS Rajali: The new P–8I Sustainment warehouse was inaugurated in June 2023 at INS Rajali. The warehouse has been planned from long term sustainment support perspective. Boeing is acquiring a new state of the art shelving system from Indian vendor.
- P–8I Training Support and Data Handling (TSDH) Centre: Boeing has also completed the construction of the Training Support & Data Handling (TSDH) Centre at INS Rajali and a secondary centre at the Naval Institute of Aeronautical Technology, Kochi, as part of a training and support package contract signed in 2019. The training facility was inaugurated and named the Ashok Roy Training Simulator Complex in April earlier this year.

Article courtesy: Boeing

At the press conference, New Delhi.

The Navy's Stallions Stable their Dragons



Indian Naval Air Squadron 315 'Winged Stallions', which has the unique distinction of operating the same aircraft type through its entire 46–year history, finally stood down its Ilyushin Il–38SD maritime patrol aircraft on 31 October 2023. Angad Singh reports from INS Hansa, Goa.

To appreciate the sentiment at the INAS 315 ramp on a muggy October evening as the sun literally sets over IN307, the last Indian Navy Il–38SD, you must understand the sheer amount of time the men and women of the unit have spent with their aircraft. Once posted to the Navy's sole Il–38 squadron, the aircraft becomes their entire life. For instance, the CO, Cdr Mrinmoy Ghosh, has spent an incredible 16 years of his two decades in uniform at INAS 315. Most others, especially senior staff, have similar stories. With thousands of hours of patrolling to the squadron's credit, its personnel have a unique bond with the charismatic Soviet–era aircraft.

And once you've come to grips with this relationship between man and machine, you then apply it to a half century of Indian naval aviation history. As much as the Il–38 means to the squadron, it is also emblematic of the doggedness that got the Indian Navy its air arm and brought it into the business of long–range maritime recon in the first place.

The Story Thus Far

Although Indian Naval Aviation was born in 1953, shore based long range maritime patrol task remained an Indian Air Force (IAF) task, with No. 6 Squadron at Poona operating overhauled B–24 Liberators in the maritime role since 1951, before replacing these with ex–Air India Lockheed L–1049 Super Constellations fitted with British ASV–21 radar from the early 1960s onward. Regardless of the efficacy of these obsolescent aircraft, the Navy always assessed the IAF's interest in maritime operations as marginal, and had lobbied from 1953 itself to take over the job.

While Admirals and Air Marshals argued their cases endlessly, the Government was only galvanised into action after the December 1971 conflict with Pakistan, when the IN lost a frigate to enemy submarine action in the Arabian Sea, attributed at least in part to gaps in maritime surveillance. By 1975, after weighing both the IN and IAF's arguments, the government decided in favour of the Navy and directed that maritime patrol assets be transferred from the Air Force.

However, the Super Constellations were obviously inadequate and the Navy had already evaluated a number of MR/ASW aircraft options, including the Hawker Siddeley Nimrod, Breguet Atlantique, Ilyushin Il–38 and even the Avro Shackleton, before finally deciding on the Il–38 for speed of availability and economic considerations. Although the Air Force made strenuous attempts to reverse the Government's decision, the Navy was cleared to receive and operate the country's first dedicated MR/ASW aircraft.

And so it came to be that in May 1976, selected IN personnel started Russian language courses and preliminary training at INS Hansa, and left for Moscow in September that year. The training in the Soviet Union (at Riga) was very intensive and although the pilots had had only single–engine (Alizé) experience, they were cleared for command of the large four engine aircraft within five hours of dual instruction. Other IN personnel received training on maintenance, sensors and armament. On completion of all aspects of training, a handover ceremony took place on 24 August 1977 and the first three Il–38s (ex–

Soviet Navy) were ferried to India, to arrive at Dabolim on 2 September 1977. The formal commissioning of INAS 315 'Winged Stallions' took place on 1 October 1977 at Goa, by Rear Admiral MK 'Micky' Roy, Flag Officer Commanding Eastern Fleet, himself a Naval Aviator and first CO of the Navy's senior recce squadron, INAS 310 'Cobras'. After a parade led by the Stallions CO, Cdr BK Malik, the unit crest was unveiled and the Squadron thus named. Two more aircraft joined the squadron in subsequent years, making up the unit's establishment of five aircraft by 1983.

The Il–38's search radar, magnetic anomaly detector (MAD), torpedoes and depth charges gave the Indian military their first means to reliably detect, track and prosecute subsurface targets from the air. Powered by four Ivchenko AI–20M turboprops putting out over 4,225 hp, the aircraft had an endurance of over 12 hours, although typical time on task was around four hours for mission durations that were usually in the 8 hour range. The standard crew complement (typically Russian in approach) was pilot, co–pilot, flight engineer, first navigator, flight signaller and two to three sensor operators. Besides their designated Long Range Maritime Recon/Anti–Submarine Warfare (LRMR/ASW) role, the Il–38s cooperated with the IAF in directing anti–ship strikes, initially by Canberras and then supplemented by maritime strike Jaguars. Naval tasks included over the horizon targeting, anti–submarine cooperation operations, surface and sub–surface search and shadow missions and independent ASV strikes. For search and rescue contingencies, INAS 315 provided round the clock SAR cover at four hours' notice, and their aircraft could carry the indigenous air dropped dinghy Rakshak for rescuing as many as 85 survivors at sea, up to 1,000 nautical miles from base.

Early in its history INAS 315 played a vital role in locating the wreckage of Air India flight 855, a 747–200B that crashed into the Arabian Sea off Bombay in January 1978. The squadron went on to conduct search and shadow missions during Operation Pawan, the Indian military intervention in Sri Lanka in the 1980s, while also being credited with detecting the hijacked ship MV Progress Light during Op Cactus off the Maldives in 1988. IN Il–38s also flew extensively toward Operation Swan to secure seaward approaches to India's coastline in the 1990s. In their first 25 years of operation, the Il–38s logged over 30,000 operational flying hours.

Starting in April 1990, under project Yaduvansh (named for the first Indian naval aviator, who started out as a WWII Hellcat pilot with the Royal Navy), the Navy and state–owned aircraft manufacturer Hindustan Aeronautics integrated the BAe Sea Eagle anti–ship missile with the Il–38. The squadron carried out live firings in May 1994, reaffirming the Il–38's position as one of the most potent aircraft of the Indian Navy.

However, after over two decades of operation, it was obvious that the Il–38s needed to be refurbished and upgraded. The Il–38s were to be brought up to the Sea Dragon standard, the suite comprising six principal upgrades — a new generation SAR/ISAR radar to replace the legacy Berkut unit, a new sonobuoy system, a chin–mounted day–night electro–optical turret, an upgraded Magnetic Anomaly Detector (MAD), a highly capable ESM fit, and a new central computing system to tie all these together. An inter–governmental contract was inked in 2001, and the first aircraft (IN305) reached Russia in March the following year. The first flight post upgrade was in July 2003, and IN305 was thereafter intensively flown on trials from the Barents Sea in Northern Russia to the Black Sea in the south. Extensive work was carried out at Khodynka on the aircraft's sensor and radar installations followed by flight testing at Zhukovsky. The upgrade also included a comprehensive overhaul and airframe service life extension. The Il–38SD would typically employ Kh–35 anti–ship missiles, AT–1ME torpedos, and PLAB series depth charges as offensive weapons. The aircraft was thus made capable of multiple roles — long–range maritime recon (LRMR), ASW, Anti–Surface Warfare (ASuW) and electronic/signals intelligence (ELINT/SIGINT).

Under command of Cdr Aruna Ranganathan, CO INAS 315, IN305 returned to Goa from Moscow on 15 January 2006, being received by Rear Admiral SK Sinha, Flag Officer Naval Aviation and Captain Devender Sudan, CO INS Hansa. The second Il–38SD (IN303) was to follow shortly. In addition to upgrading the three surviving original Indian Navy Il–38s, a further two ex–Russian Navy aircraft upgraded to Il–38SD standards were acquired as replacement for two aircraft lost in 2002.

The Base Leg

"A candle burns brightest before it is extinguished," says Cdr Ghosh, as he explains that the Stallions and their aircraft have been at their most potent in the last few years before sunsetting the Il–38. The Sea Dragon upgrade brought a significant jump in capability from the baseline — particularly the ESM fit, which is universally praised, along with the Kh–35 anti–ship missile in lieu of the obsolete Sea Eagle. The weapon has been periodically validated, with good results in SINKEXes and fleet exercises.

But what the CO is most keen to stress is the innovation brought to bear on the platform since the Russian upgrade. Starting in 2015, INAS 315 has been the sole unit capable of air logistics at sea – initially pioneering the Sahayak (Helper) canister with a 50 kg payload, before moving on to the 150 kg ADC–150 pod in early 2023. The squadron has made a surprising number of supply drops in the period, the most recent being an ADC–150 delivering parts for an embarked helicopter. The aircraft has also been the basis for several indigenous networking upgrades, addressing

connectivity with shore stations, ships and other aircraft with the Trigun datalink, Link–II, and more recently even UHF–SATCOM. In 2019, the squadron added COMINT to their repertoire, with the domestically developed Sarvadhari airborne suite. The Il–38 has also received new weaponry, being chosen as the lead platform to test and validate the indigenous lightweight anti–submarine torpedo Shyena, also called TAL (Torpedo, Advanced, Light), in 2021.

The most consequential modification, however, was the replacement of the Russian search radar with the IAI Elta unit used by the Navy's Dornier 228s. First trialled in 2015, the new sensor worked so well that the Navy immediately contracted for two more aircraft to be modified in 2017. Although certainly a belated improvement, with only five–odd years of projected utilisation, the squadron personnel are unanimous in their approval of the Israeli radar and insist it has more than paid for itself in the short time it has been in use. In fact, so impressive is the performance that the P–8 squadrons are said to be envious — high praise indeed, coming from the operators of the Navy's latest and most advanced patrol aircraft.

Nevertheless, even good times must end, and as the Navy's oldest aircraft in continuous service, the writing has been on the wall for the Il–38s since 2013, when the first Boeing P–8Is began operations in India. Initially the P–8Is replaced the ageing and maintenance intensive Tupolev Tu–142MK–Es of INAS 312, which were finally withdrawn from service in early 2017. This bought the Il–38s some breathing space, especially since the P–8I was so much more capable than the Tu–142 and thus able to take on more tasks than its predecessor.

Maintenance, especially at this late stage in their service, is exacting, demanding elaborate repairs and checks to clear aircraft for flight. Eventually, time became the deciding factor, and even though the P–8Is of INAS 316 'Condors' were yet to begin deliveries, the Navy elected to begin withdrawing the Il–38s as they finished their airframe hours. IN305, the first upgraded aircraft,

was the first to go in December 2018. She was followed by IN303, which was withdrawn in October 2020. IN301, the oldest Il–38 with over 44 years of service in Naval colours, was next to go in January 2022, leaving the unit with two aircraft — the youngest airframes — on the rolls by mid–2023.

Final Approach

Visiting a squadron weeks before it phases out its aircraft and goes dormant could be a sombre affair, but the small band of officers and sailors left on the eve of the retirement ceremony take far too much pride in, and joy from their work to let the looming deadline get them down. Even as they were preparing for the 'beginning of the end', the squadron received and executed operational tasks for the Navy — from an emergency transfer of medical PPE from Delhi to Goa in the early days of the COVID–19 pandemic, to a live patrol only a week before IN306 was retired on 21 October.

Everyone has a story, most of them good, some not, but all highlighting the bond crews form with aircraft like the Il–38. The pilots, for instance, love to flag the incredibly heavy controls, and the immense force required to affect even the most trivial manoeuvres — "The aircraft has so much inertia, and the controls are entirely mechanical with no boosters, so even flying a circuit is a workout!"

Creature comforts, or lack thereof, were a common complaint. A cramped chemical toilet with only a flimsy curtain for privacy meant aircrews needed to "manage" their food and water intake to avoid using it altogether. No mean feat on an eight hour sortie, and then further complicated by a "freezing cold cabin!"

Gripes are delivered with a laugh though, because mastery over the aircraft delivers a satisfaction that is readily apparent in these conversations at the crew cafeteria. Cdr Vivek Kumar, the squadron Senior Naval Air Operations officer (NAOO, formerly known as Senior Observer) explains it: "Each aircraft has its own personality, you have to learn their quirks until they're like old friends." That friendship pays off from time to time. Cdr Kumar recalls one of his most satisfying moments as a mission when they were shadowing a flotilla, only for the search radar to fail — instead of calling off the mission, the crew adapted on the fly, pressed the weather radar into service, and even with the degraded performance, were able to maintain the track until the sortie ended. "You can only do that when you really understand everything down to the wiring," he says.

Pilots have similar stories — Cdr Chandrakant Fulshe, the squadron Senior Pilot (second in command, and ranking pilot when the CO is an NAOO, as is the case at present), says he "relishes taming an aircraft like this. The multi–crew environment is unlike any other aircraft in the Navy, I am not even in control of my throttle [the flight engineer is]. Every action has to be thought through, multiple steps ahead, and there is constant communication with the crew on intercom. It is definitely a thinking man's aircraft."

The CO has his own tales to tell. As boss of a patrol squadron, he is proudest when the unit accomplishes tough missions. He will not be drawn on the specifics of the unit's missions, but says sub–hunting brings the most gratification. "It's like finding a needle in a haystack. The crews and the aircraft are really good at this [ASW], but every time you get a track, the atmosphere on board is electric," he says with a smile.

But for Cdr Ghosh and the rest of the squadron, the real high point for morale came in January this year, when the Il–38 joined the enormous Republic Day flypast over New Delhi for the first and last time in the type's history. Cdr Fulshe, who was flying IN306 on the day, recalls: "It was our first time flying a formation with the IAF [the Il–38 was flanked by a pair of An–32s], first time operating from Jaisalmer, first time with so many aircraft in such a crowded slice of airspace… it was an unparalleled experience."

Cdr Ghosh agrees. "Nothing," he says emphatically, "can match flying over Kartavya Path."

Last Landing

January this year was also when the Il–38's withdrawal was finally confirmed, and a few months later the date was fixed for 31 October. IN306 became the penultimate aircraft to be withdrawn, when she flew her last flight on 21 October 2023.

The Il–38 retirement ceremony brought hundreds of officers, sailors and veterans from the storied history of the Squadron together one last time at INS Hansa, the Indian Navy's largest air station, located in Goa on the west coast. Admiral R Hari Kumar, the Chief of Naval Staff (CNS), presided over the event. Although not an aviator himself, he has commanded several capital ships, including the aircraft carrier INS Viraat. He fondly recalled that "the fleet was always happy when we had an Il–38 above," and explained that the Stallions greatly improved the situational awareness of IN vessels on the high seas.

Another notable participant was Rear Admiral (ret.) Gobind Singh, who was the Squadron Air Engineering Officer (AEO) when INAS 315 was commissioned in 1977. One of only a handful surviving officers of the commissioning crew, RAdm Singh was the senior–most Stallion at the event, and was appreciated as such by serving and retired personnel alike. His presence, and that of several scores of veteran officers and sailors was testament to the enduring connection forged between the Il–38 and her crews.

The ceremony itself opened with the fixed wing aircraft of INS Hansa paying tribute to the Il–38 — a Dornier 228 from INAS 310 'Cobras' led the flypast sequence, followed by a MiG–29K from INAS 303 'Black Panthers' and then a Boeing P–8I from INAS 316 'Condors'. Finally, emerging from a literal setting sun over the western horizon, IN307 shrieked past incredibly low over the runway, before gently pulling up, leaving the Il–38's characteristically thick smoke trails hanging in the humid air.

After the speeches and ceremonial proceedings under the shade of one of the Squadron's sun shelters, attention shifted back to the runway as the lone Il–38 made its last ever landing in Indian service. IN307 touched down on Runway 08 before coasting to a halt and turning onto the ramp, where it was greeted by the traditional water cannon salute. As it emerged from the curtain of spray and parked next to sister ship IN306, on static display, the apron was also awash with sentiment, and more than

a few eyes grew moist. The CNS then greeted the crew as they emerged from the belly of the aircraft, congratulating them on the spirited send–off they had given to a legacy of more than 52,000 operational flying hours over 46 years.

Cdr Ghosh put the emotion of the evening into words: "Every airframe that has graced our squadron has had a soul. Today, as the propellers of 307 come to the final stop… the souls of these seven sisters passes on to each Stallion here. It is now our solemn duty to preserve that soul forever. While we had families to return to after sorties, the aircraft only had us. She eagerly waited for us each day, yearning to play with us over the oceans, achieving missions that often seemed impossible. And with unwavering commitment, she brought us safely back home."

So when the water cannons ran dry and the turboprops on IN307 slowed to a halt for the last time, the time spent with squadron and the aircraft meant I had the privilege of understanding of what that moment meant for Cdr Ghosh and his squadron, pioneering veterans like Rear Admiral Singh, the Winged Stallions fraternity, and yes, all of Indian naval aviation.

The author would like to thank the men and women of INAS 315 not only for their patience during a busy time, but their enthusiasm, warmth, and hospitality during his visit.

Article and photos by Angad Singh (Twitter @zone5aviation)

The author is an independent defence analyst with over a decade of experience writing on national security.

IN307 touched down on Runway 08 before coasting to a halt and where it was greeted by the traditional water cannon salute.

Interview with Air Chief Marshal VR Chaudhari, Chief of the Air Staff, Indian Air Force

***VAYU**: Can you share the latest updates regarding LCA Mk.2, AMCA and MRFA 2.0? How much significance does each platform hold for the Indian Air Force in the context of capability enhancement and long–term sustainability with the service?*

CAS: LCA Mk 2, AMCA and MRFA are projects that hold great significance in the context of capability development and capability enhancement for the IAF.

It was decided to develop LCA Mk.2 to overcome the gaps in LCA Mk.1 performance by using GE 414 engine and improved maintainability. CCS sanction was accorded in 2009 with PDC of 2018. Extension has been granted till 2027. DCN has been moved by DRDO proposing for release of funds for D&D concurrent with pursuing of ToT case with GE.

DRDO is also working towards the indigenous development of a fifth generation fighter aircraft, Advance Medium Combat Aircraft (AMCA) and IAF is providing active support to DRDO. Review of AMCA programme was conducted by Secy DD R&D and Chairman DRDO along with IAF. Many niche technologies are being developed as part of the AMCA programme. The project is aimed to achieve indigenous stealth design, engine design with super cruise and other contemporary capabilities which will be totally home grown.

IAF plans to induct six squadrons of MRFA in a phased manner. The programme would be progressed under 'Make in India' initiative of DAP–2020. Responses have been received for eight aircraft types. ASQRs are being finalised at Air HQ. Detailed interactions with OEMs and additional queries have taken place to obtain more clarity on the responses. Additionally, OEM commitments for indigenous content (IC) of selected category and compliance to Make in India provisions are being sought. It has been envisaged to integrate indigenously developed A–A and A–G weapons on the aircraft being manufactured in India.

Timely and successful materialisation of these projects would provide the required boost to our combat potential and address the issue of depleting fighter squadrons.

***VAYU**: Despite having such a large fighter and transport fleet, the Indian Air Force is reportedly short of Airborne Early Warning & Control Aircraft (AWACS) systems. What are the current plans to fill the gap? Also, can you share updates regarding the ongoing indigenous AWACS (Netra Mk.II) development involving ex–Air India A320/21?*

CAS: Presently, IAF has three AWACS (Il–76) and three AEW&C (Embraer–145) aircraft. Procurement and development of six AEW&C Mk.II (Airbus–321) is underway and a case for procurement of six additional AEW&C Mk.IA (Embraer–145) is under process. Sanction for procurement of AEW&C Mk.II system was accorded by CCS on 8 September 2021 based on pre–owned Airbus A–321 aircraft of Air India and will be developed by CABS, DRDO.

***VAYU**: Unmanned aerial technology has made a swift growth in recent years. Indian Air Force is also catching the pace to acquire state–of–the–art platforms in this category. How the procurement of US origin MQ–9 "Reaper" will expand IAF's capability envelope? And is IAF looking to complement the platform with indigenous counterparts like TAPAS/ Drishti?*

CAS: DRDO's, Aeronautical Development Establishment (ADE), is currently working on various Make in India UAV programmes. The Tapas BH–201 or Rustom–1 Medium–Altitude Long–Endurance (MALE) is one such programme with capability to operate up to 28,000 feet, with an 18 hr endurance. Another armed UAV under development is capable of operating up to an altitude of 30,000 feet with similar endurance and is capable of carrying 300 kg of payload. The MQ–9A, on the other hand, is a turboprop powered, multi–mission RPA developed by General

Atomics with a 27 hour endurance and ceiling of 50,000 feet. It has a payload capacity of 3,850 pounds, including 3,000 pounds of external stores. Recently, General Atomics signed a partnership with Bharat Forge, to manufacture main landing gear components, sub–assemblies and assemblies of MQ–9. The deal can include a significant Make–In–India component in line with the government's strategy of Atma Nirbharta. This partnership will help India develop an advanced drone manufacturing ecosystem in the country.

***VAYU**: Is the MiG–21 Bison retirement programme on schedule? Has IAF already started replacing the MiG–21 squadrons in forward bases with LCA? Also, is IAF optimistic to receive timely deliveries of LCA Mk.1A to avoid intense squadron strength depletion that will come along with MiG–21 retirement?*

CAS: The process of the MiG–21 Bison aircraft drawdown is under progress. IAF already has two operational LCA Mk.1 squadrons. The delivery of LCA Mk.1A is scheduled to start from February 2024. The LCA MK.1A are planned to replace MiG–21 Bisons. As committed by HAL, LCA Mk.1A deliveries will take place in a timely manner.

***VAYU**: As the Airbus C–295 will soon land in India, how much enhancement will it offer to the airlifting capabilities? For how many roles will it be employed in the future?*

CAS: C–295 is a versatile platform, capable of undertaking all the major air transport roles including para drop (cargo and personnel) and CASEVAC. The aircraft is capable of flying up to 25,000 ft and will be able to airlift over 5 tonnes of load or transport upto 71 troops anywhere within India. It possesses short takeoff and landing capability including capability to operate from semi–prepared runways. The aircraft will enhance the operational and logistic capabilities of the IAF.

Exercises and visits

INS Sumedha in Egypt for Bright Star 23

INS Sumedha arrived at Port Alexandria, Egypt on 6 September 2023 to participate in 'Exercise Bright Star 23'. This edition of the multinational Tri–Services military exercise saw participation from 34 countries. It was the largest ever joint military exercise in Middle East and North Africa region. Ex Bright Star 23 was conducted in two phases. The Harbour Phase involved wide ranging activities such as cross–deck visits, professional exchanges, sports fixtures and interactions for planning and conduct of the Sea Phase. The Sea Phase included complex and high intensity exercises encompassing cross deck flying, anti–surface and anti–air exercises including live weapon firing drills. The exercise provided an opportunity to the Indian Navy to "enhance and demonstrate interoperability and also gain from the best practices in maritime security operations from its partner nations".

21st India–France Ex Varuna 2023

Phase II of the 21st edition of Varuna (Varuna–23) bilateral exercise between Indian and French Navy was conducted in the Arabian Sea. The exercise witnessed participation of guided missile frigates, tanker, maritime patrol aircraft and integral helicopters from the two sides. The exercise was conducted over three days and witnessed

joint operations, underway replenishment and various tactical manoeuvres.

Indian and French Navy bilateral naval exercise was initiated in 1993. The exercise was later christened as 'Varuna' in 2001 and has since become a hallmark of robust India–France strategic bilateral relationship. The exercise "facilitates operational level interaction between the two Navies to foster mutual cooperation for good order at sea, underscoring the shared commitment to ensuring security, safety and freedom of the global maritime commons".

INS Sharda visits Mauritius

INS Sharda, Indian Navy's Offshore Patrol Vessel visited to Port Louis, Mauritius 13–15 September 2023. Prior entering Port Louis the ship had carried out joint EEZ surveillance with Mauritius National Coast Guard (MNCG). On arrival, the ship was accorded warm welcome by the Mauritius Coast Guard Dornier and Mauritian Police Force Band. During the visit, the ship engaged in several professional interactions and cross training visits. A guided tour of the ship was provided to MNCG personnel who were familiarised with ship's role and capabilities.

INS Nireekshak in Trincomalee

INS Nireekshak, the Diving Support and Submarine Rescue Vessel of the Indian Navy arrived at the port of Trincomalee Sri Lanka on 14 September 2023 to undertake IN–SLN joint dive training. Spanning over a week, the diving teams of both the Navies participated in diving exercises towards enhancing interoperability, cohesiveness and exchange of Best Practices.

IN assets in Singapore for SIMBEX 23

Indian Naval Ships Ranvijay and Kavaratti and submarine INS Sindhukesari arrived in Singapore on 20 September 2023 to participate in the 30th edition of the Singapore India Maritime Bilateral Exercise (SIMBEX), an annual bilateral Naval exercise between the Indian Navy and Republic of Singapore Navy (RSN), which is being conducted since 1994. SIMBEX holds the distinction of being the longest continuous naval exercise that Indian Navy has with any other country.

SIMBEX–2023 was conducted in two phases; Harbour Phase at Singapore from 21 to 24 September 2023, followed by a Sea Phase. Besides Ranvijay, Kavaratti and Sindhukesari, long–range maritime patrol aircraft P8I also participated in the exercise.

INS Sahyadri in maiden trilateral maritime exercise

Indian Navy's indigenously built warship INS Sahyadri, mission deployed in Indo–Pacific, participated in the maiden trilateral Maritime Partnership Exercise with the ships and aircraft from the Royal Australian Navy (RAN) and Indonesian Navy from 20–21 September 2023. The trilateral exercise provided an opportunity for the three

maritime nations to strengthen their partnership and improve their collective capability to support a stable, peaceful and secure Indo–Pacific region. The exercise also provided the opportunity for the participating navies to benefit from each other's experience and expertise.

ICG conducts conjoined exercise

Indian Coast Guard, on 23 September 2023, conducted a conjoined exercise Sagar Kavach for the state of Odisha and West Bengal to validate the effectiveness of Coastal security mechanism along the Odisha and West Bengal coast. The main aim of the exercise was to evaluate the threats emanating from seaward in present geopolitical scenario and validate existing Standard Operating Procedures (SOPs) of all Stakeholders for enhanced coastal security mechanism. The exercise was also aimed at checking the efficacy of layered security arrangements i.e air surveillance, deep sea patrol by bigger ships of Coast Guard and Navy and close coast patrol by Coast Guard interceptor boats, boats of Marine Police, CISF, Customs and Forest department etc.

Exercise Yudh Abhyas–23 in Alaska, USA

The 19th edition of Exercise Yudh Abhyas was conducted from 25 September to 8 October 2023 in Fort Wainwright, Alaska, USA. It is an annual exercise conducted jointly by the Indian Army and the United States Army. The previous edition of the Exercise was conducted in Auli, Uttarakhand, India in November 2022. Indian Army contingent comprising of 350 personnel participated in this edition of the Exercise. The lead battalion from Indian side is affiliated to Maratha Light Infantry Regiment. 1–24 Infantry Battalion of 1st Brigade Combat Team participated from the US side.

The Exercise also involved exchange of views and best practices in drills on a wide spectrum of combat skills

including combat engineering, obstruction clearance, mine and Improvised Explosive Devices warfare.

First Training Squadron 1TS to SE Asia

The ships of First Training Squadron (1TS) – INS Tir, INS Sujata, Sail Training Ship Sudarshini and CGS Sarathi are presently on a long Range training deployment to South East Asia. The deployment is part of the ongoing afloat training of the 105th Integrated Officers' Training Course. During the deployment, the ships will visit Thailand, Malaysia, Singapore, Indonesia and Vietnam.

Presently, trainees from friendly foreign countries– Bangladesh, Maldives, Mauritius and Vietnam are embarked onboard 1TS for the deployment. In addition, personnel from Indian Army, Indian Air Force and NCC cadets are also embarked furthering jointness and interoperability. The visit aims to strengthen India's commitment towards Maritime Security and foster goodwill in the region.

Exercise Yojna and EW

A joint electronic warfare exercise was conducted at IAFs Jodhpur AFS in September 2023. Air defence units of First in Battle formation along with IAF elements

and fighter aircraft with jamming pods, radars and gun systems pitched in with the Indian Army with synergised training activities.

ICG Samudra Prahari and ASEAN

In a significant demonstration of India's commitment to addressing regional marine pollution threats, the Indian Coast Guard Ship Samudra Prahari, a specialised Pollution–Control Vessel, arrived at the port of Tanjung Priok, Jakarta, Indonesia, on 1 Octocer 2023. This visit, a part of India's ASEAN initiatives for Marine Pollution Response, underscores India's expertise and collaborative efforts in tackling regional maritime challenges, particularly those related to marine pollution threats.

India–Bangladesh Exercise Sampriti

India and Bangladesh commenced the 11th edition of annual joint military exercise, Sampriti on 3 October 2023 in Umroi, Meghalaya. This exercise, alternatingly organised by both countries, signifies strong bilateral defence cooperation initiatives. With its inception in Jorhat, Assam in 2009, the exercise has witnessed ten successful editions till 2022. Sampriti–XI took place over 14 days and engaged 350 personnel from both sides. The Bangladesh contingent comprised 170 personnel, led by Brigadier General Mohammed Mafizul Islam Rashed, Commander of 52 Bangladesh Infantry Brigade. The lead unit from the Bangladesh Army side was 27 Bangladesh Infantry Regiment. Indian contingent mainly comprised troops from a battalion of Rajput Regiment.

Annual Joint HADR Exercise Chakravat

Since its first edition in 2015, the Annual Joint HADR Exercise, Chakravat, has transformed itself into a multi–agency endeavour involving participation of all three Services, Paramilitary Forces, as well as several disaster response organisations, NGOs, academic institutions and international organisations. The 2023 edition further synergised efforts at the national level among all stakeholders, as well as witness participation from eight countries of the Indian Ocean Region. The exercise has been conducted by Indian Army, Indian Navy and Indian Air Force in rotation since 2016. The last edition of the exercise was conducted at Agra by IAF. The 2023 edition of the exercise was hosted by the Indian Navy at Goa from 9 to 11 October 2023.

INS Sumedha at Lagos, Nigeria

INS Sumedha made a port call at Lagos, Nigeria on 13 October 2023 as part of its deployment to Gulf of Guinea.

The visit was aimed to further strengthen diplomatic relations, reinforce maritime co–operation, and boost interoperability between the two navies. In addition to social engagements and sports fixtures, the ship conducted a Medical Camp along with Nigerian Navy doctors for the local populace. Sumedha also undertook Maritime Partnership Exercise (MPX) with NNS Unity, with the aim to augment interoperability between both navies.

India–Malaysia Exercise Harimau Shakti

Joint bilateral training exercise "Exercise Harimau Shakti 2023", between Indian and Malaysian Army commenced on 23 October 2023 in Umroi Cantonment, India. The Malaysian Army contingent comprised troops from 5th Royal Battalion of Malaysian Army. The Indian contingent was represented by a battalion of the Rajput Regiment. Last edition of the Exercise was conducted in Pulai, Kluang, Malaysia in November 2022. Ex Harimau Shakti engaged approximately 120 personnel from both sides.

French Navy's Languedoc visits Mumbai

French Navy Ship Languedoc, an Aquitaine class frigate, commanded by Captain Christine Ribbe, visited Mumbai from 13 to 18 October 2023, on a goodwill visit. Later, INS Trishul participated in a Maritime Partnership Exercise (MPX) with Languedoc.

Aircraft spotting!

Photos by Mayyank Kaul (Instagram @ThrustVectorNeo)

On 8 October 2023, the Indian Air Force celebrated its 91st Anniversary. A week before that, there were rehearsals at Bhojtal lake, near Bhopal (MP) and a few days before the actual event, there were rehearsals at Lake Sangam, Prayagraj (UP) followed by the final flypasts over the same area on 8 October. Overall, an aerial "Sangam" of over 120 aircraft and helicopters operated seamlessly from various bases and flying at varying altitudes and speeds. Vayu Aerospace Review's Mayyank Kaul was at both venues to capture some great images.

Air display at Bhopal

As a prelude to the Air Force Day celebrations, the IAF held a fabulous aerial display at Bhopal on 30 September 2023, showcasing its power, while also motivating the youth to choose the IAF as a career. The residents of Bhopal witnessed the mega air display by the Indian Air Force over the picturesque Bhojtal Lake. Nearly 50 aircraft, airborne from various air bases near and far, participated in the display. The Governor of Madhya Pradesh, Mr. Mangubhai Chhaganbhai Patel graced the occasion as the Chief Guest. The Chief Minister of Madhya Pradesh, Mr. Shivraj Singh Chouhan, along with several civil and military dignitaries, also joined the event and witnessed the spectacular air show.

The impressive air display commenced with the Akashganga team, with 10 air warriors skydiving from a Mi–17 helicopter. The formation flying by Su–30MKI, Mirage–2000, Jaguar, Kiran Mk.II, LCA Tejas, C–130J Hercules, Il–78, An–32, CH–47F Chinook, Mi–17 and Chetak showcased the professionalism of the IAF. Another highlight was the demonstration of aerial refueling, where a Su–30MKI provided fuel to an LCA and an Il–78 replenished a Mirage 2000 fighter.

This was followed by a range of aerobatics by the indigenous Light Combat Aircraft (LCA) Tejas and the Su–30MKI. The Surya Kiran Aerobatics Team and the Sarang helicopter display team made their mark with their perfectly timed and synchronised manoeuvres.

With the culmination of this successful display, the focus then shifted to Prayagraj, where the ceremonial parade for the Air Force Day was held in the morning on 8 October 2023, followed by an aerial display over the Sangam in the afternoon on the same day.

Air display at Prayagraj

Around 120 aircraft and helicopters participated in a wonderful flypast in different formations that allowed people to watch fighter aircraft like Rafale, Sukhoi Su–30MKI, Jaguar, Tejas LCA, Mirage 2000 to helicopters like Chinook, Apache and Mi–17 besides transport aircraft like C–295, C–130J Super Hercules and C–17 Globemaster. The MiG–21 Bison made its last appearance with a flypast of 3 aircraft. This is the first time that the main Air Force Day celebrations of the country were held in Prayagraj in keeping with the new tradition of hosting the event in different parts of the country, giving a platform to the Indian Air Force to showcase its might. Last year, Chandigarh hosted these celebrations.

Defence Minister Rajnath Singh, Uttar Pradesh Governor Anandiben Patel, Chief Minister Yogi Adityanath and Chief of the Air Staff Air Chief Marshal VR Chaudhari were among the VVIPs attending these celebrations.

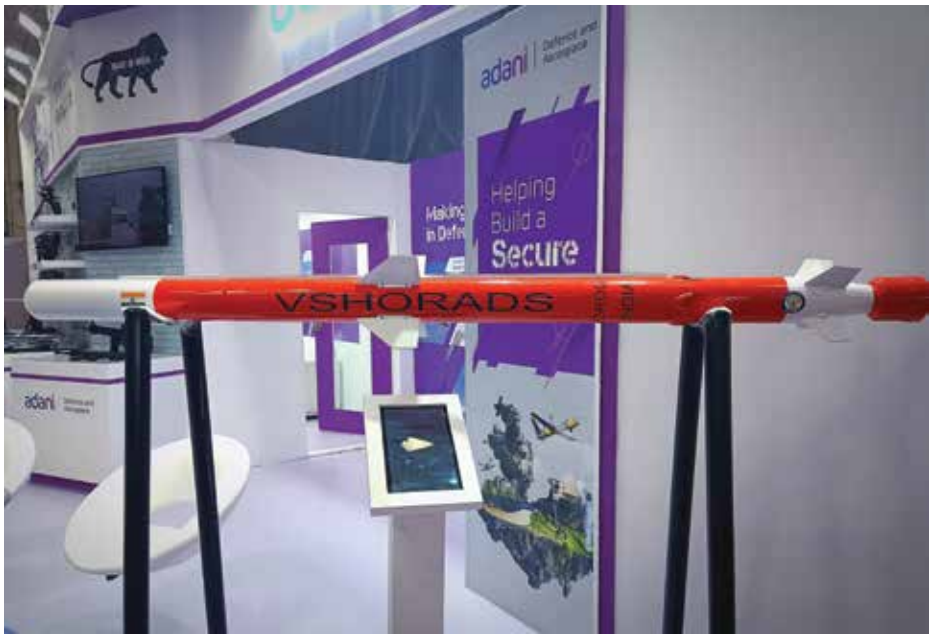
In addition to its new fighter and transport aircraft, IAF's vintage aircraft at the parade included Tiger Moth HU–512 and Harvard Trainer HT–291 which took part in the practice air display. The two vintage aircraft which have been fully restored operated in the Luv and Kush formations over the Sangam area. The Harvard trainer is part of the IAF Vintage Flight, one of only a handful such units that fly vintage military aircraft, anywhere in the world.

Meanwhile, Sarang helicopter team and Surya Kiran Aerobatic Team (SKAT) of the IAF also impressed all with their performance which was followed by a display of skills by the Akash Ganga Skydiving team of the IAF.

All photos by Mayyank Kaul
Instagram @ThrustVectorNeo

VAYU on–the–spot report

MILIPOL India 2023, New Delhi



The Milipol International Network has long been established as the preeminent authority in the realm of events dedicated to homeland security. This globally recognised platform consistently unveils cutting edge technologies in the field while effectively addressing the rapidly evolving challenges that confront the sector.

One of the most recent editions, MILIPOL23 India, took place at Pragati Maidan International Exhibition Centre in New Delhi from the 26–28 October 2023. This significant event not only provided a vital forum for the unveiling of the latest security technologies but also served as an excellent opportunity for Indian brands to showcase their products on a global stage.

The event witnessed a substantial focus on various critical sectors. The small arms segment garnered considerable attention, with prominent joint ventures such as Adani–PLR(IWI) and CARCAL–ICOMM, along with emerging Indian startups like Singh Industries IND, showcasing their latest offerings. Additionally, the expo dedicated

substantial space to reconnaissance and surveillance systems, with industry leaders like TASL, CP Plus, and Toshiba displaying an array of security solutions ranging from home security cameras to military grade IR/TV cameras catered to MoD forces.

Body armour and headgear also stood out as primary attractions for security forces, with MKU and SMPP

The exhibition also boasted an impressive display of unmanned aerial vehicles (UAVs) from Adani, Ideaforge and Drona, featuring advanced technologies such as VTOL capabilities and kamikaze drones tailored for diverse military applications. Furthermore, the expo exhibited an extensive array of ammunition, ranging from 9mm cartridges for pistols to 155mm rounds for howitzers, with Munitions Ltd. India taking the lead in showcasing a comprehensive spectrum of calibers for various artillery rounds, including the awe inspiring 300mm Pinaka Rocket.

In conclusion, the three day international military police expo not only provided an invaluable platform for companies worldwide to showcase their products but also underscored the growing influence of Indian startups and joint ventures in the sector.

International firms, equally prominent, contributed to the exhibition's diversity and global outlook, solidifying the event as a key highlight in the calendar of homeland security events worldwide.

Article by Abhinav Negi and Mayyank Kaul of Team VAYU
Photos by Abhinav Negi

VAYU on–the–spot report

Indian Military Heritage Festival, New Delhi



Raksha Mantri Mr. Rajnath Singh inaugurated the first edition of Indian Military Heritage Festival (IMHF) in New Delhi on 21 October 2023. The two day festival aims to celebrate India's rich military culture and heritage that has evolved over the centuries, through conversations, art, dance, drama, storytelling and exhibitions. It will primarily bring forward different understandings and perspectives through panel discussions by eminent scholars, practitioners and serving as well as retired officers.

During the event, the Raksha Mantri also launched 'Project Udbhav', a joint collaboration of Indian Army and United Service Institution of India, to promote indigenous discourse through exploration and integration of the country's ancient strategic acumen into contemporary military domain. Chief of the Army Staff General Manoj Pande, Chief of the Air Staff Air Chief Marshal VR Chaudhari, Chief of Integrated Defence Staff to the Chairman, Chiefs of Staff Committee (CISC) Lt Gen JP Mathew and Vice Chief of the Naval Staff Vice Admiral Sanjay Jasjit Singh were among the dignitaries present at the event.

Talking to reporters on the occasion, Mr. Rajnath Singh stated that the Indian Military Heritage Festival, which showcases the unmatched bravery and invaluable role of the Armed Forces in the security of the country in the last few decades, would inspire the youth of the nation. It would also make them enthusiastic to know more about the Indian military and their gallant deeds, he said.

Military Heritage Festival

Despite a long and glorious military history and strategic culture going back many centuries, people are largely unaware of its different facets. The festival seeks to create a benchmark in the domain of public engagement with military history and heritage through interaction while adhering to the goals for developing the Armed Forces in the 21st century.

The festival aims to give a new thrust to the study of Indian military culture, traditions and history and add tangible value to the 'Aatmanirbhar Bharat' and 'Make in India' initiative. It also provides a platform for discussing various contemporary issues relating to India and the world pertaining to security, strategy and international relations.


The festival showcased military culture through military band performances, including the Army Symphony Band presentation and Brass band displays and a Cultural Gala Evening. An exhibition to highlight and celebrate select milestones and achievements in the nation's long and illustrious military history was organised in collaboration with the Indian Institute of Heritage, Ministry of Culture.

Project Udbhav

Project Udbhav, a collaboration between the Indian Army and the USI, is an endeavour to revisit the roots of India's ancient military thoughts. 'Udbhav', which translates to 'origin' or 'genesis', acknowledges the vintage scriptures and writings of our Nation, that span centuries in the past and contain profound knowledge that can benefit modern military strategies.

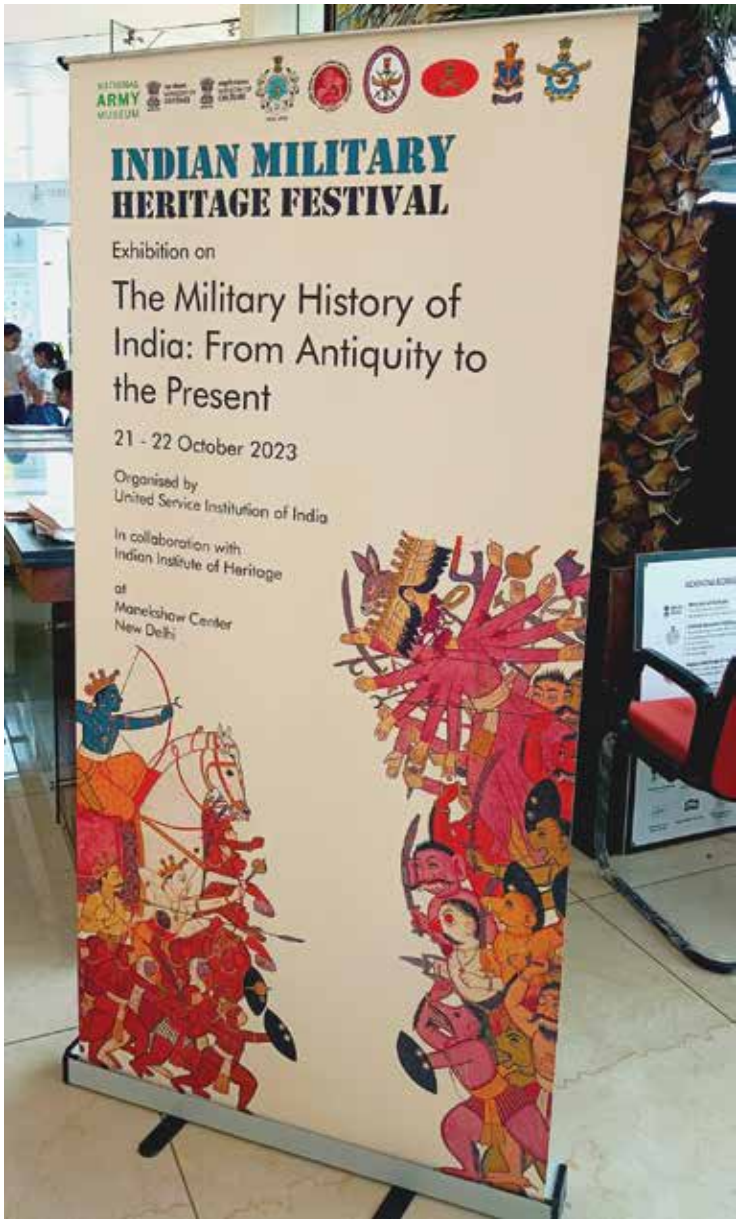
The objective of the Project is to synthesise ancient wisdom with contemporary military practices, forging a unique and holistic approach to address modern security challenges. It is a visionary initiative by the Indian Army that seeks to integrate age–old wisdom with contemporary military pedagogy.

An initiative in this research was earlier taken by the Army Training Command, who after delving into the ancient Indian Scriptures such as Arthashastra, Nitisara by Kamandaki and Mahabharata compiled the 'Compendium of 75 Stratagems'. Other academic institutions like College of Defence Management have also conducted a study to establish linkages between Indian Culture and the art of strategic thinking. These studies will also provide valuable inputs for Project Udbhav.

The necessity of this project is underscored by a critical understanding: while present day military concepts, prevalent globally, have been largely shaped by the research and doctrines of western armies, they do not wholly suffice the unique, localised requirements and the rich cultural and strategic legacy of the Indian Army.

Through the project, the Indian Army acknowledges that the nation is a treasure trove of ancient texts and manuscripts that delineate sophisticated, varied and contextually rich strategies in statecraft, warfare and diplomacy.

This project is a significant leap towards evolving new, indigenously resonant military concepts, building upon and enhancing existing strategies while intertwining them with the rich, diverse tactical and strategic wisdom encapsulated in historical documents.



'Project Udbhav' is set to emerge as the centre of indigenous strategic developments. The initiative is designed to weave a strategic vocabulary and conceptual framework that is deeply embedded in India's philosophical and cultural heritage.

It sets the stage for a robust, progressive and future ready Indian Army that not only resonates with the nation's historical military sagacity but is also attuned to the demands and dynamics of contemporary warfare and diplomacy.

The project signals a series of indepth research, discussions, studies, and engagements to delve into and disseminate the rich, varied and often under–explored treasures of India's strategic thought and military history.

By marrying age old wisdom with modern military pedagogy and operations, 'Project Udbhav' sets the stage for a robust, progressive and future ready Indian Army that not only resonates with the nation's historical military sagacity but is also attuned to the demands and dynamics of contemporary warfare and diplomacy.

Text: USI/Indian Army/MoD/Vayu Team

All photos: Mayyank Kaul and Abhinav Negi

The Vayu Team at IMHF, New Delhi

The enthusiastic Vayu Aerospace & Defence Review team attended the Indian Military Heritage Festival (IMHF) on both 21 and 22 October 2023 at New Delhi. Photos 1 and 2: Mayyank Kaul (Instagram @ThrustVectorNeo) and Abhinav Negi.
Photo 3: Pratisht Chaudhry (Twitter: @Pratisht3), Abhinav Negi and Rishav (Twitter @_devildog_rv_)

VAYU on–the–spot report

Visit to the Sri Lankan Air Force Museum

The Sri Lanka Air Force Museum, located in Ratmalana, Colombo, is a testament to the rich aviation history and achievements of the Sri Lanka Air Force and the preceding Royal Ceylon Air Force as well. Established to preserve the country's aviation heritage, the museum offers visitors a glimpse into the past, showcasing a diverse collection of aircraft, weaponry, vehicles and historical artifacts, which were once proudly serving to guard the frontiers of the island country.

The museum's primary aim is to educate and inspire visitors about the development and contributions of the Sri Lankan Air Force to the nation's defence and security. It serves as a valuable resource for aviation enthusiasts, history buffs, and the general public, offering a unique opportunity to learn about the evolution of the Sri Lanka Air Force from its inception to its modern–day capabilities. There are more than 50 airframes and 36 aircraft types within the boundaries, which are maintained precisely well.

The primary highlight of the museum is the display of various aircraft used by Colombo over the years. From early propeller–driven planes to more contemporary jet aircraft, visitors can see how aviation technology has evolved in Sri Lanka. Some notable examples include de Havilland DH.82A, IAI Kfir C.2, Mikoyan Gurevich MiG–17F, Douglas C–47B, Mil Mi–24V and more. The exhibited airframes are retired warplanes that once played a crucial role in the country's defence during

times of conflict and unrest. In addition to aircraft, the museum houses a wide range of artifacts and memorabilia that tell the story of the Sri Lanka Air Force's development and its personnel's dedication and bravery. Uniforms, medals, photographs and other historical items offer insight into the lives of the men and women who have served in the Sri Lanka Air Force. One of the significant items on display in this context is the collection of medals and the sword belonging to Air Vice Marshal E. R. Amarasekara, who served as the first Ceylonese Commander of the Air Force.

The museum's exhibits are thoughtfully curated and often include informative displays that explain the historical context and significance of the showcased items. Knowledgeable guides are usually available to provide guided tours and enrich visitors' experiences with

interesting anecdotes and facts about the Sri Lanka Air Force's operations.

The idea of setting up such aircraft and history preservation site was conceived by Air Chief Marshal Harry Goonatilake back when he was serving Commander of the Sri Lanka Air Force. Therefore, the country's first Aircraft Preservation and Storage Unit was established in 1993 at Air Force Base Ratmalana. A significant aspect of the museum is its unique location within an operational air base, which adds to its real–life appeal. This setting allows visitors to experience the museum amidst the activities of an active air force base, providing a more immersive and authentic experience.

Through its collection of aircraft, equipment, and memorabilia, the museum serves as a tribute to the nation's aviation heritage and the contributions of the SLAF personnel over the years. It plays a crucial role in preserving and sharing the aviation history of Sri Lanka with the public, both locals and tourists alike.

The museum serves as a tribute to the rich aviation history of Sri Lanka and provides visitors with an opportunity to learn about the country's aerial heritage and the contributions of its air force personnel throughout the years. For aviation enthusiasts, the Sri Lankan Air Force Museum is a treasure trove of information and a chance to get up close and personal with aircraft that have played pivotal roles in the nation's military history. Moreover, the museum's educational value attracts students, researchers, and anyone curious about the country's military history and aviation advancements.

Text and article: Rishav
Photos: Vayu

VAYU on–the–spot report

Visit to Musée de l'air at Le Bourget, Paris

With a rich history dating way back to its establishment year of 1919, the National Air and Space Museum of France, natively called Musée de l'air is a prominent Museum situated at the Paris, Le Bourget Airport. Over the years, the venue underwent several expansions and renovations, eventually evolving into the comprehensive institution it is today. Strategically situated at Europe's oldest airports and an essential hub for aviation history, the museum holds great significance for aviation enthusiasts, history buffs, and even French nationalists. Back in time, the airport gained international recognition when Charles Lindbergh landed there in 1927 after his historic solo transatlantic flight commenced from New York on his custom–built monoplane: Spirit of St. Louis.

The museum boasts a remarkable collection of over 350 aircraft, making it one of the largest aviation and aerospace museums globally. Visitors can explore legacy aircraft from both military and civilian backgrounds, including iconic airframes such as the supersonic airliner: Concorde, the Jumbo–Jet: Boeing 747, and legendary World War I and World War II fighter planes. These exhibits cover a wide range of historical periods and technological advancements, providing a captivating journey through the evolution of aviation.

Fouga CM.170 Magister with Ariane 5 rocket in the background

Moreover, the museum features an impressive assortment of space–related artifacts. Original spacecraft, satellites, rockets, and space suits are on display, highlighting the tremendous advancements made in human space exploration. Visitors can learn about various space missions and the achievements that have propelled humanity into the cosmos.

Among the museum's most notable exhibits is Charles Lindbergh's own Spirit of St. Louis, the original aircraft flown during his groundbreaking transatlantic flight. This aircraft holds historical significance as it marks one of the most celebrated milestones in global aviation history. Lindberg had made a historic solo non–stop transatlantic flight on 20–21 May 1927. Departing from New York, he successfully landed in Paris, covering approximately 3,600 miles in 33.5 hours. The flight brought Lindbergh international fame, marked a significant advancement in aviation and boosted public confidence in air travel.

Super Etendard

Douglas C–47A Skytrain

Then comes the Concorde, the world's first supersonic commercial aircraft that remains a significant attraction at the museum. It offers visitors unique insights into the marvels of supersonic travel and the brief era when commercial flights had the ability to break the sound barrier. The F–WTSS, also designated as Concorde 001, can be seen wrapped in the Air France livery. This particular airframe holds the distinction of being the first Concorde to take flight, on 2 March 1969. After a remarkable career of completing 397 flights, 812 flight hours and 255 supersonic flight hours, it was retired at the French air museum on 19 October 1973. The aircraft underwent modifications for the 1973 solar eclipse mission, equipped with rooftop portholes and observation instruments. During this mission, it achieved the longest observation of a solar eclipse, lasting an impressive 74 minutes.

The museum also pays homage to the contributions of aircraft and renowned aviators during times of conflict. It houses an extensive collection of planes used during World War I and World War II, providing a glimpse into the evolution of aerial warfare and the bravery of pilots who served during those tumultuous times, fighting till the very last breath.

In addition to its extensive collection, the Musée de l'airet de l'espace serves as an educational institution as the exhibits and interactive displays offer valuable insights into the evolution of aviation and space exploration. The museum plays a vital role in inspiring and educating visitors, particularly students and young enthusiasts, encouraging them to pursue careers in aerospace and related fields. Complementing its permanent collection, the museum regularly hosts special exhibitions and events that invite international visitors and experts to share their knowledge and experiences. These events further enrich the museum's offerings and foster a spirit of curiosity and discovery among its visitors.

Overall, the Musée de l'airet de l'espace stands as a testament to human ingenuity and the relentless pursuit of exploration and innovation in the fields of aviation and space. Whether you are an aviation enthusiast, a history buff, or someone curious about the wonders of space, this museum offers an unforgettable journey through the skies and beyond, leaving visitors with a profound appreciation for the accomplishments of humanity in the realm of air and space.

Article by Rishav
Photos: The Vayu Team

Jaguar

Super Mirage 4000

Rafale A

Douglas C–47A Skytrain

Douglas AD–4NA Skyraider

Dewoitine D.520

Supermarine Spitfire LF Mk.XVI

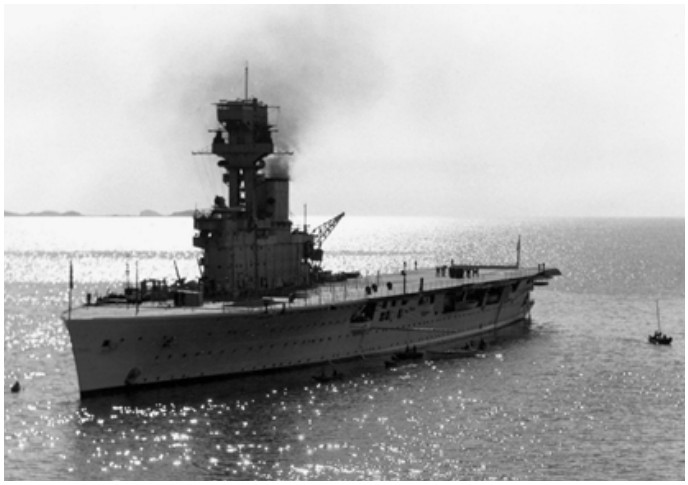
North American P–51D Mustang

Why Indian Navy must have a third aircraft carrier

INS Vikrant (R11) and INS Vikramaditya (R33) during a joint exercise. (Photo: IN)

September 2, 2022, was a red–letter day for India as Prime Minister Narendra Modi commissioned the first indigenous aircraft carrier, INS Vikrant. It is the fourth carrier ever operated by the navy and the largest warship ever made in the country indigenously. It represents the newest chapter in the history of the Indian Navy that began with the commissioning of INS Vikrant (ex HMS Hercules), the country's first aircraft carrier, on 30 April 1957. India is currently looking for a second home grown aircraft carrier to maintain a simultaneous three carrier fleet. However, the feasibility of investing huge amounts in such a programme against a not so large submarine fleet, has become a hot topic for debate among navy veterans, historians, researchers and enthusiasts alike.

In 1924, HMS Hermes became what can be said to be the first precursor of modern aircraft carriers. Since then, carriers have dominated the sea and naval conflicts, ultimately shaping the outcome of the conflicts. World War II marked the largest deployment of aircraft carriers by both warring sides. The aircraft carrier was the primary instrument for delivering airpower far from the region. The rapid progress of powerful naval engines, radars, communication, command and control, aviation technology and various other aspects quickly shaped the tenders into a floating behemoth carrying new generation planes capable of delivering heavy punch, which easily superseded the capability of mighty battleships! A new kind of warship gradually gained huge importance in a relatively short time.



HMS Hermes (Photo: Wikimedia)

From the beginning, independent India was able to fully understand the importance of aircraft carriers (and submarines) for the security and sovereignty of the nation. Under the fifteen year plan for refurbishing post–Independence, four fleet carriers were recommended, which were to be abandoned in favour of a much smaller but affordable approach. Gradually, India would procure three foreign aircraft carriers in the next sixty years. Ultimately, in 2013, India launched the first indigenously developed and manufactured aircraft carrier, the IAC–I, the "INS Vikrant". After the IAC–I, the navy is eyeing the IAC–II, a second indigenous aircraft carrier. The navy seeks a three carrier force where two carriers will always keep safeguarding the seas in case one platform has to go under refit or maintenance. And this platform was envisioned to be a larger CATOBAR (Catapult–Assisted Take–Off But Arrested Recovery) platform. Now, mainly three questions arise at this point. One, can India successfully have a CATOBAR aircraft carrier? Second, should India at all invest in another carrier rather than more submarines? Third, can India afford a behemoth investment at this time?

The answer to the first one is quite easy, yes! CATOBAR is no alien to the Indian Navy. In fact, India's first aircraft carrier, INS Vikrant had been such a tender until 1989, when it was converted into a V/STOL (Vertical/Short Take–Off and Land) configured ship. Under the 1988 Indo–French MoU, INDLT (Indian Naval Design and Liasion Team) worked with DCN (Direction des Constructions Navales) and a 40,000T platform was

envisioned based on the then under construction "Charles de Gaulle". One of the designs was a CATOBAR variant. Back in 2007, the CNS (Chief of the Naval Staff) Admiral S. Mehta confirmed that the second IAC had been on the drawing board and the plan for at least three indigenous aircraft carriers. Popularly dubbed INS Vishal, the second indigenous carrier, it was reported to be a 65,000T flat deck platform. It would feature Electro Magnetic Aircraft Launch System (EMALS) powered CATOBAR.

In August 2015, Indian delegation even visited then under construction American super carrier Gerald R. Ford. Initially it was envisaged to be a nuclear–powered platform but limitations of available technology forced the navy to favour Integrated Electric Propulsion System (IEPS). But this proposal has currently come to a halt. After a long discussion, a repeat order of the existing Vikrant has been preferred. CNS Admiral R. Hari Kumar reiterated the decision to issue a followup order in September 2023. Reportedly, it will have some improvements to the existing Vikrant design. However, as of October 2023, an official decision has yet to be taken. Nevertheless, another 45,000T platform will cost much less than the previously planned ambitious CATOBAR platform. Thus, it partially answers the third question as well.

USS Gerald R Ford (CVN78) underway in the Atlantic Ocean on 9 October 2022 (Photo: USN)

Now, answering the most important and second one will have multiple perspectives on how you should view this. Let's keep aside the traditional "aircraft carrier vs. submarine" debate. To protect India's maritime interests, we do need both. One can argue that a huge fleet of submarines can be formed with the same investment for an aircraft carrier. But a submarine can't do the job of a carrier, or vice versa! When an enemy navy fleet, during war, sneaks into national waters, a large submarine fleet might scope multiple hostiles down silently. A large sub–surface fleet will also facilitate secretly shadowing the enemy movement during both peace and war in multiple theatres. But still, a submarine can't secure the aerospace. If a hostile carrier launches its own airpower, the most effective way to neutralise them will be to project its own! Only an air force can effectively deny space to a hostile one. And where the opportunity to launch such an aircraft from the mainland tends to be zero, aircraft carriers prove to be the most crucial instrument.

An aircraft carrier allows one to project power far from the region. It is crucial to control a hostile sky, and it is the only platform to do so. With the control of the sky, one can dominate the hostile ground or sea as well. While the importance of surface fleets can never be denied, accompanying air power provides unimaginable superiority to adversaries lacking such. Softening coastal or ground strongholds also facilitates swifter and more secured deployment of ground forces, where required. India has a total coastline of 7517 km. Indian maritime interests lie from the Horn of Africa to the Malacca Strait. But to secure maritime dominance, India does need to go beyond such a boundary. Currently, India has only two adversaries. Tomorrow, there could be more, and then India will need to project power far from the region. Even to protect the Indian diaspora in a troubled region, India will need an expanding naval power. And in those cases, only an aircraft carrier could help secure the air, sea, and land for the secure movement of the Indian fleet. A secured sub–surface world and dominating the rough seas result in the tangible manifestation of securing maritime interests and sovereignty.

At the end, I will say that in the age of ever–evolving multi domain collaborative combat environments, "Sea–Denial" and "Sea–Dominance" must go hand in hand. India has invested hugely, both financially and physically, in the project for decades. The investment has resulted in a gain in terms of the rapid development of an advanced ecosystem for shipbuilding, the achievement of new domains and technology prowess. So, India must continue to roll the stone. A halt in that will result in the loss of not only strategic dominance for a long time but expertise as well, which could be irreversible. Secured air, sea, and land are the keys to maintaining sovereignty.

Article by Sankalan Chattopadhyay
(Twitter: @vinoddx9)

Directed Energy Weapons and India

Photo: DRDO, India

"Small things make big change", stands strong in modern day warfare. Small autonomous systems are bringing a huge impact on larger and more critical infrastructure. In the ongoing Russia–Ukraine war, the impact of kamikaze drones and suicide boats has changed modern day warfare strategies. Countries across the globe are spending billions developing counter systems to neutralise these types of threats. One such counter system is DEW (directed energy weapon).

Directed energy weapons are systems which use concentrated electromagnetic energy to neutralise the target on which it is targeted. This system uses magnified lasers or electromagnetic rays like high power microwaves or millimetre waves. Unlike traditional explosives, it degrades the electronics on the system or physically destroys the system.

The development of high energy weapons dates back to the 1930s when Germany developed particle beam weapons that used X–ray to neutralise targets. In 1980, a breakthrough in this field occurred when US President Ronald Reagan introduced his "Star Wars" programme where he initiated the development of a particle beam accelerator. Initial tests were satisfactory but due to its complex technology and rising developmental cost, plans were dropped in favour of traditional missile systems which were cheap and could be produced quickly during the Cold War period.

In the early 21st century, countries across the world realised that autonomous systems coordinated by manned assets were going to rule the battlezone, which made many traditional war tactics invalid, and critical assets became vulnerable to these threats. The techniques which are employed to down the critical assets are a fraction of the cost and deploying a missile to neutralise it doesn't make sense completely to the taxpayers. This made budget makers invest in more cost effective solutions like DEW and passive tech to neutralise a threat, Initially, USA and Israel co–developed Tactical High–Energy Laser (THEL), which successfully destroyed an incoming artillery shell with pinpoint accuracy. This proved the versatile application of laser, and soon many countries around the world started to roll out their laser systems.

India in the field of lasers

When it comes to India, in the period of 1990s, DRDO's laboratory LASTEC (laser science and technology centre) initiated the development of high–energy systems which

Photo: DRDO, India

were later experimented for the first time in 2001 at Hindon Airforce Base. Then gradually this grabbed the attention of the Indian armed forces and more futuristic projects were initiated to demonstrate the niche technology to the world like Kali, Durga Adithya etc. Over the period, the lab developed and rolled out various systems which could produce an output ranging from 2KW to 100KW.

In 2021, cheap drones from Pakistan dropped 2kg of IED on multi–million dollar assets present in an airforce base in Jammu. This raised a serious question mark regarding base defence against these small drones. Soon DRDO came up with a solution which they have been working on for a long time, the "D–4 anti–drone system" which meets all the requirements of the armed forces and came out with flying colours. Soon Indian Navy ordered these systems to protect their frontline warship and bases from these cheap assets.

Future ahead

Keeping future requirements in mind, the Armed Forces have initiated projects with respect to their domains. When it comes to the Indian Navy, it has initiated a project to develop a modular compact shipborne 30 kW DEW system which should have the ability to locate and neutralise targets like swarm drones, loitering munitions, small boats and USVs. The technical parameter is as follows: the all–up weight of this system should be maximum of 8 tonnes. It should be an all weather versatile system and should qualify all military grade qualifications. The system should contain an inbuilt jammer in it to disrupt the communication between the drones and USV. The system's integral radar should have detection and tracking capability with 360 degree coverage for aerial and surface targets. The radar should have the capability for detection and tracking of mini/micro drone (0.01m2 RCS) with a detection range of 10 km and a tracking range of 8 km. The weapon control system of this system should be of modular design and open architecture including Plug and Play feature to interface with other user defined equipment/ hardware. The reaction time of the system to detect–track–neutralise the target should be less than 20 seconds.

DRDO labs are also working on a compact airborne laser pod which can generate 3–5 KW power, which will be fitted on helicopters. A few projects are also under development for making compact, modular and rugged systems specific to army and air force requirements, which serve the purpose of convoy protection and base defence.

MBDA and Rheinmetall test laser weapon

After integration of the laser weapon demonstrator (LWD) onboard the German frigate Sachsen, the trials of the LWD at sea have successfully been completed. Responsible for development and construction as well as the support during the trials that have been planned and organised by the Federal Office of Bundeswehr Equipment, Information Technology and In–Service Support, is the High–Energy Laser Naval Demonstrator Working Group, or ARGE, consisting of MBDA Deutschland and Rheinmetall.

Rafael's Iron Beam laser weapon

Rafael's Iron Beam laser weapon has been successfully tested with live targets, including UAVs, mortars, rockets and anti–tank missiles in various scenarios. These tests are just the first phase of a multi–year programme led by the DDR&D and defence industries. It aims to develop a high power ground and aerial laser system equipped to deal with long range, high intensity threats, complementing the Iron Dome system, adding to Israel's multi–tiered air defence array.

Conclusion

To conclude, Indian Armed Forces are moving in the right track towards futuristic technology, to counter future threats in the right way at the right time. Directed energy weapons are still not a proven tech like conventional missiles, but soon they will be deployed in active combat duties with the forces around the world including us!

Article by D. Rethik
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DSEI 2023 breaks all records

India had a large presence at DSEI. HE Vikram Kumar Doraiswami, High Commissioner of India to the United Kingdom, inaugurated the India Pavillion at the event.

Defence and Security Equipment International (DSEI) delivered the most successful edition for its customers, key stakeholders, partners in its 24 year history. DSEI (12–15 September 2023) broke all records in terms of overall attendance, number of visitors and international delegations. Attendee numbers were up by 23% compared to DSEI 2019. The event hosted more than 1,500 exhibitors, with over 250 of those exhibiting for the first time, while online industry buyer and supplier networking tool, MeetMe, enabled over 3,200 connections, and facilitated over 1,300 meetings throughout the busy show floor.

DSEI is an international hybrid event with truly global reach, with 36 international country pavilions including Ukraine and the largest being North America, which doubled in size from the last edition. As ever DSEI hosted international delegations from across the world. The event had an increase of senior military and government

There was a big presence from Pakistan at the event.

attendees, with over 3250 VIPs and delegations from close to 100 nations visiting the biennial event, surpassing that of the existing record numbers achieved in 2019.

Many of the new exhibitors at DSEI 2023 were within "Future Tech". Sony, IBM, Oracle, Panasonic and Palantir were among the companies, demonstrating the broad reach of DSEI beyond its traditional defence and industrial base. These companies exhibited alongside the traditional defence industry, including all the major manufacturers.

Good to see Poland's WB Group and their Warmate LM which India has purchased.

Visitors saw outstanding displays of military capability, including representation from the Global Combat Air Programme, a host of warships from the UK and visiting nations, and land vehicles and aircraft from the highest calibre of exhibitors. The UK Capability Showcase was a big draw for visitors. It demonstrated the latest, cutting–edge capabilities being developed by the UK's defence and security industry. The showcase served as a platform to demonstrate the UK's "best–in–class" advancements, innovations, and expertise across all domains.

Alongside an increase in physical attendees, DSEI saw impressive take up of its digital offerings – DSEI Connect and MeetMe. DSEI Connect provided access to all live streamed keynotes, product demonstrations, thought leadership presentations and analysis throughout DSEI 2023. MeetMe enabled attendees to book and plan meetings with industry buyers and suppliers before, during, and after the event.

The DSEI Forums were free to attend for all visitors and ran for the duration of the show. Featuring panel debates and keynote speeches from international thought leaders, they explored the current strategic level challenges faced by the global defence industry and provided a platform for sharing valuable ideas with allies. Although the five main forums were divided into operational domains, all the theatres played host to cross force discussions and welcomed input from audience members with different perspectives.

DSEI Director Grant Burgham stated, "The global defence and security community convened again at DSEI 2023. Representatives of both British and international defence companies, including hundreds of SMEs, were in attendance at DSEI this year. It proved to be a vital opportunity to build connections, seek innovative collaborations and for the UK to export world–leading capabilities. Our theme, 'Achieving an Integrated Force' was well observed. To achieve an integrated force, supply–chains need to be understood and strengthened, thus creating an unbreakable cohesion between military and industry. DSEI was the ideal platform to accelerate this. DSEI works in close partnership with the UK Ministry of Defence, the Department for Business and Trade and the UK Armed Forces, our event sponsors, our partners and the media. Without their unfailing support, DSEI would not be able to provide such a range of valuable opportunities to exhibitors, governments, and visitors alike. On behalf of the whole DSEI team, we are taking stock of the opportunities this show has given, and also look forward to welcoming everyone back for DSEI 2025."

Text courtesy: The DSEI Organisers
All photos: Vayu Aerospace Review

Iconic Red Arrows open DSEI

The Royal Air Force Aerobatic Team, the Red Arrows, formally opened Defence and Security Equipment International (DSEI) with their signature aircraft flypast. Representing the speed, agility and precision of the Royal Air Force, the team is the public face of the service. They assist in recruiting to the Armed Forces, act as ambassadors for the United Kingdom at home and overseas and promote the best of British.

Photo source – UK MOD Crown copyright 2023

Record Breaking DSEI 2023:

- Over the course of the four–day event attendee numbers were up 23% over the record previously set in 2019.
- The number of total registrations saw a 20% increase over the record previously set in 2019.
- The record single day attendee record from 2019 was broken three times.
- The event hosted more than 1,500 defence and security suppliers, with over 250 of those exhibiting for the first time.
- Record number of international delegations.
- MeetMe, our online industry buyer and supplier networking tool, enabled over 3,200 connections and facilitated over 1,300 meetings.

STRIX Uncrewed Unmanned System and VTOL from BAE Systems was a major highlight of the show.

OMFV: the Bradley replacement programme

M2 Bradley (Image: Wikimedia)

On 26 June 2023, the US Army down selected General Dynamics Land Systems Inc (GDLS) and American Rheinmetall Vehicles LLC for the award of contracts for the Optionally Manned Fighting Vehicle (OMFV), now renamed the XM30. The value of the two contracts is around $1.6 billion for Phase III and Phase IV's detailed design, prototype build, and testing phases. The OMFV aims to replace the Bradley fighting vehicles in service with the US Army by 2030 and beyond. However, it is not the first such attempt, but rather the culmination of several past programmes spanning around four decades.

A brief history of Bradley

Post World WW II, West Germany pioneered the concept of the "Infantry Fighting Vehicle" by developing the Schützenpanzer Lang HS.30. Following it, both the US and USSR invested in the new philosophy, and the US study culminated in the "MICV–65" programme, followed by the "MICV–70". Under the MICV–70, FMC Corporation developed the XM723. This XM723 will later be renamed XM2 and ultimately "M2 Bradley". Bradley entered the service in 1981. However, a replacement programme was initiated even before the first Bradley was handed over to the US Army! As the MICV–70 programme progressed, an extensive study of the XM723/XM2 was conducted. The platform was found to have slower acceleration and less cross country speed than the XM1 (then the M1 Abrams MBT under development), exposing itself and having thinner armour susceptible to a firepower kill. Besides, it was feared that the noisy engine would expose the position to the enemy. So SAIFV was initiated.

Special Armour Infantry Fighting Vehicle

Fearing an overwhelming edge by the Soviet and Warsaw Pact forces by the late 1980s, a heavily armoured platform was envisioned. This would use a XM1 hull with weapons ranging from 25 mm to even 75 mm. The platform was expected to be ready by 1986. But the potential enormous cost was found out by maneuvering the benefits. As an immediate alternative, a "High Mobility IFV" concept was proposed, with Bradley being upgraded with a better engine and running gear. But sensing futility, both the "HMIFV" and "SAIFV" were scrapped.

Armoured Systems Modernisation

The "Armoured Family of Vehicles Programme" was started in the mid 1980s. It was an initiative eying the replacement of the M1 Abrams main battle tank, the M2 Bradley infantry fighting vehicle, and the M109 self–

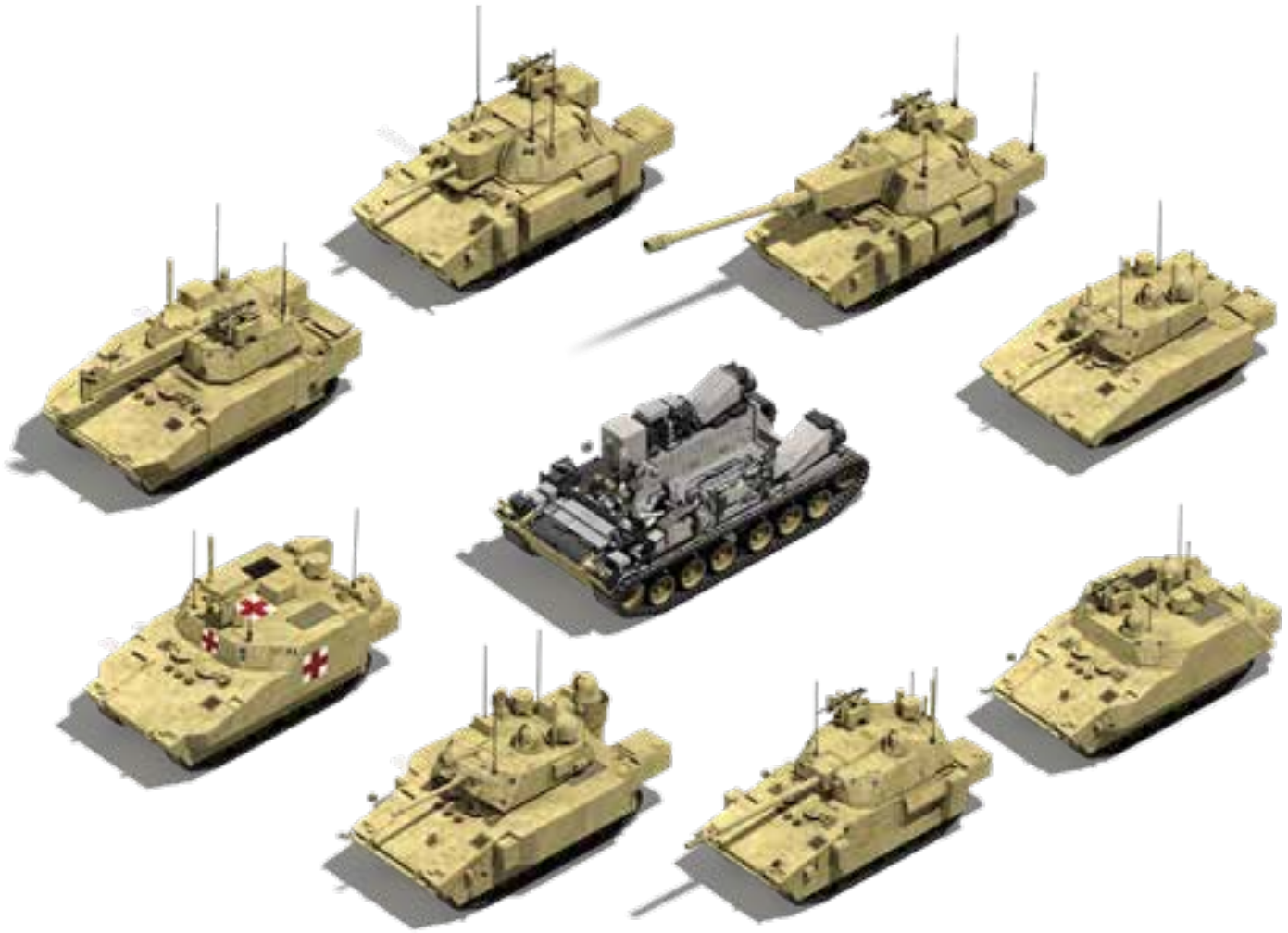
propelled howitzer by the next decade. The programme was renamed Armoured Systems Modernisation (ASM) when a replacement programme for M551 Sheridan was also included. In 1990, the US Army selected Teledyne Motors and Armoured Vehicle Technologies Associated to develop Advanced Technology Transition Demonstrators (ATTD) for the ASM programme. Full scale development was scheduled for 1997 and production by 2001. The Future Infantry Fighting Vehicle (FIFV) to replace the M2 Bradley would be based on the common heavy chassis for the new tank but with an engine at the front. The 2 crew platform would have a medium caliber gun and anti tank guided missiles. However, several issues gradually led to budgetary cuts, and finally the army cancelled the programme in 1992 following the collapse of the USSR.

Manned Ground Vehicles

The next attempt to replace the Bradley began in 1999, when the US Army initiated the "Future Combat System" (FCS) programme. The MGV was part of FCS for the replacement of a range of manned mobile platforms, including Abrams, Bradley and M109 artillery. Under this plan, a common medium chassis was envisaged, and the Active Protection System (APS) was given priority to balance the necessary protection in the absence of heavy armour. The medium platform would make air transport much easier. The intended XM1206 would be a two crew platform to carry nine soldiers and be equipped with 30 mm armament. The study found the weight of the platform would rise to 30 ton, much higher than the intended 19 ton! Initially, Boeing, SAIC, General Dynamics Land Systems (GDLS) and United Defense LP (UDLP) were to develop the MGV platforms. But in 2009, the budget cut ultimately resulted in the cancellation of the programme. The US DoD to have a heavier platform to provide necessary protection to the crew. So, MGV quickly got a replacement programme, the GCV.

Ground Combat Vehicle

The GCV programme was carried forward by BAE and GDLS (SAIC tried a failed entry). But this time both worked separately, and weight was reversed to the heavy category! Whereas in the MGV, the envisioned MBT would be as light as an IFV, the GCV would make an IFV heavier than even the current Abrams MBT! Thus, the GCV stood totally opposite the previous MGV. It was done to ensure adequate protection against IED and HEAT threats. But soon, the contractors realised the issue related to the air transportability of such a behemoth and had to work on bringing down the maximum possible weight in the most heavily armoured configuration. Under this programme, the IFV variant was given the highest priority. The IOC



MGV Family of vehicles (Image: Wikimedia)

was envisioned for 2018–2019 and full–rate production in the next year. In 2012, BAE (with Northrop Grumman) released their concept of the GCV. It would have a crew of three and carry nine squad members. It focused on enhanced situational awareness, surveillance, reconnaissance and embedded intelligence. And most impressively, it would be propelled by a hybrid electric drive (HED)! However, the biggest drawback of the platform was its weight: 63.5 tons (70 short tons). On the other hand, GDLS didn't reveal much about their project. The massive weight, reliance on ambitious but unproven technologies, and cost overruns were the main concerns. The GCV was cancelled in 2014 after spending around $1.5 billion in the last four years.

Next Generation Combat Vehicle

The NGCV started in 2015 as the Future Fighting Vehicle (FFV). However, for some time, it remained mainly an exploration to shape pragmatic and approachable future requirements. The Product Management Office (PdMO) was involved in providing technical expertise for the development. Within a few years, it was renamed the Next Generation Combat Vehicle (NGCV). Under the seven year, $700 million contract, the selected teams were to produce two prototypes by September 2022. The envisaged platform would have a two–man crew and a 50 mm gun. The vendors, BAE, GDLS and Raytheon/Rheinmetall showcased prospective platforms. In 2018, the programme was redesignated "Optionally Manned Fighting Vehicle (OMFV)" or more precisely, "OMFV–NGCV", where the new infantry fighting vehicle would be one of the development under broader NGCV.

XM30 concept from ARV (Image: Rheinmetall)

OMFV

In 2019, a Request for Proposal (RFP) was issued for the procurement of 3,590 platforms, and requirements were kept high. BAE withdrew following the high demand in the RFP while Raytheon/Rheinmetall bid was cancelled as they had failed to deliver the prototype in time. Though GDLS automatically became the single vendor, it reportedly failed to meet "critical issues with the requirement". The existing OMFV project was cancelled in January 2020 and reinitiated in February following an analysis and revision.

In the same year, the RFP was issued for the "Preliminary Design Phase". Soon, five companies were selected for participation: General Dynamics Land Systems, American Rheinmetall Vehicles, BAE Systems, Oshkosh Defense, and Point Blank Enterprises. In June 2023, the US Army announced the award of contracts to GDLS and ARV for the OMFV Phase III and IV detailed design, prototype build and testing phases. It was renamed the XM30 MICV with a two man crew and six dismounts. The GDLS team will consist of GDMS, AeroVironment, Applied Intuition, and GM Defense. Until the end of August 2023, their proposed concept hasn't been released. But according to many, the platform will have an ALAS–MC turret fitted to a modified Katalyst NGEA hull. While ARV will lead a team of L3Harris, Textron Systems, RTX, Allison Transmission and Anduril Tech. ARV calls their concept the "Lynx OMFV". It has a Lance 5030 turret equipped with L3Harris WESCAM MX–GCS MK3 sights and RTX MML to fire a wide range of anti–tank guided missiles. Both the GDLS and ARV OMFV will use the ARDEC XM913 50 mm gun and hybrid propulsion.

If everything goes well, the winner is to be selected for low rate initial production in 2027, with full rate production by 2029. So what was commenced in 1977, one can hope to witness its conclusion only in 2027!

Article by Sankalan Chattopadhyay
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Decarbonising in the Aerospace and Defence Industry

Image credit: airlineweekly.skift.com

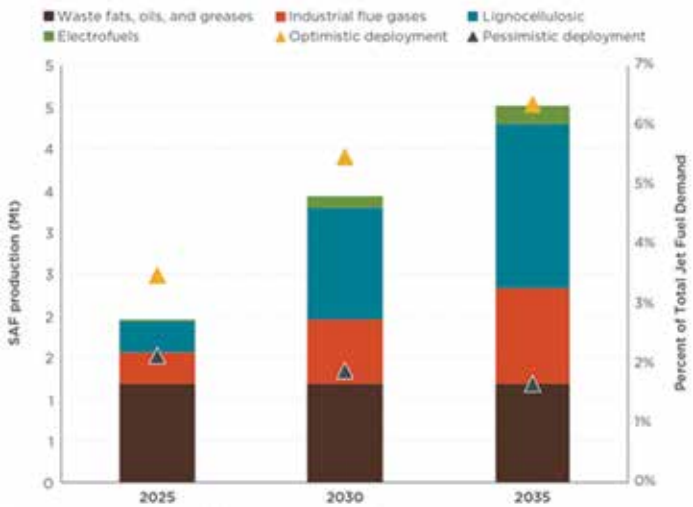
It was in 2007 when International Air Transport Association (IATA) announced to embark on its vision to achieve carbon neutral growth on the way to a carbon free future.

This was specifically meant to promote the concept of sustainable development and introduce its significance in the aviation domain as well, due to the fact that it would continue to play a significant role for the whole world and its economic survivability.

Furthermore, researchers and analysts had criticised the aviation sector for being the biggest source of carbon emissions in the environment, while the regulating authorities are not taking it as a serious concern. Therefore, certain measures needed to be studied and initiated. One of the principal strategies defined for a sustainable approach is decarbonisation.

As a term in the context of aviation, decarbonisation refers to efforts in the industry that are focused on reducing the carbon footprint and mitigating the environmental impact associated with aviation and defence operations.

The industry acknowledges its significant contribution to global carbon emissions and recognises the need to transition towards more sustainable practices.



Graph credit: energyindustryreview.com

Routes to Decarbonisation

Extensive research, collaboration and standardisation are among the core practices which need to be valued to gain excellence in the concept and roll out the desired solutions. There are active collaborations of the aviation industries with research institutions, government agencies and industry associations to accelerate decarbonisation efforts. One such collaboration is the Clean Sky Joint Undertaking (CSJU), which is in its 16th year. It has brought together Western companies, research centres and universities to develop innovative technologies for more sustainable aviation.

Image credit: energyindustryreview.com

Sustainable Aviation Fuels (SAFs) play a crucial role in decarbonisation. These fuels, derived from renewable sources like biomass and waste oils, have the potential to significantly reduce greenhouse gas emissions (such as sulphur oxides (SOx), nitrogen oxides (NOx), black carbon and particulate matter) compared to conventional fossil fuels. It can reduce the lifecycle greenhouse gas emissions by up to 80% compared to conventional jet fuel. This reduction comes from utilising renewable feedstocks, which can be blended with conventional jet fuel and used in existing aircraft without requiring any modifications to engines or infrastructure. This makes it a promising solution for decarbonising the aviation industry while leveraging the existing fleet.

Aerospace companies and defence organisations are investing in the research and development of SAFs and exploring their use in aircraft and military operations. Numerous companies and organisations in the aerospace and defence sector also started sustainable aviation fuels. For instance, Boeing has collaborated with airlines and research institutions to conduct test flights using SAFs derived from sources like cooking oil and plants. One such collaboration was made with GE Aviation, Seattle–based Imperium Renewables Inc and Virgin Atlantic which led to a successful test flight in February 2008. A B747 took off from London to Amsterdam carrying a 20% blend of biofuels in one of its engines. This marked commercial aviation's first major step in the way of decarbonisation.

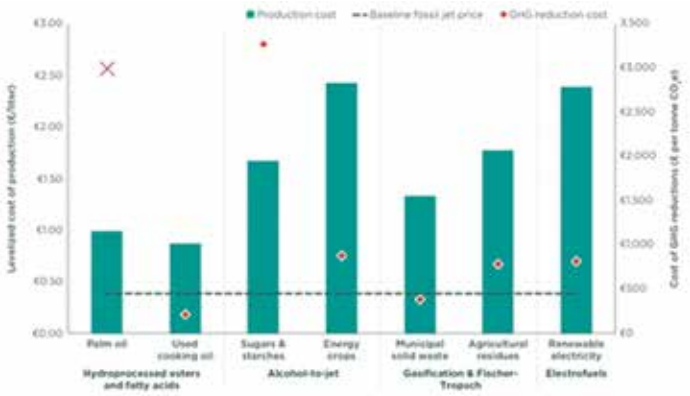
The US Air Force has also conducted successful flights, involving both transport and combat aircraft, using a 50/50 blend of traditional jet fuel and biofuels. This was part of its Great Green Fleet Initiative, which was launched in 2010 under its commitment to energy conservation and sustainability. The initiative aimed to demonstrate the use of biofuels in its aircraft and vessels during operations. The Alternative Fuels Certification Office (AFCO) was also established by the USAF to facilitate the certification and adoption of alternative fuels, including biofuels. The office works with industry stakeholders, government agencies, and research institutions to evaluate the safety, performance, and sustainability of biofuels and other alternative aviation fuels.

Another approach is the advancement of electric and hybrid electric aircraft technologies. Electric propulsion systems have the potential to drastically reduce emissions, particularly for short haul flights and urban air mobility.

Aerospace companies are actively working on the development of electric aircraft prototypes and investing in research to enhance battery technology and charging infrastructure. Electric propulsion technology is being developed and tested by certain giants. For example, Airbus has been working on the development of the fully electric E–Fan X aircraft, which aims to demonstrate hybrid electric propulsion. Additionally, startups like Joby Aviation and Lilium are working on electric vertical take–off and landing (eVTOL) aircraft for urban air mobility.

Improving energy efficiency is essential for reducing carbon emissions. This involves utilising lightweight materials like carbon fibre composites, which reduce the overall weight of the aircraft and lead to fuel savings. Optimising aerodynamics and adopting more efficient engine technologies also contribute to increased fuel efficiency and reduced emissions.

Aerospace manufacturers are incorporating lightweight materials to improve fuel efficiency and reduce emissions. Boeing's 787 Dreamliner features a significant amount of carbon fibre reinforced polymer composites, reducing weight and improving fuel efficiency. Airbus has also made progress in this area, with its A350 XWB utilising advanced composite materials. Additionally, aircraft manufacturers are continually optimising aerodynamics and engine technologies to improve efficiency.

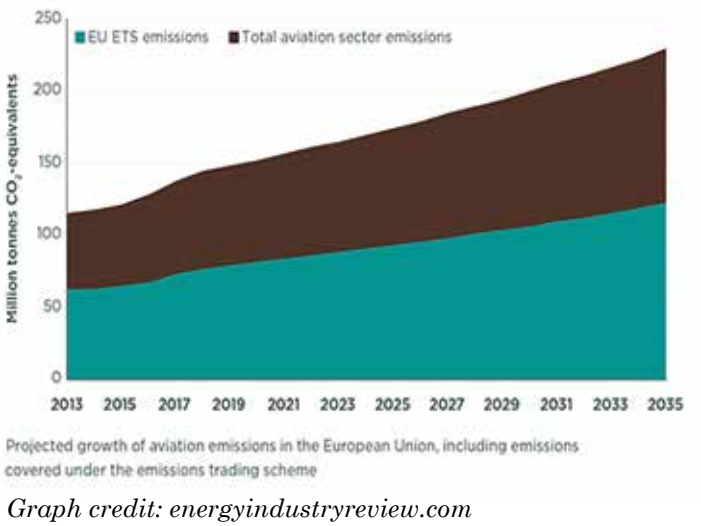


Graph credit: Pavlenko, Searle and Christensen

Operational improvements are crucial in minimising emissions. Aerospace and defence organisations focus on optimising flight routes to reduce fuel consumption, implementing more efficient ground operations, and utilising advanced air traffic management systems to improve airspace utilisation. These operational changes can result in significant emission reductions across the industry. There are already certain protocols and

operational measures implemented to reduce emissions. For example, there are advanced air traffic management systems to optimise flight routes, reducing fuel consumption and emissions. Initiatives like Single European Sky ATM Research (SESAR) aim to enhance European airspace utilisation and reduce the environmental impact of air transportation.

To demonstrate their commitment to decarbonisation, many aerospace companies and defence organisations have set ambitious net zero targets. These targets drive innovation and encourage the adoption of sustainable technologies and practices throughout the industry. By aligning their operations and investments with these targets, stakeholders aim to achieve carbon neutrality by specific deadlines. Airbus, for example, has committed to becoming a net zero emission company by 2050. The US Air Force has also set goals to achieve net–zero carbon emissions from its flight operations by 2050.



Projected growth of aviation emissions in the European Union, including emissions covered under the emissions trading scheme

Graph credit: energyindustryreview.com

India on Decarbonisation

India has also shown a growing interest in the development and adoption of aviation biofuel, to join the global efforts to reduce carbon emissions from the aviation sector. The Indian government, in collaboration with various stakeholders, has been taking steps to promote the production and use of SAF in the country.

The Indian government has recognised the importance of SAF and included it in the National Civil Aviation Policy 2016. The policy encourages the development and use of biojet fuels to reduce greenhouse gas emissions from the aviation sector. India has been investing in research and development activities to explore and develop sustainable aviation fuel technologies suitable for the country's context. Several research institutions, including the Council of Scientific and Industrial Research (CSIR) and the Indian Institute of Petroleum (IIP), are working on developing biofuels for aviation. On 28 August 2018, a Spicejet Bombardier Q400's right engine was filled up with 25% biofuel (made from the Jatropha plant) developed by CSIR–IIP. The 40–minute was a landmark event due to the fact that India was among the first in the league of developing nations to successfully carry out a demo flight with biofuel.

Experimental Test Pilots and Test Engineer from IAF's premier testing establishment ASTE pose for photos after flying India's first military flight using blended biojet fuel on the An–32 transport aircraft. Image: PTI

In December 2018, an Indian Air Force An–32 transport aircraft also flew with 10% of the same biofuel. But this was not the sole flight and multiple test flights were continued which led to official certification of the biofuel to be a standard on the An–32 fleet.

Commercially, these flights also aim to raise awareness, build confidence and encourage the adoption of SAF among airlines and stakeholders. The Indian Air Force also supports the idea of reducing its fuel costs by adopting biofuel and expanding it to cover the rest of the fleet as well. India has set ambitious targets to increase the share of biofuels in the aviation sector, aiming for 10% blending of biojet fuel by 2030. The government is also working on establishing a conducive policy and regulatory framework to facilitate the production, distribution, and use of aviation biofuel.

India has abundant biomass resources, including agricultural residues, non–edible oil seeds, and waste materials, which can serve as potential feedstocks for aviation biofuel production. The government has been promoting the use of these feedstocks for biofuel production through various initiatives. India has also engaged in partnerships with international organisations and industry players to promote the development and use of aviation biofuel.

In November 2021, state–owned Hindustan Aeronautics Limited (HAL) and US–based ZeroAvia announced their partnership for research and development of a hydrogen–electric powertrain, based on its existing ZA600 engine, to power the Hindustan–228 aircraft, which is HAL upgraded derivative of Dornier 228. ZeroAvia had also conducted the first test flight of its Dornier 228 testbed, fitted with ZA600, on 19 January 2023, resulting in positive results.

While India has made significant progress in promoting aviation biofuel, there are challenges to overcome, such as the high cost of production, limited infrastructure and ensuring a sustainable and scalable feedstock supply. Continued government support, industry collaboration, and technological advancements will be crucial in realising the full potential of aviation biofuel and fully implementing decarbonisation in Indian airspace.

HAL is collaborating with ZeroAvia to develop hydrogen–electric powertrain for Dornier 228 Zero Emission Aircraft. HAL and ZeroAvia engineers will integrate ZeroAvia's ZA600 hydrogen–electric powertrain into the Dornier 228 airframe.

Globally, decarbonising the aerospace and defence industry is a complex challenge, but the industry recognises the urgency of addressing climate change. Through technological advancements, policy support, and collaboration, the industry is actively working towards a more sustainable and environmentally friendly future. What was started as merely an idea to counter global issues has turned into a full fledged strategy today and many key players have emerged throughout time who are dedicated in the efforts to provide the necessary solutions revolving around the feasible, efficient, affordable, and most importantly, and sustainable approach to a safe, reliable and environment–friendly future of aviation.

Article by: Rishav
(Twitter @_devildog_rv_)

Sustainable Aviation Fuel in India: Groupe ADP, GMR Airports, Airbus, Axens and Safran sign MoU

Airport operators Groupe ADP and GMR Airports together with Airbus, Axens and Safran signed an MoU in March 2022 to conduct a joint study on Sustainable Aviation Fuels (SAF) and their potential in India. The objective of the study, conducted under the lead and coordination of Groupe ADP and GMR Airports and with the expertise of all partners, is to understand and evaluate the demand, the challenges and opportunities of supply, infrastructure and fueling, as well as to prepare a business case for SAF production and use in India for all kind of aviation purposes.

SAF is a clean substitute for fossil jet fuels. Rather than being refined from petroleum, SAF is produced from sustainable resources such as waste oils from a biological origin, agri residues, municipal solid wastes or algae. SAF produced using the most advanced pathways can provide CO2 emission reduction of up to 85% across the entire SAF lifecycle.

In India, already the 3rd largest domestic aviation market in the world and with a forecasted yearly growth of about 9% going forward, SAF use will be a key element to achieve the targets of carbon reduction and net zero target of the country by 2070, set by the Indian Prime Minister Narendra Modi. Considering the crucial role SAF is going to play within Aviation sector in coming years, it is imperative to evaluate and map the requirements of SAF, feedstock availability, fuel production technologies, logistics systems and airport infrastructural planning at Indian Airports and make it future ready. The joint study on Sustainable Aviation Fuels will help Indian aviation sector in assessing all these critical factors and help them gear up for the future. The study will also review the regulations in place and what could be the necessary evolutions to permit to the SAF to take off in the operations. In addition, this study will also evaluate the business model and feasibility of the implementation of a pilot project in an appropriate location in India, which could be taken up in a second phase by the partners.

World first 100% SAF transatlantic flight closer to takeoff

Virgin Atlantic and Rolls–Royce have confirmed the successful Sustainable Aviation Fuel (SAF) blend ground test on the Rolls Royce Trent 1000 engine. The test marks a key milestone in the project which will see the world's first 100% SAF flight travel across the Atlantic from London Heathrow to New York JFK on a Boeing 787, set to take off on 28 November 2023. SAF blend of 88% HEFA and 12% aromatics completes successful ground test on Rolls–Royce Trent 1000 engine, a key milestone in approvals process. Fuel supplier announced as Air bp and Virent, who will supply the 60 tonnes of SAF required for project.

Silent Skies: Enhancing aviation with quieter flight

A leading innovator in the aviation industry, is poised to seize the abundant opportunities in the rapidly expanding electric aircraft market, as forecasted by the latest Visiongain report on the global electric aircraft industry. According to the report titled "Electric Aircraft Market Forecast 2023–2033," the electric aircraft market is experiencing exponential growth, driven by increasing environmental concerns, advancements in battery technology, and rising demand for sustainable air travel solutions.

As a pioneer in aviation innovation, the key player has been at the forefront of developing cutting edge electric aircraft technologies, aimed at reducing carbon emissions and transforming the future of air transportation. A team of dedicated engineers and researchers have been working to bring forth revolutionary electric aircraft concepts that promise to redefine efficiency, affordability and sustainability in the aviation sector.

Technological advancements play a vital role in driving the development and adoption of electric aircraft. Continued innovation in battery technology, electric motors, power management systems, and lightweight materials are expanding the capabilities and feasibility of electric propulsion in aviation. Improvements in energy storage density, charging infrastructure, and range capabilities are being pursued to meet the demanding requirements of commercial and general aviation.

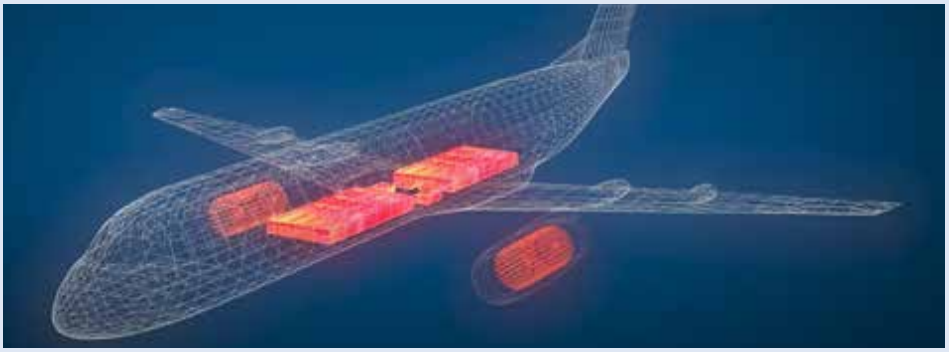
ZeroAvia completes Dornier 228 flight test campaign

ZeroAvia has announced the completion of its initial prototype ZA600 flight testing campaign at Cotswold Airport in the UK. The 10th flight in the initial series has been completed and saw a cruise test to establish projections for future ranges using the system, thus teeing up the first cross country flights as the next stage of testing and demonstration.

Installed prototype ZA600 hydrogen electric engine meets highest anticipated performance threshold, paving way for successful certification work.

Scalable electric solution for all aircraft sizes

EASIER, a project funded by the European Commission, has come to an end. The consortium of parties from five different European countries has been able to develop enabling technologies for scalable solutions that deal with increased electric power levels of (hybrid) electric aircraft. Hybrid electric propulsion is one of the pillars underpinning sustainable aviation. This will significantly increase the electric power levels on board aircraft, introducing thermal and electromagnetic challenges. These challenges presented by aircraft electric propulsion require the development of new airborne technologies that enable expanding the electrification technology trend already impacting other areas, like ground transportation or the autonomous generation/usage of electricity from renewables, to efficient and economical air transportation.



SAF for Dassault Falcon's in Little Rock

All customer acceptance and departure flights from the Dassault Aviation completion facility in Little Rock, Arkansas, will use sustainable aviation fuel (SAF). The use of SAF at this site is part of the SAF plan implemented by Dassault to reduce the carbon footprint of its aviation operations. Under this plan, all flights operated by company–owned Falcon aircraft, whether for business, transport or Falcon support, are using SAF blends.

SAF offers carbon emission reductions of 80 to 90% compared to conventional jet fuel when used in its concentrated form. All Falcon aircraft are certified to use up to 50% SAF blends. The new Falcon 10X ultra long–range twin will be compatible for a 100% SAF blend from entry into service.

Safran's decarbonisation strategy

Safran considers the sustainable fuel (SAF) sector as a vital lever to meet its decarbonisation goals in air transport. Its main advantage compared with other solutions is that it can be used in our existing engines. "We talk about "drop in" fuels which can be mixed with kerosene, or even potentially used pure, without any changes needing to be made to the aircraft, operations, or logistics infrastructure. Although the Group doesn't produce SAF, it has every intention to contribute to their development. All our engines (airplanes and helicopters) are certified to incorporate up to 50% SAF. Also, over the last few years, Safran has increased its flight tests with engines using up to 100% SAF and, in 2021, signed a major partnership to this end with Total Energies", stated Safran officials.

Building on this expertise, Safran helped prepare the ReFuelEU Aviation initiative launched by the European Commission in 2021. This agreement stipulates that from 2025, aviation fuels must incorporate at least 2% SAF. This proportion will increase every five years to reach 70% in 2050. In 2022, this commitment resulted in Safran being asked by the European Commission to head up the aviation domain of the Renewable and Low Carbon Fuels (RLCF) Alliance, with the aim of rolling out, on a massive scale, production of these sustainable fuels for the aviation and maritime sectors in Europe.

Image credit: TotalEnergies

Boeing, NASA, UA to test SAF

In a collaboration to strengthen sustainability in aviation, Boeing is partnering with NASA and United Airlines for in–flight testing to measure how sustainable aviation fuel (SAF) affects contrails and non–carbon emissions, in addition to reducing the fuel's life cycle climate impact.

Boeing's second ecoDemonstrator Explorer, a 737–10 destined for United Airlines, will fly with 100% SAF and conventional jet fuel in separate tanks and alternate fuels during testing. NASA's DC–8 Airborne Science Lab will fly behind the commercial jet and measure emissions produced by each type of fuel and contrail ice particles. NASA satellites will capture images of contrail formation as part of the testing.

The researchers aim to understand how advanced fuels, engine combustor designs and other technologies may reduce atmospheric warming. For example, tests will assess how SAF affects the characteristics of contrails, the persistent condensation trails produced when airplanes fly through cold, humid air. While their full impact is not yet understood, some research has suggested certain contrails can trap heat in the atmosphere.

Embraer's Phenom 300E and Praetor 600 in SAF tests

Embraer has successfully tested the Phenom 300E and Praetor 600 on 100% neat sustainable aviation fuel (SAF). The tests, with one engine running on 100% SAF, were performed at Embraer's Melbourne facility and provided significant insight into systems' performance when utilising blends up to 100% SAF, which was provided by World Fuel. The tests had collaboration of the engine and fuel system suppliers Honeywell Aerospace, Parker, Pratt & Whitney Canada and Safran.

The use of SAF is a critical part of Embraer's commitment to sustainability, and this milestone demonstrates the company's dedication to adapting current products to be as sustainable as possible and promoting its adoption among customers and in the industry. SAF is a renewable energy source that can reduce greenhouse gas emissions by up to 80% compared to traditional jet fuel, making it a crucial part of Embraer's targets of reaching carbon–neutral operations by 2040 and support the aerospace sector to achieve the net zero emissions target by 2050.

GE Aerospace and fuel cells plus SAF

Following the successful completion of the design phase of its FLyCLEEN project, ARPA–E has awarded GE Aerospace Research $4.5 million in Phase 2 funding to take the next step of building and demonstrating a 25kW power generation subsystem integrating solid oxide fuel cells with a SAF powered gas turbine for hybrid electric propulsion. The use of fuel cells could vastly improve the efficiency of converting the chemical energy from SAF into electric power and move closer to net zero CO2 emissions.

1962 War Series

Daulat Beg Oldie (DBO): The Gateway to Hell

The Indian Army was given responsibility for the Northern Borders in April 1960. The 114 Brigade under Brigadier IJ Rikhye, was inducted in Ladakh. Its battalions, 14 J&K Militia, were in charge of the area north of the Galwan River. The 1/8 Gorkhas were responsible for the area between Galwan and Chushul, while the 7 J&K Militia were looking after the southern territory, consisting of the Indus Valley. In April 1961, Brigadier Rawind Singh Grewal, MC of 114 Brigade, ordered the establishment of a post at DBO. A platoon of 14 J&K Militia was given the responsibility to establish a post at Daulat Beg Oldie, also termed the Gateway to Hell by old traders. It was 16 kilometres southeast of the Karakoram Pass, situated at 16–17,000 feet on the north bank of Chip Chap river. Survival in the terrain and severe weather was challenging here, and the enemy came after that. Ladakh's connectivity was also poor, with only a Jeepable road connecting Chushul and Leh. Air supply was the only way to keep posts operational.

Jat

Lt Col Bakhtawar Singh CO 5 Jat

Chivalrous Charlie

On 9 May 1962, a platoon of Charlie Company of 5 Jat under Lt Prem Singh was flown from Srinagar to Thoise, and the rest of the company was in Leh with Bn HQs. This party was seen off by the Defence Minister VK Krishna Menon himself. Thoise was also the Battalion Headquarters of 14 J&K Militia, which had already been operating in the DBO sector for a year.

Daulat Beg Oldie was only utilised by helicopters, therefore troops in Thoise established an airfield to receive Dakotas. Soon the troops from Jat were helo–lifted and sent to DBO; this move was completed by 25 May.

The remaining Charlie Company at Leh was sent to Srinagar, and from there, a platoon was airlifted and sent to Thoise. Now troops of Jat and Militia marched on foot, which took them 12 days to reach DBO. At DBO, all posts of the Indian Army were located on the eastern heights of the valley. In the meantime, troops had made the airfield at DBO serviceable enough to take heavy aircraft.

In the month of July, Major Bhairon Singh rejoined the unit after his tenure as a commandant with the CRPF in Neemuch. On 23 July, he took the last platoon with him to DBO in a Packet aircraft piloted by Sqn Ldr CKS Raje and Sqn Ldr John Philipose. It was the first time a packet aircraft landed at DBO. Men who were on leave or courses were directly airlifted from Srinagar to DBO without acclimatisation.

Now, the whole Charlie Company had reached DBO, and it was put under the command of Lt Col Nihal Singh, CO 14 J&K Militia. A small garrison was also established in DBO, which was under the command of Major SS Randhawa, who was the 2–IC of the 14 J&K Militia.

Jats at DBO

Charlie Company had Major Bhairon Singh, Subedar Raghubir Singh, Lt Prem Singh and 2/Lt HC Gujral at its HQs near the airfield and the rest of the company was divided into small posts:

8 Platoon at Bhanu under Jemadar Budh Ram

2 Sections of 9 Pl at Arni–I under Hav Maru Ram

1 Section of 9 Pl at Arni–II under L/Hav Dharam Singh

1 Section of 7 Pl at Filter II under Subedar Karan Singh

1 Section of 7 Pl at Trikal

1 Section of 7 Pl at Dabu

Charlie Company also had OPs at Jagmag and Prayogi. One section of 3" mortar was also attached to this

Lt Col Nihal S, CO 14 Militia with Maj Bhairon S

company but this section was deployed in support of 14 J&K Militia located on the South bank of Chip Chap.

Days were going by, and this company—scattered throughout a large, barren area of varied altitudes—was likewise having logistical difficulties. Since melting snow posed a constant hazard throughout the day, it was only possible to cross the passes at night or very early in the morning.

Transportation options were limited to yaks and ponies. Because it was so cold outside, weapons had ceased functioning. To defrost the weapons, Major Bhairon proposed a technique that involved passing hot water through them. Wireless used to occasionally give up too. The Jats from the plains held their position in the face of overwhelming odds. On the eve of the war's first day, the Chinese began to gather and bring heavy weaponry. At Qizil–Jilga, they had a regiment with two units attacking and one reserved. Posts of 14 J&K Militia were attacked at the same time on 19 October at 2300 hrs. The enemy quietly passed by these posts and set up a MMG in front of Bhanu. After knowing this, Major Bhairon ordered Jemadar Budh Ram to take 15 men along with him and establish another post named Prahar. Now Bhanu was under the command of Nk Bare Singh.

The Battle

The Prahar post, under Jemadar Budh Ram, was bombarded early on the 20th, and enemy infantry stormed the position around 0630 hrs. Since this was the first attack on 5 Jat, Budh Ram communicated with his company commander about this. The CO was briefed by Major Bhairon Singh about the attack at DBO. After hearing this, CO rushed in a chopper from Leh to DBO to acquire first hand information of the happenings. Three enemy attacks were successfully repelled at Prahar, and the enemy suffered severe casualties, but by the evening, ammunition was running low. Prahar had lost Sepoy Jai Lal during the last attack. This post was asked to be withdrawn after it went completely dark.

When Bhanu's Nk Bare Singh headed outside and came upon a Chinese gun position, the enemy believed he was going to lob a grenade. The enemy fired when it saw him approaching. All day long, Nk Bare Singh stayed out in the open with no supplies as the firing continued.

Troops being evacuated from Thoise

Troops of 5 Jat extricating a stuck Jeep

Suddenly, the enemy assaulted Bhanu from behind around 1600 hours after Bare Singh had miraculously withdrew to his post. A burst of LMG injured Sepoy Jai Lal in the leg, and after two hours of fighting, Sepoy Arjun Das was killed. By 1800 hours, the post was withdrawn because no reinforcements could be deployed. Nk Bare Singh, Sep Shalu Ram, and one OR covered the withdrawal, but one OR got killed, and Bare Singh and Shalu Ram got captured by the enemy. Shalu Ram somehow managed to escape the captivity, and he joined troops at Arni–I.

Havildar Maru Ram's Arni–I came under intense bombardment; in the evening, the troops from Bhanu joined this post. The soldiers battled a nighttime infantry assault. The Chinese pounded this position once more the next day and rained heavy automatic fire. Arni–I lost two soldiers this time. Chinese began to surround and advance; this cordon posed a serious danger to Dabu post, which was located near the Line of Control of Arni–I and II. On the 20th, Dabu was targeted throughout the day and night. These posts withstood intense fire.

Arni–II is a section post under L/Hav Dharam Singh. The post was within range of an enemy MMG. The enemy used similar pressure tactics that it used elsewhere. But the section remained unfazed. On 22 October, the day began with continuous automatic gunfire and heavy mortar shelling. The enemy was stronger than them, and Dharam Singh was aware of this. When the enemy waves attacked, he used a unique strategy, allowing two men with a single LMG to fire sporadically against the enemy. Others were placed on the flanks and returned fire. To give the enemy the impression that there were more people at the post, he ordered everyone to constantly switch positions. Dharam Singh kept moving his men around and made efficient use of his ammo, not wasting a single round. Despite a shell wound on his leg, he did not lose spirit and repelled the assault for three days.

On 22 October 1962, at 1200 hrs, No. 12 platoon of Zulu Company of 1 Mahar (MMG) under Jemadar Bhimu Kamble was pulled out of Uri. This platoon and RCL guns were airlifted to Daulat Beg Oldie. The platoon, though not acclimatised to high altitude, went into action immediately but had to fall back because the route, a few miles beyond Daulat Beg Oldi, was blocked by the Chinese. They were then given the task of preparing the defence of Daulat Beg Oldi airfield. Not a single support element was used in the whole battle in support of either the Jats or the Militia.

Every position was running short on ammunition on the third day of war. Dabu and Arni–I were asked to abandon, L/Hav Dharam Singh was also ordered to pull out from Arni–II and retire with his section to DBO after his soldiers staged an unwavering stand for three days.

The Confident Commander

2/Lt HC Gujral, who was platoon commander of No. 9 Platoon with 15 men, came to save his men, who were waiting to be evacuated. The Chinese had cordoned the whole vicinity of these posts, but Gujral, a young man, broke through the cordon and evacuated his wounded men in his Jeep, and he did the same action three times. After this, Gujral went inside the cordon and reorganised the post, and during the night he was ordered to withdraw to DBO, but in the pitch dark, four ORs became POWs, including Sepoy Shalu Ram, who had once escaped enemy captivity. Sepoy Bhim Singh, who was operating the LMG, volunteered to stay with the party, which was detailed to bring back casualties. This party, while withdrawing, lost its way in the dark. Charlie Company had lost five men, and six were captured.

The Withdrawal and Aandhi Company

The 20th and 21st had seen the collapse of 18 posts, and DBO was surrounded. Following his request for a retreat from the Brigade on 22 October, Lt Col Nihal Singh, the Battalion Commander, received an order from the XV Corps to evacuate to a more secure location. The helicopter pilot was also informed by Major Randhawa that Leh might be seriously threatened by the Chinese concentration.

All of the posts on Chip Chap's two banks were either removed, destroyed, or taken over late on 23 October. The Brigade gave the order for C Coy 5 Jat and the soldiers of 14 J&K Militia to leave the DBO post on 24 October at 1800 hours. The operation started around 2100 hrs. Now the only way out was a treacherous western route via Gapshan, Shiok, and Saser Brangsa. The Battalion Commander also transmitted an erroneous message to the Brigade in an attempt to divert the attention of the Chinese who were

DBO column retreating

intercepting the radio conversation. Retrenchment forces destroyed weapons such as 3" mortars, recoilless guns, radio equipment, and supplies.

Together with 2/Lt HC Gujral, Subedar Raghubir, and Jemadar Budh Ram, Major Bhairon organized a column of 200 troops, one RMO, and one engineer officer. Troops from the ITBP, IB, Militia, and Jats formed this column. There were three parties involved in the withdrawal, with Major Shardul Singh Randhawa leading the advance party since he knew the troops in his battalion and the routes properly.

Captain SP Rigzin led the rear party, while Major Bhairon Singh and CO Lt Col Nihal Singh led the main body. Now each man received 100 rounds and a personal firearm. Under the leadership of Jemadar Bhimu Kamble, the platoon of 1 Mahar (MMG) attached to the battalion refused to annihilate its Vickers MMG and instead took them along with themselves. It was a difficult withdrawal. Despite the threat from the Chinese, Jemadar Kamble returned with his six men after learning that one of his platoon's guns had gone missing. They slipped inside the abandoned position next to DBO, took the gun, and escaped.

Just a small number of vehicles were present, comprising a couple of jeeps and one tonne trucks carrying wounded and sick personnel. These vehicles were operating on the frozen surface of the river, but the weight of the vehicles soon caused the surface to give way, forcing the vehicles to be abandoned.

In order to cover the withdrawal, the rear party platoon occupied up a dominating position in DBO. On 25 October, at first dawn, they withdrew. Following a two–day march, Sepoy Bhim Singh and their party, who had lost their way on 23 October, found themselves at this location. A test of their stamina and conditioning, the column was fatigued and heavy laden as it made its way to Saser Brangsa. Running short on food, these troops marched nonstop for eighteen days. In the mountains they were somewhat lost. All by itself.

Three glaciers were encompassed by this column, with the longest one being eight miles. A reconnaissance plane saw the column when it arrived at Saser La. Supply and food were dropped by this aircraft. The men were eating adequate chow after eighteen days. Helicopters were used to evacuate casualties for three days. After halting for six days at Saser La, this column proceeded across the pass to its destination at Thoise. The soldiers were suffering from blisters, frostbite, and other high altitude ailments.

All those affected had been evacuated from Thoise and sent to hospitals in Jammu and Srinagar. Charlie Company was nicknamed Aandhi Company (Blind Company) because its soldiers got lost in the mountains; it took the company three to four months to rejoin the battalion in Durbuk.

After the 23 October, there was no fighting in the DBO sector until the official ceasefire on the 21st of November. The troops fought with grit, determination, and bravery. 2/Lt HC Gujral and L/Hav Dharam Singh were awarded Vir Chakra for their gallant actions in the DBO sector.

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Photos specially arranged by the author. CO's photo courtesy family of Lt Col Bakhtawar Singh.

Independence Day: The man who set up the joint check post at Attari–Wagah border in 1947



Major General Mohindar Singh Chopra

On 15 August, Independence Day, a huge crowd will throng the Attari–Wagah Joint Check Post (JCP) on the Indo–Pak border near Amritsar. Most of them will be unaware that for two months after the Partition there was no designated border between the two countries on this road connecting Amritsar and Lahore. It was Brigadier (later Major General) Mohindar Singh Chopra, who took over the 123 Infantry Brigade at Amritsar in October 1947, who put up a sentry post at the border which later turned into a JCP. Having organised a referendum at Sylhet in Assam before taking up his present assignment, Brig Chopra was aware of the enormity of the task at hand, given the precarious situation of sectarian clashes when he took over the brigade in Amritsar.

In his Order of the Day issued on 11 October 1947, after assuming command of the brigade, Brig Chopra emphasised the need for peace in Amritsar district without delay. "Be an enthusiast, and go forward with the task of restoring peace and tranquility and foster brotherly relations, remember the only way to ensure safe evacuation of your kith and kin is to allow Muslim convoys to go untouched…," he wrote in the order to the rank and file of the brigade.

Brig Mohindar Singh Chopra escorting the then Punjab governor C M Trivedi at the newly established joint check post at Attari–Wagah.

In the initial days, there was no thick white line in the middle of the Grand Trunk Road dividing the border of India and Pakistan. A barrier with two drums on either side was put up along with flagstaffs. Emotional scenes have been recounted by refugees from India and Pakistan upon reaching this visibly marked border as they fell down and kissed the land of their respective countries, relieved at having made it across the border alive. A discerning visitor can still see a plaque at the bottom of the flagstaff on the JCP which bears the words: "Foundation

stone of this flag staff was laid by Brig Mohindar Singh Chopra on 11th Oct 1947".

As per details provided by his grandson Karanjit Singh Chopra, Major General Chopra was from one of the first

batches of King's Commissioned Indian Officers of the Indian Army, having graduated from the Royal Military College at Sandhurst in England in 1928. Born in 1907 in Amritsar, he did his schooling at the Prince of Wales Royal Indian Military College at Dehra Dun before being selected for Sandhurst.

After first attachment with the 1st Royal Fusiliers in Ambala and Kasauli, he was transferred to the 1st

Rajputs. In 1932, he became the first Indian officer to join the famous 6th Royal Battalion of the 13th Frontier Force Rifles at Hanguin. In 1941, he graduated from the Staff College at Quetta and served with the Iraq–Persia (Paiforce) and in the Burma Theatre during the Second World War.

Chopra was promoted to Lieutenant Colonel in 1946 and took over as the first Indian Commanding Officer of the 1 Assam in Shillong. He was appointed Commander

Plaque on the flagstaff at the Joint Check Post at Attari. Pushpindar S. Chopra (Maj Gen MS Chopra's son) stands alongside the plaque.

of SYLFORCE in July 1947 to maintain law and order during the conduct of the referendum in Sylhet on whether the district in Assam would join India or Pakistan.

After the Partition, he took over the command of the 123 Infantry Brigade in Amritsar in October 1947 and was entrusted with ensuring the safety of the refugees travelling in and out of Amritsar district.

In 1949, he was promoted to Major General and was tasked with resurrecting the famous 5th Infantry Division, then scattered along most of north and eastern India. In 1950, Maj Gen Chopra was appointed Colonel of the 5th Gurkha Rifles (Frontier Force) and three years later, he took over as GOC 20th Infantry Division, the last division to have troops stationed in Tibet.

In February 1952, Maj Gen Chopra survived an air crash which would have wiped out the entire senior leadership of the Army. A de Havilland Devon aircraft of the Indian Air Force crashed near Lucknow. On board were GOC–in–C Western Command Lieutenant General S M Shrinagesh (Later Chief of the Army Staff), Chief of General Staff Maj Gen SPP Thorat (later GOC–in–C Eastern Command), Quarter Master General Maj Gen KS Thimayya (later COAS), Maj Gen Chopra, Military Secretary Maj Gen Sarda Nand, and Brigadier Ajaib Singh, apart from the aircraft crew.

After his retirement in 1955, Maj Gen Chopra became India's first Ambassador to the Republic of the Philippines until 1959. On returning to India, he was appointed the director of the National Institute of Sports in Patiala. He held that post until 1968. Maj Gen Mohinder Singh Chopra passed away in 1990.

Devon of the IAF and the generals who survived

Written by Man Aman Singh Chhina

The article first appeared in The Indian Express, 13 August 2023
All images courtesy: Maj Gen MS Chopra's family

Frisian Flag 2023

The international exercise Frisian Flag 2023 took place at Leeuwarden Air Base. From 2 October 2023 until 13 October 2023, two waves were flown every day from Monday to Friday. These waves took place in the morning between 9:30 AM and 12:00 PM and in the afternoon between 1:30 PM and 4:00 PM. On 13 October, only the morning wave was flown and in the afternoon the participants left for home and therefore the exercise. The unrest in the world and an ongoing war on Europe's eastern border makes it once clear again that peace and security cannot be taken for granted. Well trained units are therefore of great importance to keep the Netherlands and NATO territory safe and to defend them if necessary, now and in the future.

Commodore Johan van Deventer is the commander of Air Combat Command (ACC) of the Royal Netherlands Air Force. This command covers all the Dutch Air Force unit that combines all the F–35A Lightning II and F–16AM Fighting Falcon fighter operations and MQ–9 Reaper operations. Also the fighter control, targeting and network management are part of this organisation within the air force. The ACC units are all based at Leeuwarden Air Base, Volkel Air Base and the Air Operations Control Station New Millingen. Van Deventer says, "Today we're here at Leeuwarden Air Base, because Leeuwarden is the centre of all we do in the next two weeks during the exercise Frisian Flag. This exercise is our annual exercise where we train high–end fights with lots of aircraft of an International coalition. We bring that coalition here to Leeuwarden and we train whatever we need to do. We have here the greatest airspace of Europe to do it and we have the greatest unit of Europe that can organise it. Next to that we are here with all the participants from the different nations".

Recent Air Policing missions over the eastern flank of NATO territory, as well as past missions such as over Kosovo, Afghanistan and Iraq, have proven that international cooperation is indispensable. All differed greatly in terms of threat level and task for the pilots. The war in the Ukraine shows once again the necessity for airpower. Because only airpower can create the preconditions needed to gain freedom of movement on land, at sea and in the air. To protect both our national and NATO integrity, integration of air capabilities is crucial. NATO–Allies need to be ready to face any kind of threat, at all times. They need to rely on each other, know what to expect from each other and be able to work alongside. Exercises like Frisian Flag provides the alliance the training that is needed.

During Frisian Flag 2023, pilots are prepared for various

situations involving operations in an international context. Complex scenarios provide training in defensive missions, such as monitoring airspace or protecting supporting aircraft, and in offensive missions, such as attacking airspace to gain the upper hand, but also attacking ground targets. This makes Frisian Flag a valuable exercise to participate in for both young pilots and experienced flight commanders. Commodore van Deventer explaining the reason why an exercise of this scale is needed for all involved parties, "Especially in this time frame we're living in it's very important to do that coalition operation and to do that high end training, because war might start tonight and tonight we must be ready as the Royal Netherlands Air Force but definitely as the NATO Air Force together. With all our allies we have to be ready to execute as one single team. How are we able to go and do that, well that's done by exercising and by training and that's what we do here the next two weeks at Frisian Flag 2023".

and to participate in future international missions. This is exemplified by the homebased deployment over Poland in 2022, in response to the Russian invasion of Ukraine. Within hours of the invasion, at the request of NATO, the

Importance Frisian Flag

The Royal Netherlands Air Force (RNLAF) was deployed almost continuously over the last decades, not only for international peacekeeping and peace enforcing missions but also to protect NATO territory, support allies and to emphasise the strength of the NATO alliance. Deployments and international missions nearly always take place in cooperation with allies, coalition partners within NATO, the UN or the EU or a group of countries that share the same goals and values. But always in an international context.

Deployments or international missions do not start with actual operational deployment, but with shared values, starting points, doctrine, training and exercises. Training in an international context is necessary to ensure that the RNLAF remains capable to carry out its air defense duties RNLAF and its allies were flying over Poland safeguarding the airspace on the eastern flank, while under NATO command. Following this mission, the RNLAF also executed enhanced Air Policing missions over Bulgaria, 2022 and Poland, 2023.

Major Marcel Burgers is the Project Officer for this year's edition of Frisian Flag. Marcel, who is tactical callsign 'Fikkie', is in its daily job an Air Combat Manager in the Royal Netherlands Air Force. After the explanation of Commodore van Deventer, Major Marcel explained the goals of Frisian Flag in depth, "With this training we will make sure that we are on the highest readiness level available. We practice and train during planning briefing and debriefing. All the pilots can look each other in the eyes and we can learn from each other. This is necessary, because we know what's going on in the

real world and we need to train and be ready. Not only all our governments expect that we are full time ready, but also the civilian people from every nation which participates expect that we as a military organisation can execute missions on the highest level possible".

Participants at Frisian Flag 2023

Leeuwarden Air Base

The Netherlands: F–35A
Belgium F–16
Germany: Eurofighter
Finland: F/A–18
USA: F–35A

Homebase

Denmark: F–16, Skrydstrup Air Base
The Netherlands: F–16, Volkel Air Base.
United Kingdom: F–35B, Queen Elizabeth II aircraft carrier.
Multinational Tanker Unit (MMU): A330 tankers, Eindhoven Air Base
France: E–3F, Avord Air Base

Article by Alex van Noije and Joris van Boven

Photos: Alex van Noije & Sergeant–Major Jan Dijkstra Mediacentrum Defensie

Photos: Alex van Noije & Sergeant–Major Jan Dijkstra Mediacentrum Defensie

EATC Aeromedical Evacuation day

On 7 November 2023, the first 'Aeromedical Evacuation' day was organised by EATC at Eindhoven Air Base (ICAO code EHEH). 'Aeromedical Evacuation' is the transport of injured people by air to a safer environment. EATC is a partnership of seven European countries being Belgium, France, the Netherlands, Germany, Italy, Luxembourg and Spain.

About 80 experts in the field of medical transport by air came together at Eindhoven air base. These were experts from the participating ETAC countries, but also from Denmark and the United States. There, the experts received an explanation about the possibilities and expertise that ETAC can offer in this area. The Aeromedical Evacuation procedures and challenges of the participants were then discussed.

The commander of EATC, Major–General Franck Mollard of the French Air Force, indicated in a speech that Aeromedical Evacuation is one of the 3 core tasks of EATC, in addition to air transport and refueling of aircraft in the air (air–air) refueling. Aeromedical Evacuation is a major puzzle in which various countries have unique resources and capabilities. And all the pieces of the puzzle are put together by EATC, after which the right choice can be made for the required help.

Various aircraft and helicopters were positioned on the western platform of Eindhoven Air Base. All aircraft were equipped for 'Aeromedical Evacuation'.

EATC

EATC is a partnership of seven European countries: Belgium, France, the Netherlands, Germany, Italy, Luxembourg and Spain. These countries combine and optimise air transport in Europe. Where EATC acts as a broker between cargo that needs to be transported and

Airplane type	Air Force/Owner	Comments
A330 MRTT	French Air Force	Standard tanker aircraft that can be converted in 24 hours
A330 MRTT	Multinational MRTT Unit (MMU)	Continuously configured in the MEDEVAC version, based in Cologne (DE)
A400M	German Air Force	
C–130J	Italian Air Force	
CH–53	German Air Force	Helicopter used in war zones
Bombardier Challenger 605	Civil contractor from Luxembourg	Provided by the Luxembourg Government

transport aircraft that still have space on board. With the help of ETAC, the participating countries try to use air capacity as efficiently as possible.

For example, the A330 MRTT (MMU unit) carries out an air to air refueling mission for Spanish fighter jets on behalf of the Netherlands; a French C130J performs a parachute drop mission for Germany; while a Belgian helicopter is transported by a Spanish A400M; a Luxembourgish Learjet performs an aeromedical evacuation for an Italian soldier injured in a crisis area; an Italian C27J transporting French freight; a Belgian A400M transports Dutch soldiers and finally a German A400M performs an aeromedical evacuation mission off Luxembourg.

The participating countries use the ATARES system for settlement. The "Air Transport & Air–to–Air Refueling and other Exchanges of Services" (ATARES) is a cashless exchange system for air transportation. Several European and NATO countries are part of the multinational ATARES agreement. The exchange of services is based on the "Equivalent Flying Hour" (EFH): this reference is the cost of one (1) C–130 flight hour. All other aircraft types offered under the ATARES scheme are calculated based on this C–130 reference.

This arrangement facilitates mutual support through the exchange of services and is the currency used by the EATC Member States. This cashless service allows countries to save on outsourcing costs and optimise aircraft utilisation (less empty space). It can also provide countries with additional training opportunities. ATARES is not based on purely bilateral reciprocity, but must be seen in the global multinational framework. EATC provides support to participating countries in three areas namely Air transport, Air–Air refueling and Aeromedical Evacuation. The headquarters of EATC is based at Eindhoven air base.

Article by Joris van Boven and Alex van Noije
Photos: Joris van Boven

Para exercise Falcon Leap 2023
Annual training culminates into Market Garden

Training exercises are developed to provide added value in such a way that the military service men are able to improve their performances and skills and gather new insights. Furthermore it helps units to maintain their readiness levels for the situation that they are called upon by their command. Training close together with other defence elements to establish a common goal, is also essential for integrated or joined missions. A clear example is exercise Falcon Leap were ground forces work together with their colleagues of the air force.

Falcon Leap is an annual open invitation exercise and focusses on cargo and para trooper droppings and held in The Netherlands during autumn. Main operating base is Eindhoven air force base, home of the Dutch Air Mobility Command (AMC) and houses amongst others several C–130H Hercules transport aircraft of 336 squadron. Here we meet with Lt Colonel Linda Lauret, Chief of Staff AMC and Falcon Leap exercise director, telling more about the 2023 edition.

"The primary goal for Falcon Leap 2023 (FL23) is to conduct a joined and combined exercise. Joined as The Netherlands army and air force do this together and combined as we have multiple international participants over here together with our own units. During FL23 we train with all nationalities together to learn and practice the various procedures in a standard way, to learn to know each other and get familiarised with each other's material and equipment. This to ensure we understand each other

Lt.Col. Linda Lauret, the Falcon Leap 2023 (FL23) exercise director

so that we can safely integrate operations. Secondary goal is that our joined army and air force organisation are able to plan and execute the exercise successfully and, not at last, provide good hostmanship for all our participants", as Lt.Col Lauret explains.

"FL is an annual repetitive exercise and once an edition has finished, the focus goes already to the new exercise for the next year. First on overall level but with three fourths year to go we go further into the details. As FL is an open invitation exercise, we inform our allies in time through the common channels so they are aware of the new exercise and can over think participating. Followingly we can start planning the capacities once we know which participating aircraft and foreign units intend to come. Next to fixed training elements, we try to adapt the programme and include nation's specific desired elements to be trained upon. One can think of a dedicated element for a loadmaster of one or more aircraft", as Lt. Col. Lauret points out.

FL23 saw participating units from Czech Republic, Germany, Italy, Romania, Greece, Denmark, UK, Poland, Spain, USA, France and Portugal, which all brought together almost 1000 para troopers. The first week focussed on air dropping of various types of cargo through Container Delivery System (CDS) usage at multiple sites throughout The Netherlands. Under the responsibility of the 11th Supply Company, a sub unit of the army 11th Air Mobile Brigade, the cargo was received, packed and with parachutes attached, for hand over to the aircraft' loadmasters who were in charge until the release and drop of the CDS out of the transport aircraft in the Landing Zone. In this setting the training was also added with Engine Running Offload (ERO) procedures, to minimise the time of the aircraft on the ground and can take–off

For the WWII memorial of operation "Market Garden", a historic Dakota joined in.

again quickly. The Dutch AF provided 2 C–130's for the exercise and these were joined by C–130's from Italy and Greece, a C–295 from Poland, an A–400 from Germany and a C–27 from Romania.

The second week was reserved for the dropping of para troopers and each day 3 formation flights were planned for all the droppings. The exercise ended with a mass para dropping of all participants, over the Dutch Ginkelse Heide in the direct vicinity of the city of Arnhem for the WWII memorial of operation "Market Garden". Therefore some additional USAF C–130's and a historic Dakota joined the other Falcon Leap aircraft at the end of the exercise.

In 2024 the Market Garden memorial will be 80 years and for that reason the exercise will have a larger character than the usual annual exercises. Due to the foreseen additional aircraft for this important event, it is expected that Gilze–Rijen will also act as host air base next to Eindhoven.

Text and photos by Peter ten Berg

Anatolian Air Drills

Asian–European training with increasing role of industry

Two Su–25's performing a formation take–off

For the fighter pilot community, the names of Konya and Anatolian Eagle are synonym for exercises that excel in intense training in a multinational setting. With such "train as you fight" exercises, the younger fighter crews are introduced to large scale multinational operations, where the more experienced pilots are enabled to deepen their tactics further and can share their knowledge with the whole community.

Essential for the success of such an exercise is a combination of several factors. Turkish Air Force Lt.Col. Hakan Girgin, Anatolian Eagle Training Centre Commander, provides Vayu more information about the Anatolian Eagle exercise at Konya air base as an importing "Flag" exercise.

According Lt.Col. Girgin some of the key factors which contribute to achieve optimum results include the sufficient free air space as well as providing realistic, complex and various mission scenarios which include a variety of other (than only air force) defensive and offensive units and assets. Furthermore it is important to have national and international participants with aircraft that can contribute to a wide spectrum of mission roles and be complementary

Made in Turkey: Aselsan displayed some of its new or updated systems at AE

to the others. Another element which brings added value to the exercise, appears to be the further integration of the national defence industry. Displaying and introducing

Azeri crew chief welcomes pilot prior an AE mission

Brand new Qatar AF Typhoons took part in AE

weapon systems during Anatolian Eagle, is monitored with interest by the numerous international observers who are invited to visit Konya during the exercise. This years edition of Anatolian Eagle, which was held earlier this year, brought again a number of interesting participants as well as interested observers to Konya, located in the heart of the central Anatolian region.

Konya

After having successfully participated in the USAF Red Flag exercise at Nellis AFB in 1997, the Turkish AF gained the ambition to develop their own flag exercise. With the lessons learned and the requirement to enhance flying combat training for Turkish air crews and to increase the inter–operability with other air forces, two "Anatolian Flag" exercises were held at Incirlik Air Base. In 2001 the next step was made when the exercise, renamed to Anatolian Eagle, moved to its current location, the 3rd Main Jet Base at Konya. Through the years further investments were made in the facilities of the air base and a dedicated Anatolian Eagle Training Centre Command (AETCC) was erected.

Although having their new local exercise option, Turkey joined several more Red Flag exercises in the years thereafter. Nevertheless their jets could be found more regularly in nearby European exercises like "Tactical Air Meet", "Brilliant Arrow", "Joint Warrior" and "Frisian Flag", in which the focus was on training with other NATO allies. Now that Turkey had its own Anatolian Eagle training initiative, one could see the interesting fact that the exercise was not limited to NATO members only. Due to the country's location in south east Europe, the Turkish exercise became also of interest from nations out of the middle east and Asian regions. The fact that you can see nowadays countries like Saudi Arabia, Qatar, Israel, Pakistan, Jordan and Azerbaijan next to all European air arms, makes the exercise for all involved very valuable.

Additionally Lt.Col Girgin draws the attention to the

F–4E's from 111 Filo played a major role in air–to–ground missions

An Aselsan Sadak 4T dispenser carrying 4 Tolun's underwing a Turkish F–16

importance of the almost unrestricted nearby airspace with a spanning of 215 nm from west to east and 180 nm from north to south, from ground level up to 50.000 feet high. Furthermore the exercise aids include an "Air Combat Manoeuvring Installation" (ACMI) system and a variety of Surface to Air Missiles (SAM) systems, which provide realistic mission threats to the complex flight scenarios that have to be executed. Currently 2 AE exercise are held annually, a national orientated variant and an "open invitation" exercise, focusing at international participation. An AE exercise day includes 2 mission, of which the morning wave concentrates on a comprehensive Combined Air Operation (COMAO) while the afternoon allows participants to fly missions in a smaller set up.

2023/2 edition

By early May the flight activity at 3rd Main Jet Base Konya increased considerably with the arrival of participating aircraft for Anatolian Eagle 2023, which was planned to start on May 1st. The Pakistan Air Force, which is a regular AE contributor, had delegated No. 5 Squadron "Falcons" with its block 52 F–16C/D's from home base Shahbaz. For the 3rd year in row the Azerbaijan Air Force contributed to AE and now with 3 single seat Su–25 "Frogfoot" aircraft from the "Su–25 Eskadrilya" home base at Kyurdamir. The United Arab Emirate (UAE) Air Force showed up at Konya with block 52 F–16E and F's from the "Al Dhafra Air Wing" at Dubai. The UAE F–16's flew their missions with AGM–88 "High–speed Anti–Radiation Missile" (HARM) or AGM–65 "Maverick" missiles attached to their wing armour stations. UAE neighbouring country, Qatar, was also present at Anatolian Eagle. The Qatar Emiri Air Force forwarded one of their newest fighter aircraft types, the Typhoon. 3 single seaters and 2 twin seaters, all from 7th Air Superiority Squadron of the Flying Wing 1 based at Tamim air base, were deployed to Konya. The final international participant of AE 2023 was the Royal Air Force flying missions with their Typhoons both from Konya as from Cyprus.

The host of Anatolian Eagle, the Turkish Air Force, had its F–16's playing the main role in the exercise and a wide variety of units that operate the "Fighting Falcon" had deployed several aircraft to Konya for the 2 weeks drill. Temporary deployed units included 113, 152, 161, 181, and 191 Filo (squadron), all in a multi roll and 151 Filo in a combined Suppression Enemy Air Defence (SEAD) and Multirole. A key role was reserved for the block 30 and 50 F–16C's and D's of 132 Filo "Hançer" which is based at the 3rd Main Jet Base Konya and played the aggressor, red forces, role during the exercise. Interesting was the appearance of a 132 Filo F–16C with serial 87–0019 in a deviant light grey digital camouflage scheme and although being applied several years earlier, still the only airframe flying with this c/s. Impressive as always was the presence of a quartet F–4E–2020 Phantom II's of 111 Filo "Panter" squadron from Eskisehir

Digital camo applied to an F–16C of local aggressor unit 132 Filo

With Konya city in the back ground this Pakistan F–16 returns after a COMAO

An Azeri Frogfoot seen during tests with Aselsan KGK–83 wing guided munition

air base, being assigned with Air–to–Ground (AG) roll during the exercise. Furthermore E–7T "Wedgetail" aircraft, from 131 Filo "Ejder" at Konya, giving "Airborne Warning And Control System" (AWACS) or so called Command & Control (C2) supported the exercise together with NATO E–3C AWACS aircraft who use Konya as one of their Forward Operating Bases (FOB). Additional aerial assets provided by the Turkish Air Force included KC–135 tanker aircraft and Unmanned Combat Aerial Vehicles (UCAV).

UCAV and industry at AE

Lt.Col. Hakan Girgin explained that both the Akinci and the ANKA–S Unmanned Combat Aerial Vehicle (UCAV) systems took part in the reconnaissance (Recce) role, but operating out of other air bases. This year the UCAV operations remained out of sight, where in 2022 the new Akinci system from producer Baykar was giving a large podium to gathered media while operating out of Konya. The Akinci is a twin propeller driven "High–Altitude Long–Endurance" (HALE) UCAV and in service with the Turkish Air Force since 2021. The Akinci is specified with a cruise speed of 240 kmph, can fly up to 45.000ft, stay airborne for more than 24 hours and the 8 hardpoints can carry a variety of missiles and/or bombs.

The system is furthermore equipped with an "Active Electronically Scanned Array" (AESA) radar for navigation together with actual and synthetic meteorological estimation, an Aselsan "Common Aperture Targeting–System" for reconnaissance–surveillance–targeting duties, an Electronic Warfare (EW) pod and a Signals Intelligence (SIGINT) module. Lt.Col Girgin mentioned that the Anatolian Eagle exercise focusses at the training of the fighter pilot, however the supportive element of UCAV's, will likely grow in the years to come. Aselsan, a Turkish developer and producer of electronic defence systems, had several of its systems on display during Anatolian Eagle 2023/2. Samples were a duo of laser targeting and Intelligence Surveillance and Reconnaissance (ISR) turrets, a laser guided munition kit LGK–82, precision (GPS–inertial navigation system) guided munition kit HGK–82 and can be used in combination with the Akinci UCAV.

Furthermore a GPS/INS guided munition "Tolun IIR" (Imaging Infra–Red seeker head) with a reach of 43 NM could be found and a Sadak 4T dispenser carrying 4 "Tolun's" with a reach of 50 NM. At the Anatolian Eagle flight line an F–16 in "Solo–Turk" demonstrator livery was visible, with an underwing loaded Sadak T4 rack, including Tolun munition.

While 2 of the Azerbaijan Su–25's were engaged in the daily AE missions, a 3rd Frogfoot was seen in trails carrying 2 Aselsan KGK–83 wing guided munition kits. The orange coloured armament was fitted on extended

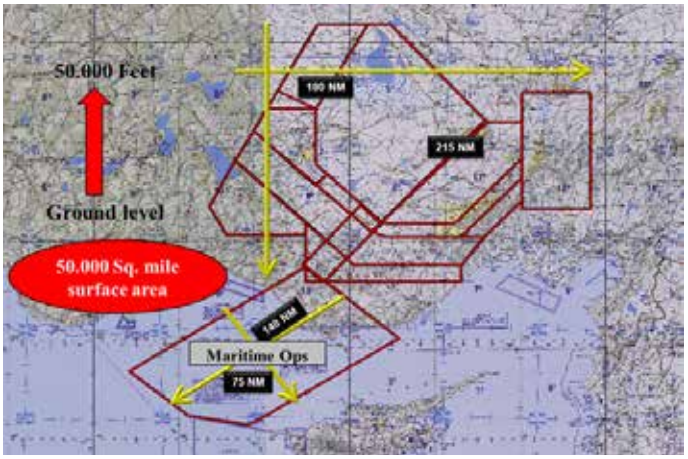
UAE Air Force block–52 F–16F armed with an AGM–65 "Maverick" missile

F–16D starting its AE mission while other aircraft await their planned mission time

wing pylons. During the flight trails, the SU–25 was accompanied by Turkish F–16's.

Wrap up

After 2 weeks of intense flying, a final Anatolian Eagle mission was flown on 11 May under supervision of Turkish Defence Minister Mr Hulusi Akar, his Azerbaijan counterpart Colonel General Zakir Hasanov and numerous other distinguished visitors and observers.



Mr Akar addressed the importance of international working and training together in Anatolian Eagle exercises which consequently means investing in relations and friendship and bringing regional stability and peace. Minister Akar also looked forward to the co–exercise "Anatolian Phoenix", focussing at international CSAR training with participants from Azerbaijan, Romania, Cyprus and Qatar during June, which aimed at similar shared values.

Text and photos by Peter ten Berg

One of the 5 Qatar Typhoons taking off from Konya AB

Exercise Red Flag Alaska 23–3

F–35A 185347 of 356th FS Green Demons seen taking off

Exercise Red Flag–Alaska 23–3 (RF–A 23–3) took place from 10–25 August 2023, integrating various forces in a complex and realistic threat scenario. Coordinated by the Pacific Air Forces (PACAF), it was the third iteration of the year. Originally named Cope Thunder, the exercise was held annually at Clark Air Base in the Philippines since the mid–1970s. It was relocated to its current location at Eielson Air Force Base (AFB) in Alaska in 1992 following the eruption of Mount Pinatubo. In 2006, it was officially renamed Red Flag Alaska.

Eielson AFB, located near the city of Fairbanks and the Joint Pacific Alaska Range Complex (JPARC), covering an area of over 67,000 square miles in a sparsely populated region of central Alaska, offers unique and challenging geographical conditions for aerial training. A vast amount of airspace with few restrictions is required to manage such a large number of participants, and Alaska is perfect for this purpose, being the largest US state in terms of area but also one of the least populated.

As stated by Col. Curtis W. Dougherty, Commander of the 354th Operations Group at Eielson AFB and as the Deployed Force Commander for RF–A 23–3: "Integration and interoperability are primary objectives of RF–A, especially after the arrival of fifth generation aircraft. The significant advantage of conducting an exercise like this in this area of Alaska is the ability to concentrate a large number of diverse resources within the JPARC and have the opportunity to test techniques, tactics, and procedures together with other participants that we implement during our daily training. It is this interoperability that allows us to be ready from day one, in case the Coalition and Allied partners need to come together to respond to a common threat."

Indeed, analysing the various missions the US Air Force (USAF) has participated in, it has emerged that the majority of combat losses occur during the first eight or ten missions flown by a crew. Therefore, the goal of RF–A is to provide each crew with the appropriate combat preparation to face these initial missions, thereby increasing their chances of survival.

RF–A 23–3 involved various units, including fighters, transport aircraft, refueling aircraft, airborne early warning and control (AWACS), from several air forces such as the USAF, US Marines Corps (USMC), the US Navy (USN) and the Royal Australian Air Force (RAAF), most of which were based at Eielson AFB, while others operated from JBER Elmendorf–Richardson AFB near Anchorage.

Despite the variety and specific roles of the entities involved, RF–A organisers take this into account and plan flight operations in a way that makes the training activity optimal for everyone. Participants in RF–A are divided into "Red" aggressor forces, "Blue" coalition forces, and "White" forces, representing the neutral overseeing and control agency.

During RF–A 23–3, two missions were conducted each day, one in the morning and one in the afternoon. These missions are divided into three different types: STRIKE, OCA (Offensive Counter Air) with SEAD (Suppression of Enemy Air Defense), and DCA (Defensive Counter Air).

EA–18G Growler 168765 CAG of VAQ–134 Garudas

EA–18G Growler 168936 of VAQ–134 Garudas

As Col. Dougherty explains: "In the first case, the main objective of the Blue Force is to attempt to penetrate enemy territory and strike priority targets in the scenario we have developed. OCA and SEAD sorties, on the other hand, aim to bring all our resources close enough to enemy territory to destroy or suppress SAM batteries or other threats, in order to establish air superiority in contested areas. In the case of DCA, the goal is to protect 'the good guys land' from enemy attack led by the Red Air component, doing everything possible to prevent them from doing so."

Participants

Starting with the units under the 354th Wing based at Eielson AFB, the participating squadrons were:

- 18th Aggressor Squadron (18th AGRS) "Blue Foxes," equipped with Lockheed Martin F–16C Fighting Falcon, Block 30. Acting as part of the Red Force, the primary mission of the 18th AGRS is to provide a realistic representation of the threat to the Blue Force.
- 356th Fighter Squadron (358th FS) "Green Demons,"

168th ARS ANG tail lineup

F–16C Block 30E 86–0338 of 18th AGRS taking off

equipped with the fifth–generation fighter Lockheed Martin F–35A Lightning II.

- 168th Air Refueling Squadron (168th ARS), part of the Alaska Air National Guard, participated in the exercise with its Boeing KC–135R Stratotanker aerial refueling aircraft.

Other participating units based at Eielson AFB included:

- US Navy participated by deploying the Electronic Attack Squadron 134 (VAQ–134) "Garudas," an electronic warfare unit of the United States Navy based at Naval Air Station Whidbey Island in the state of Washington. Currently, the squadron is equipped with the Boeing EA–18G Growler. Growlers are specialised in electronic warfare missions using a wide variety of jammers to confuse enemy radar systems, significantly enhancing the ability to conduct SEAD operations. It is one of only five non–carrier–based Expeditionary Squadrons in the US Navy and is frequently deployed worldwide to support US Air Force Expeditionary Wings, allied task forces, and more. Last year, VAQ–134 deployed six aircraft to Spangdahlem AB in Europe during the early stages of the Ukrainian conflict to bolster NATO's deterrence and defense capabilities along the eastern flank.
- US Marine Corps participated with the Marine Fighter Attack Squadron 214 (VMFA–214) "Black Sheep," part of the 3rd Marine Aircraft Wing (3rd MAW) based at Marine Corps Air Station Yuma, Arizona, equipped with the fifth–generation Lockheed Martin F–35B STOVL Lightning II aircraft that has recently been assigned.
- The Royal Australian Air Force (RAAF) participated in RF–A with the No. 77 Squadron, based at RAAF Williamtown in New South Wales. Since January 2021, they have been equipped with Lockheed Martin F–35A Lightning II, replacing the F/A–18 Hornets previously in service. RAAF contingent deployed in Alaska consisted of six F–35A aircraft and approximately 100 personnel stationed at Eielson, along with three Boeing E–7A Wedgetail AEW&C aircraft from No. 2 Squadron, also based at Williamtown, supported by about 70 pilots and ground personnel, deployed to JBER AFB.

F–16C Block 30E 86–0335 of 18th AGRS

F–16D Block 30H 87–0375 of 18th AGRS

From JBER AFB, the following units also operated, in addition to the aforementioned Australian E–7A aircraft:

- 3rd Wing, based at JBER, operated with its Lockheed Martin F–22A Raptor aircraft.
- 2nd ARS, which transferred a Boeing KC–46A Pegasus from its base in McGuire to Alaska.
- 133rd ARS, part of the New Hampshire Air National Guard stationed in Portsmouth, stationed four of its Boeing KC–46A Pegasus at JBER.
- VMGR–152 "Sumos" of the Marines, stationed in Japan, specifically at the Iwakuni base, deployed one of its Lockheed Martin KC–130J Hercules to support in–flight refueling operations.

This type of multinational exercise allows air forces from different countries to integrate with each other and is a testament to the spirit of collaboration and shared commitment to maintaining peace and security in the Indo–Pacific region.

Text and photos: Fabrizio Capenti and Marco Papa

F–35B 170051 of VMFA–214 completing last checks before take off

F–35B 170051 of VMFA–214 taking off

Tiger Meet 2023

F–16C belonging to 192nd Filo of Turkish Air Force wearing a full Tiger livery

After 35 years of absence, last time was in 1988 at Cameri, Italy returned to host the multinational Nato Tiger Meet 2023 (NTM 2023) air exercise. Reserved only to the squadrons having a tiger as their emblem, this exercise is famous for the goliardic spirit among the crews and personnel, as well as for the presence of several aircrafts wearing eye catching and gaudy tiger themed paint schemes. This year the NTM ran from 3 October until 13 October at Gioia del Colle air base, home of the 36° Stormo (36th Fighter Wing) of Aeronautica Militare (Italian Air Force, ItAF).

"It was a very special coincidence to host the NTM 2023 in Gioia del Colle in conjunction with the Centenary of the ItAF. We started preparing this complex exercise a year ago and here now we have over 1300 people, seventy planes and around ten helicopters belonging to nineteen Tiger squadrons from fourteen Countries" stated Major Emanule F. Project Officer of NTM 2023 and commander of XII Gruppo Caccia (12nd Fighter Squadron), one of the two "Tiger squadron" of the IAF.

"As hosting nation we are responsible to create the scenario. Being an exercise tailored to different needs we must taking into account the needs and peculiarities of each participant and therefore it is essential to work and plan face to face with all of them, exchanging experiences and sharing tactics and procedure between different air assets, identifying the points of greatest and worst learning, correcting any gaps and improving day after day".

A Luftwaffe Tornado ECR of TLG 51

E–2C belonging Flottille 4F provided Airborne Early Warning

Responsible for organising the NTM 2023 and in addition to ensuring logistical support to the participants, ItAF deployed its two Tiger squadrons and other external air assets. The homebased XII gruppo, on Eurofighter Typhoon, and the 21 gruppo with AW–101 helicopters. Beside the "Tiger Units" ItAF provides a pair of S–208 from 60th Stormo of Guidonia, a C–130 operating from Pisa while, a single KC–767A for air refueling and a G–550 CAEW which provided the battlefield situational awareness; the latter operating from Pratica di Mare. As usual, the most numerous type was the F–16, brought by the Belgian, Portuguese, Greek, Polish and Turkish Air Forces. Czech and Hungarian Air Forces were both present with the Swedish made JAS–39C/D Gripen multirole fighter.

The French presence was varied and saw the presence of air assets belonging all the three Armed Forces: Armée de l'Air et de l'Espace brought the latest version of its Mirage 2000D/RMV and Rafale F4.1 both belonging ECE 1/30 "Côte d'argent". The Aviation légère de l'armée de Terre (ALAT) was present with SA–342M Gazelle and EC–665 Tigre HAP attack from EHRA 3. As "non–tiger unit" Aeronavale sent a pair of its E–2Cs belonging Flottille 4F which provided Airborne Early Warning. The latter were joined by a single NATO's E–3A Sentry (operating from the AWACS's Forward Operating Base Trapani), and by a Learjet 35A owned by the German company GFD tasked with Electronic Warfare duties. Among the non–NATO countries present, Switzerland brought the F–18Cs from Fliegerstaffel 11, while Austrian Air Force was present with the EF–2000s from 2.Staffel, making their debut in the NTM after obtaining full member status in 2021.

Austrians worked closely with their German Luftwaffe's colleagues from TakLwG74 (which won the Silver Tiger Tropy NTM 2023). The large German contingent (in total around 200 personnel and 12 aircraft) was completed by the Tornados ECR from 51 TakLwG51. "The NTM exercise was born in the 1960s as an air exercise focused on air dominance and therefore focused on air to air missions, in accordance with the military doctrines of that time" explains Colonel Vito Cracas, Director of the exercise.

EC–665 Tigre HAP attack from EHRA 3 and AW–101 of 21th Gruppo

ECE 0130 with Mirage 2000D RMV the latest version of this FAF aircraft

"Clearly nowadays it is no longer like that, because we are facing new challenges operating in a multi domain environment including air, land, sea, space and cyber and so this exercise must evolve accordingly. Although the primary task are still air defence operations, implying the achievement and maintenance of air superiority, interdiction we are also including assets and personnel from other Armed Forces, in order refined procedures relating to different tasks such as cooperation with the joint terminal attack controllers (JTAC), troops support on the ground (Close Air Support–CAS), insertion and exfiltration of Special Forces with helicopters or search and rescue of personnel in a hostile environment (Personnel Recovery–PR)".

"We believe that interoperability between fourth and fifth generation assets is important. Unfortunately, both due to operational needs and various training commitments, in this edition we were unable to use the F–35 but we plan to do so in the next edition, as well as the use of satellites for IMINT activities. But, let me say that even if they are not designed to be stealth, the 4 and 4.5 generation aircraft, which represent the bulk of NATO and allied fighting forces, remain key assets and thanks

EF–2000 of TakLwG74 and 2023 Winner of Silver Trophy

EF–2000 belonging to 2.Staffel of Austrian AF first participation at NTM

F–16A MLU belonging to 31st Squadron of Belgian Air Force wearing a full tiger livery

F–16C Block 52+ belonging to 335 Sqn of Hellenic Air Force landing after the afternoon mission

Homebased EF–2000 XII Gruppo of ItAF special livery designed by Luca Pennacchio

Rafale of ECE 0130 of French Air Force at 4.1 standard

to the latest avionics upgrades and the integration of new weapons, maintain relevant performances".

"I had the honour of bringing the first Typhoon here to Gioia del Colle and, believe me that today, thanks to the latest software package, the aircraft's performance has grown exponentially. Furthermore, many of the participants here brought aircraft with the latest software updates, allowing us thus carrying out extremely profitable training activity. Regarding UAV, however, their use has not currently been considered useful for a simple reason: despite their importance, they are vulnerable, as they are slow and lack self defence capabilities and therefore would have forced us to focus on their use, for example by providing for an air escort and specific planning, diverting resources from the training goals that interest us most".

JAS–39C Gripen of 211 Sqn Czech AF

The intense flight activity, with an average of around 110 sorties per day, was mainly structured on two daily waves: a morning main wave, with all assets involved in a complex COMAO (Composite Air Operation) mission, and an afternoon shadow wave, where participants carried out complementary missions, Basic Fighter Manoeuvring (BFM), Air Combat Manoeuvring (ACM) and Slow Mover Interceptor (SMI), using S–208 liason

aircraft as target. Operations took place in the enormous airspace of Puglia, Calabria and Basilicata, in Southern Italy, extending up to the Tyrrhenian airspace located east of Sardinia island, also involving the local EW range of Salto di Quirra.

"This has allowed us to expand the number and type of anti–air threats simulated, introducing also land assets (the SIRIUS anti–aircraft system), naval assets (the ITS Caio Duilio destroyer of the Italian Navy), allowing us to also carry out BVR simulating the new long range missiles (Meteor), suppression/destruction of enemy air defenses (SEAD/DEAD), Anti–surface warfare (ASuW) missions, increasing the difficulty of the scenario created for this exercise". The availability of such large airspace was a strong point of NTM 23: "Thanks to coordination with national civil airspace control agencies, we can operate over an area as large as the Netherlands," stated Colonel Cracas. "We received positive feedback from our Allies' delegations during their visit here, and I must say that Italy could soon host another edition" he concluded. The upcoming NTM 2024 will be hosted by TakLwG51 at its Schleswig–Jagel Airbase, Germany.

Article and photos: Fabrizio Capenti and Simone Marcato

Learjet 35A owned by the German company GFD

JAS–39C Gripen of 101st FS Hungarian AF

Tornado of TLG51 lineup

Radom Air Show

Radom Air Show

The Polish Air Force organises its open house/air show once every two years. The 2023 event took place in the weekend of 26–27 August. As always at Radom–Sadkow Air Base, now known as Warsaw–Radom, hosted the air show.

Radom–Sadkow

The Air Base is home to 4. Skrzydło Lotnictwa Szkolnego (4 Training Wing) which is equipped with the PZL–130TC–2 Orlik. Originally 44 PZL–130TC–1 were purchased of which 28 were converted to the TC–2 variant. Radom–Warsaw opened in April 2023. Among a new terminal its runway was extended from 2.000 meters to 2.500 meters. It serves to relief Warsaw Chopin international airport which is located roughly 100 kilometers to the north. The terminal was built at the northwestern part of the air base. A small maintenance facility for the Polish armed forces is also located at the base.

The Polish Army will be equipped with 96 AH–64E Apache Guardians. US Army 3/17 CAV, 3rd CAB presented one of their Apaches to the public.

Poland's aviation modernisation

The Polish Air Force (PLF), as well as its colleague armed services, are in the process of modernising its aircraft, helicopter and other equipment. Currently the PLF operates a mix of former Russian/Soviet aircraft and helicopters. Most likely the show saw the last appearance to the public of the MiG–29 Fulcrum. Poland received 12 MiG–29's (of which three single seat MiG–29UB). It also operated former Czech Republic and German Air Force Fulcrums, respectively 10 (one MiG–29UB) and 22 (four MiG–29UB). Several of these should have found their way to Ukraine. Another Russian made fighter/attack aircraft the Su–22 Fitter is also in the twilight of it career. Several were overhauled and remain in service. Its reported these will change air base from 21. Baza Lotnictwa Taktycznego (21 BLT) at Swidwin to Miroslawiec Air Base. The first base will be upgraded to accommodate operations with the F–35A Lightning II. 32 have been ordered with the first aircraft to be based in Poland to be assigned to 32. Baza Lotnictwa Taktycznego at Łask were the 10. Eskadra Lotnictwa Taktycznego (10 ELT) operates the F–16C/D. The second Lightning squadron will be based at 21 BLT.

The Polish Air Force also purchased the Korean Aerospace Industries FA–50 with 48 aircraft to be delivered. In 2023 it's planned to deliver 12 FA–50GP (Gap Filler). Another 36 are to be delivered in a few years' time. These will replace the MiG–29s.

Poland will become one of the largest operators of the Boeing Apache with 96 AH–64Es bought. Those will replace the remaining operational Mi–24 Hind in service with the Army. That service will also see another four S–70i Blackhawk delivered joining the four already operated. The Navy is saying goodbye to its Mi–14 Haze. Two Leonardo AW–101s were delivered, routing through The Netherlands, just prior to the air show. Leonardo will also deliver 32 of its AW149 helicopter. Saab is in the process of converting two Saab 340 aircraft to Saab 340AEW&C.

The Air Show

The Air Show saw the debut of the KAI FA–50GP. One arrived to participate in the static display with its sister being part of the last formation flying together with a MiG–29. All three–armed services took part in the static and flying display or were part of the formation flypast. Just two helicopters did not attend. The Navy SH–2G Seasprite of which four were purchased from the US Navy. Either being in maintenance or operationally tasked a Seasprite could not participate. Also, there was no Mi–24 taking part in the air show. A few months earlier at an open house at their homebase these also did not take part in any flying activity. Part of the show was a fly past consisting of no less than 17 formations with 69 aircraft presented from the Air Force, Navy and Army.

The US Army 3/17 CAV, 3rd Combat Aviation Brigade showed its AH–64E to the public. 3 CAB is the current rotational brigade deployed to Europe in support of Atlantic Resolve with Powidz Air Base hosting their

14 ELTr is in the process of receiving five C–130H Hercules. Their anniversary C–130E took part in the formation fly past.

Arrival of the Finnish Air Force Hornet solo display.

Recently delivered both FA–50GP and took part at Radom Air Show. Aircraft 5002 had the honour to be presented in the static display.

American colleagues. Leonardo who not only is delivering the AW101/149 also delivered its M–346 training aircraft to the PLF. 41 BLSz has all sixteen aircraft assigned and is based at nearby Deblin Air Base. No less than 9 of their aircraft took part at Radom 2023. Of course, international participants also took part and consisted of F–16's from Belgium and Denmark, Croatia (OH–58D and UH–60M), Czech Republic (JAS–39 and W–3A), Finland (F/A–18) Germany (A400M, P–3C), Hungary (H145M), Lithuania and Slovakia (L–410), Switzerland (F–5E), United Kingdom (Typhoon FGR.4) and the USAF (KC–135R IL ANG). A mock–up version of the F–35A was on static display.

Note: above relates to aircraft seen during our visit to Radom.

Text and photos: Manolito Jaarsma
Instagram: Phantomaviation
Twitter: @Phantomaviation

An M–28TD performing circuits after dropping paratroopers.

Four Leonardo M–346s in the fly past. In total nine of the 16 aircraft took part in the airshow.

Based at Warsaw 1 BLTr took part with their red/white VIP W–3 Sokol and pictured Mil Mi–8T.

An Army Mi–17 flying with a Navy Mi–14 Haze. The Mi–14 will be withdrawn from service in the not too distant future.

Three ship Fitter formation in the flypast after which two continued to perform their role demonstration.

Most likely the last public appearance of a Polish AF MiG–29 Fulcrum. No.108 being one of the original Polish Fulcrums.

Croatia participated with its OH–58D Kiowa Warrior and UH–60M Blackhawk. Both on static display.

Representing the based 42 BLSz a PZL–130TC–2 on static display at the maintenance facility

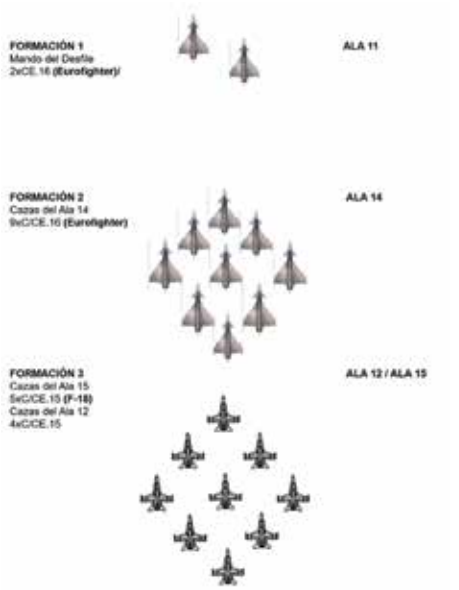
National Day of Spain: Spanish Force parade in Madrid

Three hornets return back to base after their formation flight over Madrid

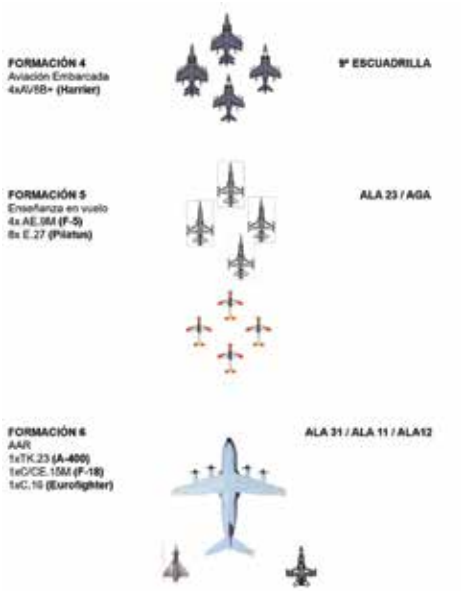
Every year, on 12 October, Spain celebrates their Fiesta Nacional de España or Día de la Hispanidad. This day is marked as Spain's national day and has been celebrated since 1892. The celebration traditionally includes a military parade attended by the king, together with the royal family, the president of the government and other senior representatives of all branches of government. The military parade takes place in Madrid on the day and includes military hardware from all branches of the Spanish armed forces.

The Discovery of America in 1492 was momentous and 12 October has been considered a memorable day because from then on contact between America and Europe began, culminating in the so–called "meeting of two worlds", which transformed the worldviews and lives of both Europeans and Americans; as the European colonisation of the Americas began. However, on 12 October 1492, the existence of America was not revealed. Christopher Columbus always believed that he had reached the Indies without suspecting that he had stumbled upon the American continent. On 23 September 1892, Queen Regent Maria Cristina of Habsburg–Lorraine issued a Royal Decree in San Sebastián, at the proposal of President

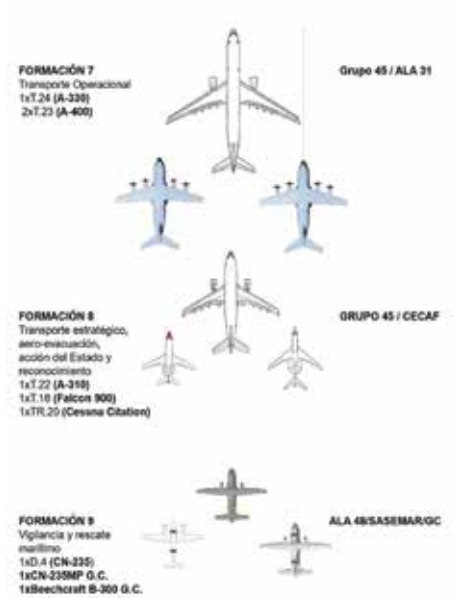
One of the brand new A330MRTT's particpated to show the air to air refuelling capabilities of the Spanish Air Force



Parade 1



Parade 2



Parade 3

Antonio Cánovas del Castillo, declaring 12 October 1892, a national holiday, in commemoration of the Discovery of America.

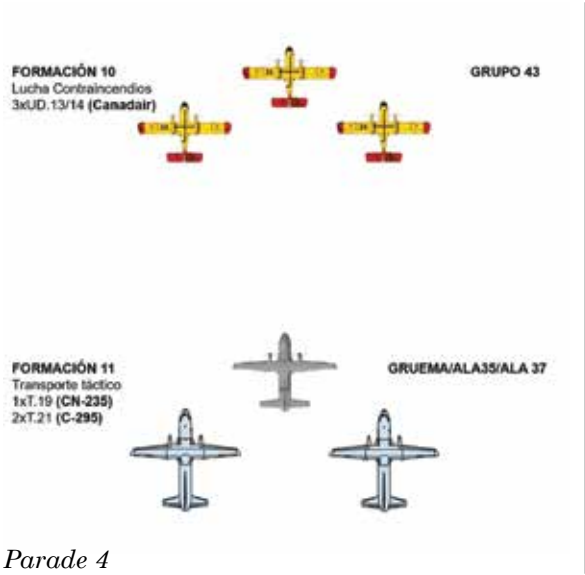
The 2023 edition of the military parade included some 58 aircraft and 28 helicopters from the Spanish Air Force, Navy, Army as well as the Spanish Civil Guard (Guardia Civil) and Spanish police. On the ground there were 109 vehicles and 33 motorcycles, which were joined by 120 horses. In total over 4000 men and women participated on the ground and in the air during the event. The air assets operated from the four military bases around Madrid. Army helicopters operated from Colmenar Viejo, North of Madrid. These included resident Boeing CH–47F's Batallón de Helicópteros de Combate V (BHELTRA V) and Eurocopter EC–135T2's from Academia de la Aviación del Ejército de Tierra (ACAVIET) and Batallón de Helicópteros de Emergencias (BHELEME II). Visiting helicopters came from Batallón de Helicópteros de Ataque I (BHELA I) with their Eurocopter Tigre HAD's and NHIndustries NH–90TTH's from Batallón de Helicópteros de Maniobra III (BHELMA III). Operating from Cuatro Vientos, to the South of Madrid, were resident Air Force Eurocopter AS–

A mixed formation of EC–135P2's and AS365N3's showed the helicopter assets of the Guardia Civil

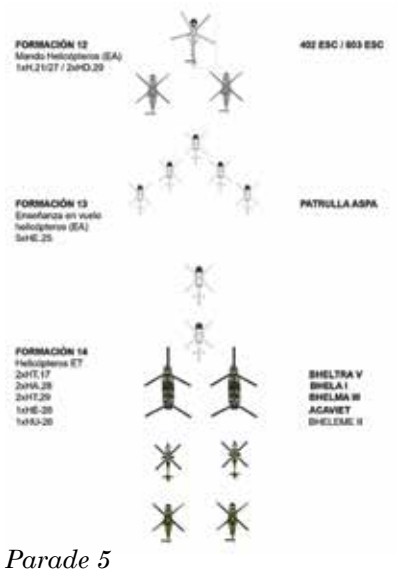
One out of two CN235 VIGMA's on strength with the Guardia Civil particpated during the 12th of October

332B Super Pumas from 402 Escuadrón del Ala 48 and NHIndustries NH–90TTH's from 803 Escuadrón del Ala 48.

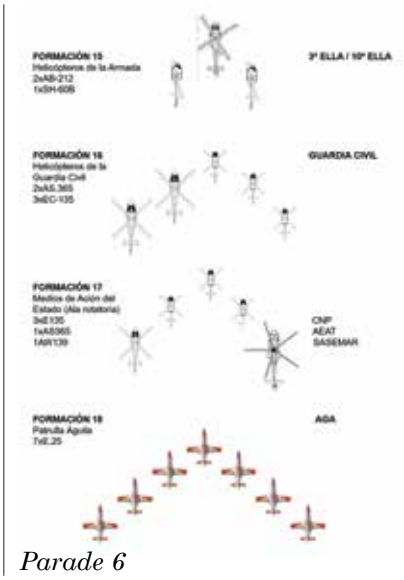
Also operating from there were Eurocopter EC–120B Colibris from Patrulla Aspa del Ala 78 and the Navy participated with Agusta Bell AB–212ASW's from 3ª Escuadrilla de la FLOAN and a Sikorsky SH–60B from 10ª Escuadrilla FLOAN. The Spanish police also flew from here with their EC–135P2. Also located South is Getafe from where the light transport planes took off. Several Casa C–295's from Ala 35 and Ala 37 and a Casa CN–235 from Grupo de Escuelas de Matacán (GRUEMA) participated. Also, a Cessna 560 Citation from Centro Cartográfico y Fotográfico (CECAF) flew from Getafe. In addition to these, four Pilatus PC–21 from Academia General del Aire y del Espacio (AGA) and the Casa C–101's from Patrulla Águila participated. Most of the fast movers took off from Torrejon Air Base, just East of Madrid. From the based aircraft at Torrejon, Ala 12 participated with their McDonnell Douglas EF–18's, while Grupo 45 provided a Falcon 900, Airbus A–310 and A–330MRTT. Also based at Torrejon are the Canadair CL–215's and CL–415's from



Parade 4



Parade 5



Parade 6

A dual seat EF–18BM from Zaragoza air base takes off from Torrejon air base

Ala 11 and Ala 14 together brought 12 Typhoons showing the future of the Spanish Air Force fighter force

Ala 23 based at Talavera La Real still operates the 50 year old SF–5B. No replacement of these have been announced yet

Five EAV–8B's (including one air spare) were present at Torrejon. These Harriers are still going strong

Grupo 43 flew during the parade as well. In addition to these, EF–18's from Ala 15, Eurofighter Typhoons from Ala 11 and Ala 14, Northrop SF–5B's from Ala 23 and McDonnell Douglas EAV–8B's from 9ª Escuadrilla de la Flotilla de Aeronaves (FLOAN) all participated from Torrejon. Finally, the Guardia Civil flew from their own hangar at the North side of Torrejon with their Casa CN–235, Beechcraft King Air 300, Aerospatiale AS–365N3 and Eurocopter EC–135P2.

Text and photos: Erik Bruijns

330 Skvadron trains with Alpine Rescue Group

The airfield of Bomoen Flyplass is normally the place to be for Skydivers. For that kind of people better known as Skydive Voss. This is one of the biggest centres for skydivers, with normally 15,000 till 18,000 jumps every summer. During the weekend of 16 and 17 October 2023, the airfield was used as a training weekend for the Alpine Rescue Group. They were training with 330 Skvadron and the Norwegian Air Ambulance. 330 Skvadron was present for this exercise with an AW101 MK612 Merlin and the air ambulance in the form of an EC135 T3.

During the weekend, the briefing started at 7.30 in the morning to properly coordinate what is expected of each other and thus achieve optimal communication between the crew of the AW101 and the Alpine Rescue Group. One of the rescuers explained to me, "with increasing tourism and extreme sports in Norway, it is very important for us to train with the air force and air ambulance several times a year. The seasons change dramatically in Northern Norway, from cold, dark winters where you can get lost in only seconds, to summers with sunlight all day and night and an explosion of life outside. Every year, there's a short window of time called summer, with its midnight sun, blooming flowers, playful birds, animals, and people. Then it gets darker. Sunset creeps into the day, and the time it gets dark changes from midnight to half–past seven to half–past six as the Northern world hurries towards the polar nights. Then a lot of hikers don't know when it gets dark," he explains. "You don't remember: 'okay, tonight it gets dark ten minutes earlier than yesterday.' So many don't anticipate the darkness, and they get stuck in the mountains or the forest because they can't see anything. And then it gets cold outside."

Just imagine for yourself. It's a warm, sunny day. You don't think about bringing your jacket or headlamp because it's so lovely outside and the hike isn't too long. Then it gets darker, a full hour before you expected it, and it gets colder quite quickly. In fact, it soon gets freezing. Suddenly you realise that you're stuck, that there's no way you can get down from the mountain safely. You're cold and you can't see the path, then fear of hypothermia hits you and you have no choice but to call for help. "And at that moment, the ones who will answer your call and gear up to come save you are the volunteers of the Alpine Rescue Group. They will leave their family dinner, grab their rescue packs, head out into the dark mountains and

they will do everything in their power to find you and bring you down before it's too late. And we don't do that alone".

"In hard to reach places we ask 330 Skvadron for assistance. Yes, and there we are coming in the picture", Captain Iversen explains. "Our primary role is search and rescue in every setting". Captain Iversen is the first pilot of the AW101 MK612 Merlin helicopter. He is stationed at Luftforsvaret station Stavanger/Sola. With 650 flight hours, he's an experienced pilot. "24/7 we are on stand–by for medical evacuation all over the country. First of all, we are always on standby for the oil platforms that are located in many places off our coast. That is why we have helicopters stationed at various places all over the length of the country, such as Orland, Rygge and Bodø. Our secondary task is the rescue and evacuation of tourists, hikers or mountain climbers who have gotten into trouble for whatever reason. In these cases, we are helped and assisted by the Alpine Rescue Group. Flying in the mountains is not always easy, because circumstances like the weather can change in a minute and the strength of the wind sometimes changes in strength and direction. Finding the target is not that difficult in Norway. As pilots we have many reference points in the landscape such as fjords and mountains. A few years ago, we were guests at the SAR meet at Koksijde, and things were much more difficult for us then. Most parts of the landscape in Belgium and the Netherlands are flat. Finding a reference point is then much more difficult for us. Here in Norway, it is hilly everywhere. Even in the Oslo area, where it is not very mountainous. Unfortunately, we were unable to attend the SAR meet at Nordholz this year due to

operational commitment, but we hope to be present again in the future. Especially because squadrons can learn a lot from each other and exchange experiences."

Captain Iversen continues, "Most of the times we are called upon when the winch is needed during the evacuation. We have a winch of 200 meters maximum. That is a major advantage compared to the air ambulance helicopter that flies with the EC135. What I already mentioned is that flying in the mountains is not always easy. That is why we determine who will take over the controls while flying. Does the co–pilot have a better view of the situation then I do? Then he takes over the stick".

On 25 October 2007, a project started that had the intent to replace all Westland Sea King search and

rescue helicopters with new rescue helicopters by 2020. On 19 December 2013, a contract was signed between AgustaWestland and the government, for the purchase of 16 AW101 helicopters. The agreement came about after fierce competition between different manufacturers to satisfy the Norwegian requirements. Participants were AgustaWestland, Eurocopter, NHIndustries, Sikorsky Aircraft Corporation and Boeing. The government considered that AgustaWestland AW101 met the requirements and specifications in the best possible way.

On 12 June 2017, Per–Willy Amundsen, Minister of Justice and Public Security, announced the opening of Leonardo's AW101 Norway Training Centre at Stavanger Sola Air Station. The training centre included an AW101 Full Flight Simulator (FFS), jointly developed by Leonardo, along with an AW101 SAR console training system linked to the FFS to provide rear crew training. The first training course at the centre started prior to delivery of the first rotorcraft. The training centre will be used by both Norwegian and foreign AW101 customers. The first AW101 was delivered in November 2017. The Norwegian AW101s officially started operating in the rescue role on 1 September 2020.

The AW101 is named SAR Queen in Norwegian service. Captain Iversen explains, "the Sea Kings will be phased out gradually from December 2023 onwards and they now only fly from Rygge/Moss air base. After 47 years we are unfortunately saying goodbye to an icon". Captain Iversen also flew on the Sea King. "The Sea King was a great helicopter, extremely reliable, but keeping it flyable requires more and more man hours. The Merlin is superior in every way. It flies much more stable. Lots of new technology. Almost everything in the Sea King is manually operated. The merlin has a completely digital cockpit and new sensors, it's like a flying computer. In the beginning we had some small issues but our maintenance crew and people from Leonardo fixed it very quickly. We usually have two or three Merlins stationed at Sola. One is always on standby while one or two are under maintenance. Or one standby and one for training and one on maintenance. With the arrival of the Merlin, the search and rescue task in Norway is guaranteed for now and in the future".

Article and photos: Fred Peursem

Tiger Meet 2023

The Tiger is considered a symbol of speed, strength and hunting prowess, with many units in air forces across the globe having chosen this magnificent animal as their squadron emblem.

The annual gathering of squadrons whose emblem wears a Tiger took place at Gioia del Colle airbase, in Southern Italy, from 2 to 13 October. It had been 35 years ago, during 1988, when the Tiger Meet was last held in Italy. The location for this year was no coincidence; the Italian Air Force celebrates its 100th anniversary during 2023 and has organised a number of exercises and public displays to commemorate this milestone. This year's host was 12 Gruppo Caccia (Fighter Squadron), which operates the Eurofighter Typhoon from Gioia del Colle under the umbrella of the 36th Fighter Wing.

Calabria and Puglia, a large area of airspace over land as well as sea. The perfect weather in this region in this time of year allowed for unhindered flying operations to take place.

Units train interoperability during Defence and Air Interdiction missions, as well as providing Close Air Support. The rotary wing assets participating in the exercise practice Combat Search and Rescue, the recovery of personnel in a hostile environment.

Usually, the morning mission consisted of a COMAO (Combined Military Air Operation) in which all participants took part. During the afternoon, many participants took the opportunity to train with and against each other in much smaller packages of aircraft.

For more realistic training scenarios, the Italian Navy employed various

Exercise goal

Being one of the largest flying exercises in Europe, bringing together 70 fast jets and 10 rotary wing assets, the Tiger Meet aims to sharpen cooperation and solidarity between the various European air arms. It allows participants to share their experiences in line with NATO's military goals.

Operations took place over the southern Italian regions of Basilicata, surface assets to participate in the exercise. The participation of the NATO AWACS and French Navy Hawkeye provided the participants with real time Airborne Early Warning information.

Tiger Meet history

In 1960 the commander of the RAF 74 sqn, flying the English Electric Lightning, started correspondence with an old friend that had just taken command of the USAF's 79 Tactical Fighter Squadron, based at Woodbridge in England and flying the F–100 Super Sabre. Their idea to bring both Tiger units together for a combined exercise set the ball rolling, and the NATO Tiger Association was born. Already in 1962, the Tiger Meet held at RAF Woodbridge grew into a bigger affair with eight units participating. During 1973, 1980 and 1988 the Tiger Meet was also held in Italy. Location for these meets was Cameri airbase, then home to the 21 Gruppo with their F–104 Starfighters. This squadron still exists, but nowadays operates the HH–101A 'Ceasar' helicopters, a dedicated CSAR variant of the EH–101 Merlin.

Tiger traditions

In line with the 'work hard, play hard' principle, the Tiger Meet allows plenty of time for participants to socialise and get to know each other better, especially during evenings and the weekend. Traditionally, an opening as well as closing flag ceremony was held. During the latter, at the conclusion of the exercise, the national anthem of the host was played while the participant nation flags were lowered. While partaking in a Tiger Meet, personnel were often seen wearing special Tiger themed uniforms, hats and cloth badges.

During the weekend in between the flying weeks, the Tiger Games are held. They consists of various sports and challenges to further increase cooperation between participants. Usually, units adorn one or more of their aircraft in a special Tiger livery, and a contest is held for the best painted aircraft. The 2023 Tiger Meet didn't disappoint as some units had brought beautifully painted aircraft. Winner of this year's edition became the Tiger Eurofighter Typhoon of TLG74 of the German Air Force.

The closing night of the exercise saw the Silver Tiger Trophy being awarded to the unit that had shown the most 'Tiger Spirit' during the Tiger Meet. The trophy was presented to the NATO Tiger Association in 1977, when the Tiger Meet was hosted by the International Air Tattoo airshow at Greenham Common in the United Kingdom. The winning unit gets to keep the trophy until the next Tiger Meet, and is allowed to fix a little silver tag with unit name and date to the wooden base of the trophy.

During the closing night of the 2023 Tiger Meet the Silver Tiger Trophy was awarded to TLG74, who had also won the prize for best aircraft livery. For a year, the Silver Tiger Trophy will reside in southern Germany.

Between 3 and 14 June 2024 The Tiger Meet is once again scheduled to take place at Schleswig–Jagel airbase in Northern Germany.

Article & photos:
Robin Polderman

Tiger Meet 2023 participants:

Country	Unit	Aircraft	Homebase
Austria	2 Staffel	3x Eurofighter Typhoon	Zeltweg
Belgium	31 Smaldeel	6x F–16AM	Kleine Brogel
Czechia	211.tl	5x JAS39C/D	Caslav
France	ECE 1/30	3x Rafale, 3x Mirage 2000	Mont de Marsan
France	EHRA 3	4x SA342M, 2x EC665	Etain–Rouvres
France	4F	2x E–2C Hawkeye	Lann–Bihoue
Germany	TLG51	6x Tornado ECR	Schleswig–Jagel
Germany	TLG74	6x Eurofighter Typhoon	Neuburg
Greece	335 Mira	5x F–16C/D	Araxos
Hungary	101st AW	4x JAS39C/D Gripen	Kecskemet
Italy	12 Gruppo	6x Eurofighter Typhoon	Gioia del Colle
Italy	21 Gruppo	3x HH–101A Merlin	Grazzanise
Italy	202 Gruppo	2x S208M	Guidonia
NATO	NAEW&CF	1x E–3A AWACS	Preveza FOB
Poland	6.elt	6x F–16C/D	Krzesiny
Portugal	Esq 301	5x F–16AM	Monte Real
Switzerland	Staffel 11	5x F/A–18C	Meiringen
Turkey	192 Filo	3x F–16C/D	Balikesir
Civil	GFD	1x Learjet	Hohn, Germany

Lithuania for 36 AIM–120C–8's

Lithuania has requested to buy thirty–six (36) AIM–120C–8 Advanced Medium Range Air–to–Air Missiles (AMRAAM) and one (1) AIM–120C–8 AMRAAM Guidance Section.

UK for 3000 JAGMs

United Kingdom has requested to buy three thousand (3,000) Joint Air–to–Ground Missiles (JAGM), AGM–179A. Also included are dummy missiles; technical assistance; publications; integration support; and other related elements of logistics and programme support. The total estimated programme cost is $957.4 million.

Finland for 150 AARGM–ERs

Finland has requested to buy up to one hundred fifty (150) AGM–88G Advanced Anti–Radiation Guided Missiles–Extended Range (AARGM–ERs). Also included are Dummy Air Training Missiles (DATM); missile containers; software; training; support equipment, etc.

Japan for 63 Rolling Airframe Missiles

Japan has requested to buy up to sixty–three (63) Rolling Airframe Missiles (RAM) Block 2B Tactical Missiles, RIM–116E. Also included are RAM Guided Missile

Round Pack Tri–Pack shipping and storage containers; training equipment; operator manuals and technical documentation, etc. The estimated total cost is $74.6 million.

Latvia for 6 M142 HIMARS

Latvia has requested to buy six (6) M142 High Mobility Artillery Rocket Systems (HIMARS); twelve (12) M30A2 Guided Multiple Launch Rocket System (GMLRS) Alternative Warhead (AW) Pods with Insensitive Munitions Propulsion System (IMPS); twelve (12) M31A2 GMLRS Unitary (GMLRS–U) High Explosive Pods with IMPS, etc.

Oman for 301 TOW 2B's

Oman has requested to buy three hundred one (301) Tube Launched, Optically Tracked, Wireless Guided (TOW) 2B, Radio Frequency (RF) Missiles (BGM–71F–7–RF). Also included are US Government and contractor technical, programme, logistics and engineering support services and other related elements of logistics and programme support. The estimated total cost is $70 million.

Norway orders additional NSMs

Kongsberg Defence & Aerospace has signed a supplemental agreement with the Norwegian Defence Material Agency (FMA) for the ongoing procurement of Naval Strike Missile (NSM) for deliveries to the Norwegian Navy. The value of the contract is MNOK 487.

Norway for 6 MH–60R's

The US Navy awarded Lockheed Martin a contract to produce six multi–mission MH–60R Seahawk helicopters for the Norwegian government. Designed and built by Sikorsky, a Lockheed Martin company, MH–60R aircraft will enable Norway to perform multiple maritime missions, including search and rescue and coastal and offshore patrol. Norway's order marks the second MH–60R contract award in less than a month. Earlier, the US Navy awarded Lockheed Martin a contract for eight Spanish Navy MH–60R aircraft. Sikorsky has delivered 330 MH–60R aircraft to five countries. Sixty–four more are on order or in production for India, Greece, South Korea, Australia, Spain and Norway.

X–59 selected as one of TIME's Best Inventions of 2023

The X–59 experimental supersonic aircraft, built by Lockheed Martin Skunk Works and NASA Aeronautics, was selected as one of TIME's "Top Inventions of 2023" in the Transportation category. Early next year, the X–59

will be unveiled to the public at a rollout ceremony in Palmdale, California, before the aircraft takes its first flight later in the year.

GA–ASI LongShot flight testing

General Atomics Aeronautical Systems, Inc (GA–ASI) is poised to begin the flight–testing phase on the Defense Advanced Research Projects Agency's (DARPA) LongShot programme. Begun in 2020, General Atomics was competitively awarded a contract to develop DARPA's concept for disruptive air combat operations through demonstration of an air–to–air weapons capable air vehicle.

Milrem Robotics' new combat UGV with LMs

Milrem Robotics has unveiled a new THeMIS Combat Unmanned Ground Vehicle (UGV) equipped with loitering munitions that allow engaging targets farther behind enemy lines. The new system is equipped with Hunter 2–S tactical swarming drones by Halcon and features artificial intelligence that offers frontline forces the ability to locate, track and accurately eliminate soft targets, light vehicles and armoured vehicles.

BAE Systems and QinetiQ's A–UAS

BAE Systems and QinetiQ have signed a framework agreement which will see both parties collaborate in the area of autonomous uncrewed air systems (A–UAS) and mission management systems.

SkyDrive for 50 eVTOLs

SkyDrive Inc, an eVTOL aircraft manufacturer based in Japan, and Solyu Company, an aircraft leasing company specialising in zero emission in Korea, announced that they had signed a Memorandum of Understanding and Solyu has agreed to pre–order of up to 50 SkyDrive eVTOL aircraft "SkyDrive".

Textron and NetJets for 1,500 Cessna Citations

Textron Aviation and NetJets announced a record breaking fleet agreement for the option for NetJets to purchase up to 1,500 additional Cessna Citation business jets over the next 15 years. This agreement extends NetJets' existing fleet agreement, and includes options for an increasing number of aircraft each year, enabling NetJets to expand its fleet with Cessna Citation Ascend, Citation Latitude and Citation Longitude aircraft.

GE delivers 3,000th GE90

GE Aerospace announced that it has delivered its 3,000th GE90 production engine. Designed specifically for the Boeing 777 family, the GE90 engine family has combined for nearly 130 million fight hours and 18 million cycles since entry into service in 1995. Currently, 29 GE90 engines have accumulated more than 100,000 flying hours, with the fleet leaders approaching 107,000 hours and 19,000 cycles. The production totals include 408 base engines (GE90–94B) and 2,592 growth engines (GE90–115B).

Safran LGS for Bell's Tiltrotor

Safran Landing Systems is onboard Bell's tiltrotor aircraft programme, as part of the US Army's Future Long–Range Assault Aircraft (FLRAA) project. According to the contract, Safran Landing Systems will design and develop the fully integrated landing system. The US Army announced selecting Bell at the end of 2022.

NGC to modernise E–2D Advanced Hawkeye

Northrop Grumman was awarded a contract by the US Navy to evolve the E–2D Advanced Hawkeye cockpit and computing architecture with Delta System Software Configuration 6 (DSSC 6) through 2028.

Thales CMS for Polish Miecznik frigates

Thales will equip the Polish Navy Miecznik frigates with the TACTICOS combat management system, sonars, infrared sensor and radars providing the warships with multiple functions for detection, identification, command and control and decision making. The first ship is expected to enter service in 2029 through a strategic programme, which incorporates a cooperation agreement between Thales and the PGZ–Miecznik Consortium (lead by Polska Grupa Zbrojeniowa).

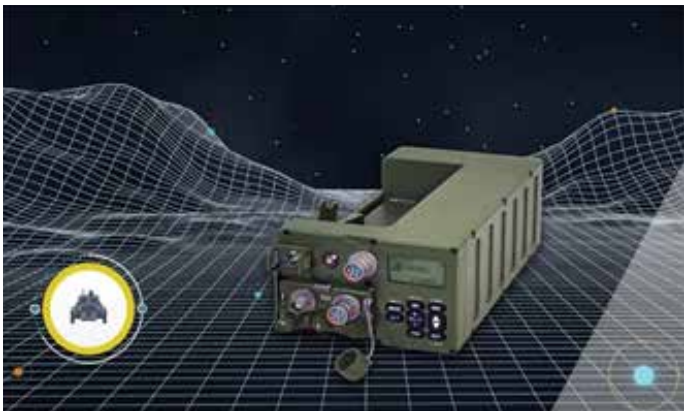
Cessna Citation Longitude reaches 100th delivery

Textron Aviation announced that it has delivered the 100th flagship Cessna Citation Longitude business jet to a longtime Citation customer. Textron Aviation employees celebrated this significant milestone with a special celebration at the company's headquarters in Wichita.

BAE advanced projectile for M109 Paladin

BAE Systems, in partnership with the US Army's Combat Capabilities Development Command Armaments Centre (DEVCOM AC), fired the XM1155–SC guided projectile the furthest distance an M109 Paladin has ever fired a guided projectile. The projectile successfully guided to and impacted the target area using GPS, demonstrating the added capability the round can deliver to the US Army's current howitzer fleet.

Thales order for 7,000 Combat Net Radios



The US Army has ordered more than 7,000 Thales RT–2129 Combat Net Radios (CNR) based on the Improved Multiband Inter/Intra Team Radio (IMBITR) technology, demonstrating "the service's continued confidence in Thales' ability to deliver next generation radios for the Army's network modernisation effort".

Austria selects C–390 Millennium

The Austrian Ministry of Defence announced the decision to select the C–390 Millennium aircraft as its new tactical transport solution. Austria joins Brazil, Portugal,

Hungary and Netherlands as future operator of the C–390 Millennium multi–mission platform, an aircraft "that is rapidly redefining the standards of tactical transport in the world defence market".

Czech Republic selects the Embraer C–390

Czech Republic announced the start of negotiations on potential acquisition of the new generation multi mission Embraer C–390 Millennium, a military transport aircraft. The decision to start negotiating towards possible purchase the C–390 was based on a market assessment and analysis prepared by Czech Republic's Ministry of Defence, which identified the C–390 as the most suitable solution for meeting the requirements of the Army of the Czech Republic.

SkyWest for 19 Embraer E175's

Embraer has agreed to the sale of 19 new E175 jets to SkyWest Inc for operation in the United Airlines network, adding to the 90 E175 jets SkyWest already operates for United. The value of the contract, which has been included in Embraer's Q3 backlog, is US$1.1billion, based on list price.

Southwest Airlines orders 108 more 737 MAX Jets

Boeing and Southwest Airlines announced the carrier is increasing its commitment to the 737 MAX family with an order for 108 737–7s. The new deal supports Southwest's modernisation strategy and provides flexibility to expand its fleet.

FORM IV

Statement about ownership and other particulars about newspaper (Vayu Aerospace Review) to be published in the first issue every year after the last day of February.

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I, Vikramjit Singh Chopra, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Vikramjit S. Chopra

Date: 15 Nov 2023 Signature of Publisher

News from MBDA

EUROSAM for additional SAMP/T NG systems

OCCAR–EA Director Joachim Sucker and Eurosam Managing Director Eva Bruxmeier signed the Amendment of the FSAF–PAAMS Sustainment & Enhancement (S&E) contract for the procurement of new generation ground based air defence systems SAMP/T NG for Italian Air Force. This procurement adds to the SAMP/T NG production ordered in January 2023 for the Italian Army and French Air and Space Force. The contract was signed in the presence of SEGREDIFESA, DGA and Italian Air Force representatives as it sees this Armed Force joining as a new FSAF–PAAMS domestic user, following the Italian Army and Navy, the French Navy and Air and Space Force and the British Royal Navy.

MBDA showcases ORCHESTRIKE

During the 2023 edition of Paris Air Show, MBDA demonstrated its collaborative combat effectors solution, ORCHESTRIKE. For the first time in Europe, an interactive demonstrator will allow military users to immerse themselves in a unique simulated raid using network enabled effectors, linked to each other, reacting live to the developments of a tactical situation. MBDA is actively developing the technologies to deliver collaborative effectors. These involve connectivity, software architecture and algorithms, including Artificial Intelligence with human in the loop.

AQUILA and MBDA

The extended air defence domain poses increasing challenges with fast–growing and complex threats, such as manoeuvring ballistic missiles, hypersonic cruise missiles and hypersonic glide vehicles. These new threats need to be addressed by dedicated interception solutions to ensure the efficient protection of domestic high value assets and operational deployments in the coming decades.

MBDA has worked for more than five years on innovative options for counter–hypersonic air–defence building on expertise from the ASTER anti–missile interceptor and deep knowledge of threats. This is the AQUILA project, proposing the most valuable counter–hypersonic interceptor concepts for European nations, alongside a global area defence portfolio with other MBDA air defence products.

MBDA and Mistral 3 ground–based air defence system

The Minister for the Armed Forces for France, and his counterparts from Belgium, Cyprus, Estonia and Hungary, signed a Letter of Intent (LoI) for the joint acquisition of the Mistral 3 ground–based air defence system. Led by the French Ministry for the Armed Forces with support from MBDA, the intent is to implement a joint acquisition of Mistral 3 by the French procurement agency Direction Générale de l' Armement (DGA) on behalf of all the partner countries. Mistral 3, currently in service with the French armed forces, is an air defence missile equipped with an infrared imaging seeker and advanced image processing capabilities. It can engage low thermal signature targets such as unmanned aerial vehicles (UAVs), turbojet–powered missiles and fast attack craft at long range.

MBDA welcomes Italy's intent to join the FC/ASW programme

MBDA welcomed the Italian Government's intent to join France and the UK in the Future Cruise/Anti–Ship Weapon (FC/ASW) programme. A Letter of Intent (LOI) that enables the launch of the key preparatory work for Italy to join the programme was signed by the representatives of the three National Armament directions: Lieutenant General Luciano Portolano, Secretary General of Defence and National Armaments Director for Italy, Andy Start, UK National Armament Director and CEO of DE&S, and Emmanuel Chiva Chief executive of the Direction générale de l'armement.

Participation in the FC/ASW programme will provide all three nations with a sovereign next generation deep strike and heavy anti–ship capability to counter advanced

threats. The programme will support the three countries' strategic co–operation on missile technologies, through MBDA as an integrated European defence champion.

Aster demonstrates performance in NATO trials

NATO exercises have again proven the potent air defence capabilities of MBDA's Aster missile in providing long–range protection from difficult air threats. Exercise Formidable Shield saw four successful Aster firings conducted by the Royal Navy, French Navy and Italian Navy against supersonic and subsonic sea skimming and manoeuvring targets. During the exercise, Italian Navy frigate "Margottini" successfully fired an Aster 30 against a Coyote GQM–163A supersonic target and an Aster 15 against a Firejet target. Meanwhile, French Navy frigate "Bretagne" fired an Aster 30 against a Coyote GQM–163A supersonic target and Royal Navy destroyer "HMS Defender" successfully conducted an Aster 30 firing against a Firejet.

MBDA led consortium and LARINAE project

The French defence innovation agency AID (Agence de l'Innovation de Défense) has announced the selection of a consortium led by MBDA in response to the LARINAE call for projects. The objective of LARINAE is the rapid and collaborative development of a remotely controlled ammunition capable of neutralising a hardened target within a radius of fifty kilometres.

Following on from the success of the first COLIBRI call for projects, MBDA has confirmed its position in the field of remotely–controlled ammunitions with the selection of its MUTANT concept, based on a "Minimum Viable Product" approach and focused on user requirements. It confirms MBDA's choice of an agile approach, to respond to the need for a rapid, innovative and sovereign solution for the armed forces.

MBDA's SPEAR–EW moves to the next stage

MBDA has received additional funding from the UK Ministry of Defence to accelerate the development of the SPEAR–EW stand–in jammer. SPEAR–EW is a novel electronic warfare effector designed to confuse and suppress enemy air defence, protecting friendly forces and acting as a significant force multiplier.

The world of Airbus

PHI for 20 H175 and 8 H160s

Airbus Helicopters and PHI Group (PHI) have signed a framework agreement that includes commitments for 20 super–medium H175 helicopters and 8 H160s to serve the energy market worldwide, including in the US.

Cathay Group orders 32 A320neo's

Hong Kong's Cathay Group has announced the purchase of an additional 32 Airbus A320neo Family aircraft as it continues to invest in expanding and modernising its fleet. The agreement doubles the Cathay Group's total orders for the A320neo Family to 64, of which 13 have already been delivered.

UA for 60 additional A321neo's

United Airlines has placed an order for 60 additional Airbus A321neo aircraft. United previously ordered 50 A321XLR and 70 A321neo aircraft. With this new order, the airline's direct purchase commitment from Airbus is now for 180 A321 aircraft.

LATAM takes its 1st A321neo

LATAM Airlines has taken delivery of its first A321neo leased from AerCap and placed an order for 13 additional A321neo aircraft. This is the first delivery of a committed backlog of 76 A321neo aircraft. In total, LATAM has 111 A320 Family aircraft to be delivered.

TA for 10 more Airbus A350–900s

Turkiye's national flag carrier, Turkish Airlines, has announced a new order for 10 additional A350–900 aircraft, taking its total for the type to 40. This latest agreement is in addition to one announced in August for four A350–900s. Turkish Airlines already operates a fleet of 14 A350–900s.

Successful A330 MRTT flight test campaign

Airbus and the Republic of Singapore Air Force (RSAF) worked together to successfully complete the automatic air–to–air refuelling (A3R) flight test campaign with the Airbus A330 Multi Role Tanker Transport (MRTT) and F–15 fighter, ahead of its certification in the first half of 2024. Over the course of three weeks in August, a RSAF A330 MRTT made more than 500 automated wet and dry contacts with the air force's full fleet of receiver aircraft, including the F–15SG aircraft, a customised variant of the US built F–15E Strike Eagle.

The world of Boeing

Enhanced AH–64E Apache's 1st Flight

The newest version of the AH–64E Apache has successfully flown with an upgraded capabilities suite as Boeing continues to modernise the platform. The upgraded E–model Apache, known as Version 6.5, or V6.5, is the next configuration of the attack helicopter.

Vietnam Airlines selects 50 Boeing 737 MAX

Boeing and Vietnam Airlines announced that the carrier has selected the 737 MAX family to expand its single–aisle fleet, with a commitment to order 50 737–8 airplanes.

SMBC orders 25 Boeing 737 MAX

Boeing and SMBC Aviation Capital announced the airplane lessor is ordering 25 737–8s. The new order increases SMBC's backlog to 81 737 MAX jets.

Australian P–8A Poseidon's to receive upgrades

Australia recently announced the Royal Australian Air Force's (RAAF) fleet of P–8A Poseidon Maritime Patrol and Response aircraft will be upgraded to Increment Three Block Two, the latest capability upgrade available for the aircraft. The upgrade will enhance anti–submarine warfare, strike and intelligence capabilities.

RTX selected by Boeing for X–66A

RTX has been selected by Boeing as a collaborator on the X–66A flight demonstrator, part of NASA's Sustainable Flight Demonstrator project. Two RTX business units, Pratt & Whitney and Collins Aerospace, will support Boeing with Pratt & Whitney GTF engines, and Collins nacelles and engine accessories.

UA for 50 more Boeing 787 Dreamliners

Boeing and United Airlines announced the carrier is expanding its 787 Dreamliner fleet, exercising options to order 50 787–9 airplanes and securing an additional 50 options. With 150 firm orders, United has the largest Dreamliner orderbook on record and is positioned to become the largest 787 operator in the world. This announcement follows the airline's record setting purchase of 100 787 airplanes last year.

Boeing, Nammo Ramjet 155 test sets distance record

A Boeing and Nammo team set a record for longest indirect fire test of a ramjet powered artillery projectile alongside officials from the US Army, firing a Ramjet 155 munition from a 58 caliber Extended Range Cannon Artillery (ERCA) at Yuma Proving Ground, Ariz. The test advances development efforts for the Army's top modernisation priority, Long Range Precision Fires. The success follows last year's Boeing/Nammo test recording the longest ever indirect fire test of a Ramjet 155 munition.

News from Lockheed Martin

LM and Slovakia unveil 1st F–16 Block 70

The first F–16 Block 70 aircraft for the Slovak Republic was unveiled at Lockheed Martin's facility in Greenville, South Carolina, during a visit from the country's Minister of Defence, Martin Sklenár. The Slovak Republic will be the first European country to receive this newest and most capable version of the Fighting Falcon.

1st flight of Slovakian F–16 Block 70

Lockheed Martin announced the successful flight of the first Slovakian F–16 Block 70. The flight occurred 29 September at Lockheed Martin's production facility in Greenville, South Carolina, with test pilot Ryan 'Cujo' Blake successfully conducting multiple system tests to validate performance and supersonic capabilities during the flight.

LM UK launches Team Black Hawk

Lockheed Martin has announced its intention to participate in the UK Ministry of Defence's (MOD) New Medium Helicopter (NMH) requirement. It outlined its team of UK partners and the benefits of choosing the Sikorsky Black Hawk helicopter to replace the UK's aging mixed medium helicopter fleet. Lockheed Martin also outlined its plan to collaborate with those UK partners to create a multitude of opportunities for UK industry,

including jobs and opportunities in export, manufacturing and future technology development.

US Navy Selects LM to develop ICS

The US Navy selected Lockheed Martin as its Integrated Combat System (ICS) Systems Engineering and Software Integration (SESI) agent. Lockheed Martin will design integrated warfare system architecture and capabilities so that software updates can be delivered in real time across the Navy's surface fleet of Aegis destroyers, cruisers, and frigates, plus carriers and amphibious ships.

LM's Captive Carry Test

For the first time, a Lockheed Martin missile communication prototype successfully demonstrated a proof–of–concept for providing inflight target updates to a surrogate Guided Multiple Launch Rocket System (GMLRS). During a recent captive carry test, the company's Remote Interceptor Guidance 360 (RIG–360) uplinker prototype provided target updates

to a data link being evaluated for experimental use on MLRS Family of Munitions (MFOM). The data link was flown inside of an aircraft replicating the rocket's surface to surface trajectory.

Contract for 8 Spanish Navy MH–60R Seahawks

Lockheed Martin has received a contract from the US Navy to produce eight Sikorsky MH–60R Seahawk helicopters for the Spanish Navy (Armada). Designed, built and integrated with advanced missions systems and sensors for anti–submarine and anti–surface warfare, the future Armada MH–60R aircraft will significantly upgrade and broaden the range of maritime capabilities currently performed by its SH–60B Seahawk fleet.

Successful test of MFEW–AL

Lockheed Martin announced a successful flight test of the Multi Function Electronic Warfare Air Large (MFEW–AL), an airborne electronic payload with attack and support capability. This MFEW–AL test represented the first time in decades US Army Electronic Warfare (EW) Soldiers successfully conducted a series of airborne electronic warfare against a variety of threat emitters. Additionally, this test marked a key milestone that moves the system closer from system development to initial production.

Supporting the National Cyber Range Complex

The US Army Contracting Command Orlando, on behalf of the Test Resource Management Center and Programme Executive Office Simulation, Training and Instrumentation, has selected Lockheed Martin for Event Planning, Operations and Support (EPOS) at the National Cyber Range Complex (NCRC) site at Joint Base Charleston in Hanahan, South Carolina. This effort, which is one of five tasks orders on the NCRC programme, will provide realistic cybersecurity environments to enable test and evaluation of major Department of Defence (DoD) acquisition programmes and realistic training and certification for the DoD Cyber Mission Force.

Philippines for 3 C–130J–30's

The Republic of the Philippines Department of National Defence announced the acquisition of three new C–130J–30 Super Hercules tactical airlifters from Lockheed Martin through a Direct Commercial Sale. In choosing the C–130J, the Philippines joins 21 other nations that rely on the Super Hercules to support tactical airlift mission requirements.

News from Saab

Order for additional functionality for Gripen E

Saab and the Swedish Defence Materiel Administration (FMV) have entered into an agreement regarding new functionality and adjusted delivery schedules for Gripen E and Gripen C/D. The agreement relates to the period 2023–2030 and the order value is approximately SEK 5.8 billion. In order to secure the Swedish Armed Forces' operative fighter capability, the Armed Forces, FMV and Saab have agreed on adjusted development and delivery plans, enabling continued development and operation of Gripen C/D after 2030 in parallel with the introduction of the next generation fighter, Gripen E.

US AT4 and Carl–Gustaf ammunition order

The US Department of Defence (DoD) has expanded a current framework agreement with Saab for AT4 systems and Carl–Gustaf ammunition. A new order has also been signed valued at USD 104.9 million with deliveries during 2024–2026. The Indefinite Delivery, Indefinite Quantity (IDIQ) framework agreement was originally signed in 2019. The extension will allow the US customer to place orders of Saab's close combat solutions for up to an additional USD 422 million.

Bombardier delivers Global 6000 for Saab's GlobalEye

Bombardier Defence recently celebrated the sixth delivery of a Global 6000 aircraft to Saab, ready to be transformed by Saab into their Airborne Early Warning and Control solution known as GlobalEye. This aircraft will join the Swedish Air Force once Saab completes the transformation, further "highlighting the illustrious capabilities of both companies in providing forward–looking solutions for nations across the globe".

AEW order from Poland

Saab has received an order from Poland's Ministry of National Defence for two Saab 340 Airborne Early Warning (AEW) aircraft. The order value is approximately SEK 600 million and the contract period is 2023–2025. These early warning systems comprise the Saab 340 aircraft equipped with Saab's Erieye radar. The contract also includes ground equipment as well as in–country logistics and support services.

Saab launches Giraffe 1X deployment set

Saab has launched a new Deployment Set configuration for the Giraffe 1X radar. The new configuration is designed to be easily transported, swiftly relocated and quickly operational: all features highly desirable on a modern battlefield or where air threats from any direction pose a real risk to a fixed installation. Giraffe 1X Deployment Set is an easily deployable, compact and robust, software based, lightweight 3D AESA radar. Giraffe 1X Deployment Set is a "versatile solution for both mobile and fixed installations".

New camouflage feature solves communications challenge

Saab has announced a new feature for its Barracuda Ultra lightweight Camouflage Screen (ULCAS) giving armed forces the possibility to combine protection from the enemy with the possibility to communicate with friendly forces. Saab's new Frequency Selective Surface technology (ULCAS–FSS) allows selected radio frequencies to pass easily either way through the camouflage net, while protecting against the higher frequencies of electromagnetic waves used by radar systems.

Saab and Boeing sign 787 Dreamliner agreement

Saab has signed an extension agreement with Boeing for the manufacturing of large cargo doors, bulk cargo doors and access doors for the Boeing 787 Dreamliner. The framework agreement is an extension of an existing contract signed with Boeing in 2004 for the 787 Dreamliner programme.

Order for Sight and Fire Control capability for CV90

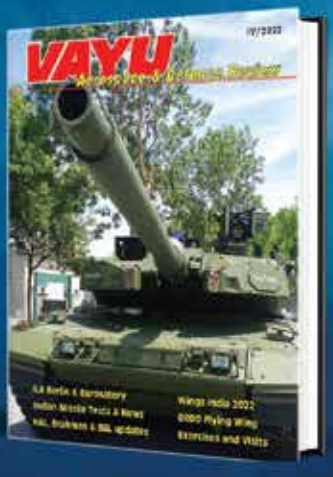
Saab has received an order from BAE Systems Hägglunds for sight and fire control capability for the CV90 combat vehicle. The order value is approximately SEK 970 million and the contract period is 2023–2029.

Saab will provide the sight and fire control capability for the BAE Systems' CV90 ordered by the Czech Republic earlier in 2023 and will carry out the work in Sweden and the Czech Republic.

VAYU

Aerospace & Defence Review

49th year of Vayu



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Rubin Design Bureau's Amur 1650 submarine

Kilo class submarines are well known at the export market. More than 70 ships of the basic and upgraded design have been already constructed and inducted into the Russian Navy and those of friendly countries. Now meet Amur 1650, the next generation submarine. She is more compact: with similar weapon pack (six torpedo tubes with ammunition comprising 18 torpedoes and missiles) the surface displacement has been reduced; the displacement of Pr. 636 submarines is about 2,400 tons, the same of Pr. Amur 1650 is less than 1,800 tons. Due to automation, the complement has been reduced from 52 to 35.

Powerful torpedo–missile complex, capable to strike both underwater and surface targets, as well as to attack land targets. Torpedo or missile salvo can be launched from all six tubes. Improved stealth, hence, advantage in duel situations. It also reduces the probability of detection by surface ships and anti–submarine aircraft. Stealth is ensured by advantageous hull lines, carefully designed propulsor (propeller), slow–speed low–noise permanent magnets propulsion motor, specially developed low noise equipment and advanced acoustic protection means.

Forward sonar array and availability of towed array sonar, as well as advanced processing techniques enable detection of very low–noise targets at considerable distances. The submarine is designed also for tropical waters operations.

Ergonomic Combat Information Centre (CIC): operators' consoles are of modern design and have user–friendly interface. Consoles arrangement ensures swift and accurate joint work in standard combat and emergency scenarios.

Amur 1650 can be fitted with Air Independent Propulsion (AIP). Rubin Design Bureau proposes AIP system based on diesel fuel reforming. Diesel fuel reforming is attractive from operational point of view: hydrogen is not stored on board, instead it is produced and instantly used (absence of "hazardous stock"); only in case of diesel fuel reforming, the submarine gets the opportunity to store one type of fuel only and use it for diesel–generators, as well as for AIP system. Hence, the submarine operational cost reduces; use and storage of diesel fuel onboard submarines has been mastered long ago; all naval bases of the world have adequate infrastructure for diesel fuel storage. Hence, additional infrastructure cost inputs are not required; it is possible to develop a range of plants: from low to high power and finally, the AIP system is designed to be maintenance free between submarine's overhauls.

Text and photos: Rubin Design Bureau

Rosoboronexport and production of small arms

Rosoboronexport JSC (part of Rostec State Corporation) has significantly expanded its export catalog of Russian small arms over the past 5 years.

"Over the past 5 years, Russian arms manufacturers have significantly expanded the range of their products. Rapid development of design and engineering competencies is due to a high level of competition in the global market, market diversification into narrower segments, production management optimisation, as well as the emergence of new players in the national arms market. Thanks to this, today Rosoboronexport can offer its partners more than 90 models of small arms that fully meet the demand from any army and special operations units," stated Alexander Mikheev, Director General of Rosoboronexport. "Moreover, there are over 50 models of civilian and service weapons in our export catalog, which are in high demand from police and special agencies of our partner countries. We offer precision rifles, carbines, pistols and hunting rifles on the market."

Among the latest models promoted by Rosoboronexport on the world market are products from the Kalashnikov Group and JSC High Precision Systems, both are Rostec's subsidiaries: Kalashnikov AK–308, AK–19 assault rifles, Chukavin SVCh sniper rifle, Lebedev PLK pistol, Kalashnikov PPK–20 submachine gun, Kord 6P68 and 6P67 balanced–action assault rifles, Kord–338LM bullpup precision rifle and the SHAK–12 heavy assault rifle system.

Among civilian and service weapons, precision rifles such as the ORSIS T–5000, ORSIS F–17 and a heavy ORSIS 12.7 model from Promtechnology, the Raptor, Phantom and Elegance Exclusive rifles from Bespoke Gun that debuted in 2023, as well as Lobaev Arms' DXL–5 Devastator, TSVL–8 M5 Dominator and DVL–10 M3 Wolfhound precision rifles occupy top positions in their market segments.

Traditional manufacturers of small arms for the armed forces are also present in the civilian arms market. In particular, High Precision Systems offers the MTs–566 and MTs–560 carbines, and the Kalashnikov Group – the Saiga–9 self–loading carbine, the MR–135 Taktika pump action shotgun and the MR1 self–loading hunting carbine.

All modern models of Russian civilian and service small arms are high–quality, convenient and high–tech products. They combine excellent ergonomics, adaptability to the user and high performance characteristics. Their design allows convenient and easy mounting of sights and tactical accessories, ensuring their effective use in various conditions. In addition, thanks to unique design solutions, they enable you to fully implement your shooting skills, regardless of anthropometric data and the availability of a variety of clothing, gear and equipment.

Rosoboronexport offers foreign customers small arms systems suitable for the most challenging combat and special missions. They include a wide range of day, night, thermal imaging and holographic scopes manufactured by Shvabe, a Rostec subsidiary, Infratech and Dedal, as well as a range of Russian made sniper, armour piercing, armour piercing incendiary and tracer ammunition.

Kord

Raptor

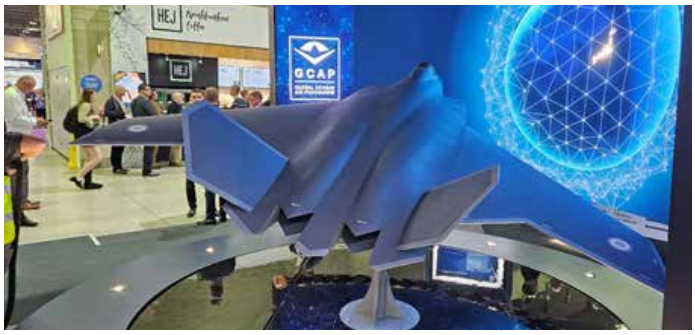
"Many models of small arms presented by Rosoboronexport on the world market have already been tested in real conditions and improved by manufacturers with regard to feedback directly from the battlefield. They meet the requirements of modern combat operations in terms of performance, operational characteristics and ergonomics to the maximum extent possible," Alexander Mikheev stressed. "At the same time, Russian manufacturers continue to expand the range of their models. One of the new products from Kalashnikov Group will be unveiled by Rosoboronexport at Dubai Air Show in November 2023."

Courtesy: ROE

AK–19 and AK–308

Orsis

GCAP industry partners agree next steps



Defence industry leaders in the UK, Japan and Italy have agreed a trilateral Collaboration Agreement to deliver the concept phase requirements of a next generation combat aircraft for the Global Combat Air Programme (GCAP).

GCAP is a strategically important partnership between the UK, Japan and Italy, which brings together the three nations and their respective industries to collaborate on shared military and industrial objectives in the delivery of a truly next generation combat aircraft in 2035.

The agreement between BAE Systems (UK), Mitsubishi Heavy Industries (Japan) and Leonardo SpA (Italy) reflects positive momentum and strong trilateral cooperation, and will involve the industry partners maturing integration, collaboration and sharing of information towards the next phase of GCAP.

The Collaboration Agreement supports ongoing discussions to set out long–term working arrangements and maturity of the concept and capability requirements for the next generation combat aircraft.

Herman Claesen, Managing Director, Future Combat Air Systems, BAE Systems, stated, "We have maintained a high tempo of engagement with our industrial and government partners in Italy and Japan since the launch of GCAP. The Collaboration Agreement signals the strong alignment across all three nations to meet common goals and objectives on the programme to deliver a truly international, next generation combat aircraft."

Guglielmo Maviglia, Director GCAP Programme, Leonardo SpA, stated, "This trilateral collaboration on the programme, for the development of a next generation system, represents the flagship of the distinctive capabilities and disruptive technologies that the partners of the three nations will share, in an innovative way, for the success of the programme. Participation in DSEI London fits perfectly into our progress of the collaboration and consolidates more than ever the strong ties created between the partner companies of Italy, the UK, and Japan. In this context, we are particularly proud to be able to contribute to the future and the prosperity of the generations to come with significant implications for security and technological development, as well as in the field of research and innovation in the aerospace and defence sectors."

Hitoshi Shiraishi, Senior Fellow, GCAP, Mitsubishi Heavy Industries, stated, "We are truly honoured to be part of GCAP and will bring all of our considerable knowledge accumulated through previous programmes to the table. The Collaboration Agreement is one of the key steps to ensure our mutual success. We have already started cooperating closely with our UK and Italian partners and believe that our mix of cultures and diverse perspectives will contribute to the success of this programme."

GCAP is a hugely significant programme for the security, political and economic prosperity of each nation and through effective knowledge and technology transfer will help to evolve and deliver important sovereign combat air capability in each nation for generations to come.

FLY NAVY, FLY

A HISTORY OF INDIAN NAVAL AVIATION

PUSHPINDAR SINGH
ANGAD SINGH

Air Marshal (R) Harish Masand says…

I Learnt More than Flying from Them: The Tiger Cubs of 1 Squadron

1 Sqn Jaisalmer, end January 1984. Sitting: Vashisht, Saha, Nijjar, Saini, Tam Sarma, Zapo Sinha, Jimmy Thomas, Koti Rao. Standing: Sahota, Kika Khanna, OR Parsad (partially hidden), Fuzz Moulik, Santa, Oka, Teshter, SC Mehta, Harish, Kadian, Mallu Malhotra.

My recollection of the time I spent in 1 Squadron, "The Tigers", 40 years ago came back like a flood when early in October, I was informed about the celebrations for the 90th anniversary of the Squadron planned on 6/7th of November 2023 and invited for the event. More importantly, reflecting on those days brought to the fore the lessons I had learnt while serving as the flight Commander of the Squadron in Gorakhpur in 1983–84. This piece is thus dedicated to those young Tiger Cubs and the airmen who taught me some things about life and leadership, despite being years younger and junior to me, which I may never have picked up unless I had been there with them in those difficult days.

I say difficult because the Squadron had been declared non–operational by DASI sometime in late 1982 and the morale of the Squadron was obviously low, particularly since 1 Squadron had the distinction of being the premier squadron of the Air Force, being the oldest, rich in its history and achievements and having produced almost all the initial leaders of the Indian as well as the Pakistan Air Forces. What prompted me to write this article at this time was also the fact that some of the later 1 Squadron members, that I had met recently, had no inkling or recollection of these events and how the Squadron recovered from this humiliating and demoralised period in its history. This article is thus meant to express my gratitude to all the folks of 1 Squadron of those days who stood with me and contributed to our combined efforts in bringing the Squadron back to a respectable operational status in quick time, albeit a little suspiciously and reluctantly initially, which is what taught me an immense amount in terms of human relations and man–management and which came in handy in my future appointments.

How I landed up in 1 Squadron also makes a strange story because, by all normal parameters, I should not have been there. The readers may recall that in my previous article on Air Marshal Dilip Jog, (Issue 5/2023), I had mentioned how I was sent for the Su–7s when I was actually seeking a conversion to MiG–21s. Due to that experience, I never again asked for any choice posting through the rest of my career in the Air Force and always left the column for the choice of posting in the ACR Form blank, leaving it to the powers that be to decide on where to utilise me. In end of 1982, I was completing the Staff Course in DSSC, Wellington and it was customary for the Director Personnel (Officers), DPO for short, to visit and ask the students where they wanted to go after the course. I gave a blank Form as usual which prompted the CI (Air), then AVM Cecil V Parker, to call me and ask me, in a lighter vein, whether I intended to settle down in Wellington permanently. I replied in the same manner to state that I really didn't care where I was sent and would not really mind if I stayed back with him in Wellington, which suited Malini and me in every aspect. Then came the perplexing posting order to 1 Squadron, then located in Gorakhpur. So, Malini and I drove across North to Gorakhpur along with our daughter, Ruheene, who was just over a year old then, slowly through Poona, Indore, Delhi and Lucknow, to meet family and friends during the bit of leave and joining time as also to collect our

1 Sqn, Jaisalmer, January 1984 on the tarmac

belongings, most of which were parked in Indore with my parents after our return from Iraq in July 1981.

Passing through Delhi, we called on then Group Captain Vinay "Kappy" Kapilla and his charming wife, Rekha, whom we had known since Adampur days, when I was a Flt Lt in 101 Sqn in 1977–78, and had been privileged to be their neighbour while Kappy Sir was a Wg Cdr commanding 108 Squadron. In Delhi, Kappy Sir was the JDPO and the conversation over dinner came around to my posting to 1 Squadron. I frankly expressed my surprise at this move since I was essentially a MiG–21M (Type 96) guy having spent my time in 17 & 101 squadrons with a bit of MiG–21FL (Type 77) flying in TACDE in 1978–79 and all other variants, but essentially the trainer, in Iraq from 1979–81. So, while I was being sent to a Type 77 squadron to be the senior Flight Commander in a short–while, others who were far more qualified on Type 77s and senior to me, due for command of a squadron soon, were being sent to Type 96 squadrons as the third or fourth in seniority for Flight Commander's post. Kappy Sir, in his typical laconic manner, told me to stop thinking of such things and just said he had personally chosen me to restore the squadron's operational status since the Tigers had been declared non–ops by DASI a few months before. One couldn't argue with that.

We arrived in Gorakhpur in mid–January 1983. The CO then was Wg Cdr RRJ "Lala" Dass and the senior Flight Commander Sqn Ldr V Pashupathi, the latter I knew from Hasimara days when he was in 17 Squadron. Immediately after me was Sqn Ldr Satish Mehta, again well known from Hasimara days and who also was my neighbour since we were allotted a flat next to him in the married quarters. After that, there were some Flight Lieutenants and lots of young Flying officers, all in various stages of their operational syllabus with just "Koti" Rao, Kadian and Arvind Oka just operational by day. Initially, I found it strange that all the younger folks, the Cubs as I called them, were absolutely cold and indifferent to us, in the squadron as well as the Mess. Malini and I started to visit the Mess, which was almost 4 km away from the married quarters, regularly for the library and a drink.

1 Sqn 75th Reunion 2008

In the initial few visits, we found that all the bachelors avoided talking to us and just disappeared from the area after seeing us. I found out slowly that this was because of a deep distrust that had developed between the senior leadership and the junior lot. So, the first agenda on my list was to gain their trust so that we could work together as a team towards our operational goal. The same thing applied to the airmen who were also initially unfriendly. So, we had to adapt instead of just assuming that our position as a Flight Commander automatically gave us the standing we wanted and find innovative ways to get the young Cubs in sync with us. What I practically also learnt in this process was different techniques to gain the trust of the subordinates, by giving them due respect and space, till they felt that you were honest and sincere in your efforts towards their operational training/performance and welfare while displaying high professional standards yourself.

1 Sqn GJ April 1983. L to R Peter, Guddi, MIAF, Self and Malini.

Another opportunity came my way within 2 to 3 weeks of my arrival when "Lala" Dass decided to pit himself against me to prove a point, after just a few familiarisation sorties due to my longish break from flying, by putting me for a 1 vs 1 sortie against him in the flying programme. Somehow, that morning of the sortie, I found all the cubs looking at me in a strange manner and later found out that they had all gathered around the radio set in the crew room to monitor the sortie as soon as we took off. This important sortie was flown on 2 February 1983 as per my log book. Without being immodest, Lala tried to get the better of me by initially positioning himself at an advantage but I managed to get behind him pretty quickly every time. We did some four or five situations before he got tired of it. In the debrief, Lala just said we would repeat the sortie since his aircraft seemed under powered. So, we switched aircraft between the two of us and took off again, with the same results. Needless to say, there was no debrief and Lala just walked off with an expression of disgust. After these two sorties, I thought I saw a trace of respect in the eyes of the cubs and sure enough, that evening in the bar, a couple of them joined us for a drink. No names here, but one of them even expressed satisfaction at what they had heard over the radio in these sorties because Lala had a habit of taking one of them off and on for a combat sortie and then gloat over the situations in the

debrief instead of teaching them how to do better. Immediately thereafter, I started flying combat sorties with the cubs towards their operational syllabus and, though they perhaps found it initially boring, I briefed and debriefed them thoroughly while explaining my pet theory of paths to them explaining that the objective was that they should be able to step on my shoulders and do better than me when they reached anywhere close to my seniority and experience.

However, my flying in the squadron was a little restricted in the initial period because of the Golden Jubilee celebrations of the squadron planned on 1 April 1983. For this, the CO tasked me with a number of jobs, because of my PSC, which included the compilation of the squadron history, organising the squadron museum and all the events, including golf in the afternoon, the entertainment programme in the evening followed by the GJ dinner. Particularly for the history and the GJ brochure, I had to make a few trips to Delhi to meet, and collect some stories and material from, our illustrious predecessors which included then Air Chief Marshal Arjan Singh, Air Marshal "Timki" Brar, Air Marshal LM Katre and Group Captain "Omi" Taneja, the latter having commanded the Squadron during the 1965 Indo–Pak War on Mysteres. This is when I picked up the details of the mission the Squadron had flown on September 7, 1965 and the missing Sqn Ldr AB "Tubby" Devayya which led to my writing a dream sequence on what may have happened in Tubby's mission and publishing it in the Squadron Golden Jubilee Brochure. Unfortunately, my copy of the Brochure has gone missing but I still have the typed manuscript with me.

1 Sqn GJ 1983 with MIAF

In this time, I was hearing some stories of the stuff that was going around in the Squadron which had broken the trust between people, both from the officers as well as the men. Somehow, I found a good link to the men with two Junior Warrant Officers, Mathur in the MT section and Premnath, an Inst/Fitter who was literally in charge of the technical activities in the squadron. Both got very friendly with me and I used to visit them regularly for tea and samosas, in JWO Mathur's house and Premnath in the SNCO's Mess since he was living–in. I also got involved in the Squadron games, particularly football and hockey apart from volley ball with them. Due to all these activities, the mutual respect and bond grew further, particularly due to the entertainment programme wherein the men's families including their young children were participating for the GJ. This also taught me how to gain the trust of the airmen without any over familiarity but with mutual respect while motivating them to work as one team and produce the desired results.

1 Sqn 1983 GJ and Bhangra

Soon after the Golden Jubilee events, my flying with everyone picked up. We were also required to move to Poona for the command gunnery meet in early May 1983. Lala asked me to pick the team for various events which I politely declined since I had not done any armament training with the Squadron and did not know individual capabilities in that area. I politely told the CO that I could only go by the armament register and the scores recorded therein, (all of which suspect in my mind), and it would be better if Pashupathi and he together decided on the teams for the events. Since I had not done any armament training myself for over four years by then, I also requested him to leave me out of this event till I got my hand in. While the latter request/suggestion was not accepted, and I was put in the team in all the events, my doubts on the authenticity of the armament register were confirmed since the squadron did not perform anywhere close to the scores of individuals logged therein. I wouldn't like to say any more on this and name individuals who performed or who did not.

The same held true for the aircraft serviceability state which was confirmed soon after when Pashupathi was on leave pending posting in May 1983 and the young technical officer, Flt Lt "Pandit" Sharma came to me with the inflated morning serviceability state for my signature and I refused to sign. This resulted in an angry Lala calling me and literally ordering me to sign it but I held my ground and politely refused. Quite obviously, that did not win me any points with him or my report that he wrote shortly thereafter on handing over the Squadron to Teshter Master in end May or 1 June 1983 and which hurt me later in my career but I think it did take my stock up with all the youngsters when they realised that I was willing to sacrifice my career on principles. I could narrate some more stories on this aspect but would desist from doing so here after so many years. So, that was another lesson in transparency, honesty and principles for me.

1 Sqn on the sands of Sam, January 1984

At that time though, I didn't really care nor made any efforts to have the report corrected and since I was not informed of anything in writing. Instead, my entire focus was to get the Squadron upto speed as soon as possible once Teshter Master took over. Towards this, I started with a fair amount of theory for air to ground armament work and for tactical and air combat manoeuvring with detailed briefings on the theory of paths that I had formulated for my own self. I also started flying with each individual to slowly build up their capabilities. On taking over, Teshter also designated

me as the 2 i/c of the Squadron and asked me to look after most of the administration too. This involved a fair amount of paper–work and also interaction with the airmen in the afternoons before night flying.

At the same time, I decided to make all the standard briefing guides and sight pictures for various conditions on readily available charts. Tester was also particular that I didn't keep the youngsters in the Squadron after 1.30 pm and get them back only if there was night flying planned. That gave me a lot of time in the afternoons on my own to do all the required works before night flying on almost 10–12 days a month. While I didn't keep anyone back in the Sqaudron after 1.30 pm, the pace with day and night flying made some of the young wives complain to me, in a lighter vein, that I was keeping their husbands busy and away from them most nights. Here, Malini helped a lot. She was a friendly, easy–going person so, on the social front, she was truly my greatest asset to break the ice and get people going. Through all this, we formed a good cohesive team with lots of professional as well as social activities. I also found the Cubs enthusiastic about advanced exercises like 4 Vs 2, 2+2 Vs 2, strike plus escorts Vs CAP as also night strike role to which I progressively introduced them. This was the time when we really bonded and coined phrases like, "Number One, Second to None" and "work hard, Play Hard" for the Squadron.

Our team work really paid off and was visible both professionally in the Squadron and in social functions. Knowing how busy I was, some of young Cubs and some wives started asking Malini out whenever they had the time and taking her for movies or just a gad in town, at times. Malini also built a great rapport with all the Station Ladies, and some of them became friends for life. The pace of training and camaraderie paid off in quick time since DASI visited us without any notice in February 1984 when the young Cubs proudly and confidently showed Wg Cdr "Ben" Brar, the main Inspector, what they had learned making him ask me what I had done to them.

We didn't reveal that having manoeuvred with 6 to 8 aircraft in combat, the Cubs now found 2 Vs 2, with just three other aircraft to keep in contact, a piece of cake. We got our operational status back from DASI with an Average Plus rating which was pretty good considering the experience level of our pilots and the limited time we had for retraining after the GJ. Our armament scores, both air to ground as well as air to air, also showed tremendous improvement because of all the theory we studied before the phase, followed by detailed film debriefs, with a healthy competitive spirit developing between everyone during the armament detachment at Kalaikunda in September 1983. Soon, I also quietly introduced the Cubs to the night strike syllabus, with just dummy attacks, which was practiced with zeal in the desert later while in Jaisalmer. The perking up of the self confidence levels in the Squadron was obvious.

1 Sqn 90th Anniversary. With Chimpy Kaushal and Ramas

At the same time, with motivated men working on the aircraft, our aircraft serviceability also truly started matching the earlier made–up figures. As I had mentioned earlier, having won over "Pandit" Sharma and JWO Premnath earlier, and even the senior STO, Sqn Ldr Yadu later, really helped us in this effort. We also had the advantage of being the only fighter squadron in Gorakhpur where we there was little difference between first line and second line men and equipment. With better serviceability, everyone got a lot of flying and quickly became operational in all phases which gave each person greater confidence and satisfaction. We also instituted procedures wherein we got into combat or the main portion of the mission as soon as we reached the designated sector at the desired altitude and finished exercise heading towards base so that we could recover without wasting time.

This led to shorter sortie durations but higher sortie generation, thus also saving precious aircraft hours while reducing the down–time for servicing. The efforts and sacrifices made by all the folks to achieve the mutually agreed laid down objectives is something I have not forgotten and am grateful for even today. In a lighter vein, Teshter liked me to lay down such formal monthly objectives, having come from CDM, and we got the opportunity to show–off accomplishment sometimes even before the deadlines we had set for ourselves. The best part was that we achieved all these objectives progressively without a single accident or serious incident, minor ones like hitting a buck at night on the runway during the landing roll and then celebrating with a barbecue, in the play hard part, notwithstanding.

Of course, such team achievements also came with an odd problem when I had to ground one of the operational Flight Lieutenants, who had joined the Squadron from elsewhere, and recommend him for transfer out of fighters due to his lack of situational awareness and leadership in the air. This did cause a bit of a flutter but almost all the pilots saw this happen in a transparent manner and understood that there was no compromising on professional standards and flight safety. Though the affected officer initially questioned my assessment, even Teshter soon found out for himself and accepted that this was being done essentially to save that pilot's life and family though, initially, he may personally be disappointed at this turn of events. Another lesson that is fresh in my

1 Sqn 90th Anniversary with 1965 veterans Phillip and Danny Satur

mind through which all the folks from that era are still alive. The only one we unfortunately have lost from that team of 1983–84 till date was "Koti" Rao, later in Tezpur after moving to MOFTU, due to ejection seat failure. The rest all did well in various walks of life with some notable ones making it to C–in–Cs/VCAS/DCAS. They certainly did better than me, as exhorted to them earlier.

Such efforts bonded us all and due to the transparency, the divide between seniors and juniors was effectively bridged. The real proof of our operational readiness came when just before new year in 1983, the new Station Commander, Gp Capt Subburamu, charged into me as the officiating CO on 27 December 1983 and said we had to proceed to Jaisalmer immediately since the squadron detachment there had to be relieved from ORP duties. We were initially tasked to move there after New Year in early January 1984 with 2 x An–12s as transport support, the ferry being planned with the Drop Tank. Now, Command wanted us to take over the ORP immediately after landing so we had to fly in the clean configuration with the gun–pod since the transport support was just one Avro, already on its way to Gorakhpur that day, and some more the next day or the day after. While Groupie Subbu kept breathing down my neck to try and hurry me up, I took my time to redo the entire plan with the STO and pilots, delegating different duties to individuals to get us going as soon as possible. In between, we also rushed out to kiss our wives/GFs goodbye and to pick up a change of clothes and toiletries that could be carried in the MiG–21 itself, leaving the suitcases for later transport aircraft since the first Avro was already loaded to its maximum capacity with first line equipment and men to support the ORP aircraft till the other load arrived. Even with this complete change of plans, we managed to get airborne for the first leg till Bareilly within 4 hours of receiving the order to move. Unfortunately, the weather after Bareilly did not permit us to take off for the second leg till Jodhpur that day and we had to spend the night in Bareilly. The next day also, we had to change the route through Sirsa, instead of Jodhpur, due to bad weather. We still encountered a line squall extending to around 45,000 ft on the way to Sirsa but all the 10 fighters and one trainer that we were taking got through safely, even though some of the pilots were young Flying officers who had just attained their Day Operational Status.

As soon as we landed at Jaisalmer, just after lunch, the Station Commander, Group Captain Vishnu Johri, had us ushered into the base ops room to give us a push to take over ORP duties. I think we gave him a scare when he walked into the briefing room and found all young folks and, as he shared with me a few days later, was worried about the record of Jaisalmer till then with young people like us. A glance at the photos of Jaisalmer detachment would make that obvious. The next day, I, perhaps, confirmed his foreboding since after ensuring the ORP manned before dawn, we did not fly that morning since I was trying to get all the administrative support sorted out and had left the rest to go over the station orders for flying. Groupie Johri finally had me traced out in the MT Section and asked me to see him immediately. He then told me that the last squadron detachment had done 400 sorties in their month's stay there and asked why we were not flying. I told him that the transports given to us were all in bad shape, even the refueller had to be push started, and I was in the MT Section trying to get these repaired and fixed to the extent possible. I told him that even the arrangements for the airmen were far from satisfactory and I intended to get all these issues sorted out so that we could focus on the flying thereafter without having to worry about mundane matters like where the meal transport had broken down, when the shift men would arrive or where the refueller was after each sortie.

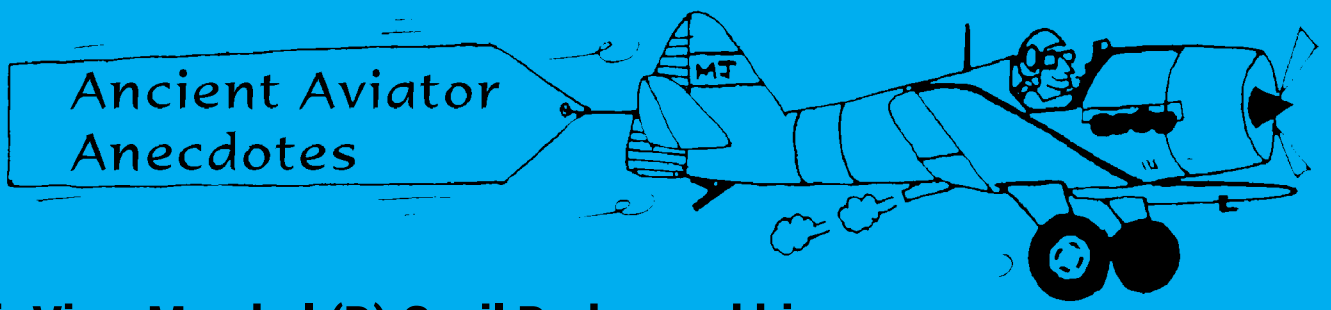
Fortunately, he did not take offence and immediately issued orders to rectify all these issues. We, then, literally beat all records by flying 534 sorties in that month long detachment. Over dinner in his house a week or so later, he told me why he had apprehensions after seeing us in the briefing room after arrival but after seeing how well we were flying, all his doubts and apprehensions were gone. Needless to state, Groupie Johri and I struck a good friendship in that period and he always met me warmly whenever our paths crossed later, though due to our different jobs and seniority, the meetings were rare. He also became very fond of all the squadron folks and even invited the whole lot to his house once. Needless to state, he was also happy with our armament scores at Pokhran.

For the next anniversary in April 1984, we all got together and planned an Arabian Night which also turned out to be a great success, due to the contribution of all members. The events with the men also saw enthusiastic participation from all and were a roaring success with the bonding between all ranks evident to all.

In July 1984, Tester Master left us and GM Vishwanathan took over. I had known Vishu Sir since my OTU days in Jamnagar and he was very happy to inherit the Squadron in the shape it was in due to the sustained team effort of everyone. He also gave me full freedom to continue with the "work hard, play hard" line that we had adopted.

I soon left the Squadron in October 1984 on promotion and went back to Staff College, from where I had come retracing the road trip of early January 1983, with loads of good memories and many new Tiger friends. Some attached photographs of those days and the recent reunion over the 90th anniversary celebrations in Gwalior would keep reminding me of the good times of 40 years ago with the greatest lesson of all in life, of making friends so that every time you meet, there is always a big hug and lot of cheer (s).

The author of this series: Air Marshal (R) Harish Masand seen here at Aero India



Air Vice Marshal (R) Cecil Parker and his.....

NO 58 PILOTS COURSE @71

On 30 August 1952, at No. 1 AFA Begumpet, (then) AVM Subroto Mukherjee awarded wings to and commissioned 30 young Pilot Officers after their successful completion of 18 months training on Tiger Moth and Harvard aircraft. 13 of them (along with one naval aviator) proceeded to nearby Hakimpet for their fighter conversion on Spitfire and Tempest at CTU. 17 went to TTW in Agra for twin–engine conversion on Dakota.

Post conversion these pilots joined squadrons. The fighter stream flew Vampire, Toofani, Mystere, Hunter, Gnat and MiG–21 aircraft. The transport pilots moved on to Liberators, Il–14, Avro, An–12, Packet, Chetak helicopters and Canberra bombers. The QFIs in the course taught basic and advance flying on Prentice, HT–2, Iskra, Kiran and Harvard. No 58 PC was created at the formative stage of the IAF and went on to serve from the early 1950s to the late 1980s.

Members of the course participated actively in both 1965 and 1971 Indo–Pak wars. It lost 7 pilots in peace time operations. From this course came 14 QFIs, 11 commanding officers, two test pilots, one Air Attache, four air officers, one gallantry awardee of the MVC and the youngest Indian member of the Caterpillar Club. The last pilot retired in 1988. Till date, 17 more have passed on due to natural causes. 71 years after commissioning, of the original 30, six nonagenarians are active and dispersed in the NCR, Hyderabad and Australia as under:–

(a)	AVM DE Satur, AVSM VM	(4339)	Noida	(93)
(b)	Gp Capt SL Tandon	(4334)	New Delhi	(94)
(c)	Wg Cdr RL Badhwar	(4341)	Gurugram	(92)
(d)	AVM CV Parker MVC VM	(4346)	Vayupuri	(91)
(e)	AVM MK Rudra	(4358)	Sainikpuri	(91)
(f)	Wg Cdr MW Tilak	(4331)	Perth	(91)

To mark its 71st Anniversary, the Hyderabad based families of No 58 Pilots course got–together for lunch on 30 August 2023; see pictures. A slice of history from the last century.

25 Years Back

From Vayu Aerospace Review Issue VI/1998

First MiG–21–93 Flight

The first upgraded MiG–21bis of the Indian Air Force (MiG MAPO designation MiG–21–93) made its first flight at Enizhny Novgorod (formerly Gorky) on 7 October 1998. Flown by Sokol's test pilot, Oleg Antonovich, the IAF loaned MiG–21 was airborne for 40 minutes, its test flight programme will continue till mid–1999, being joined by a second upgraded MiG–21 before the end of 1998.

Fernandes hints at AJT Production

Speaking at a function at Ozhar while visiting the Hindustan Aeronautics Limited facilities near Nasik on 25 October, the Defence Minister Mr George Fernandes said that "production of sophisticated jet trainers would begin within a month. The production of Sukhoi Su–30s would also start soon discussions and an agreement with Russia".

India is a missile power

On 2 October, the Clinton Administration reiterated that India and Pakistan must sign the Comprehensive Test Ban Treaty, improve bilateral relations and meet other US conditions "unconditionally" before it could consider lifting of sanctions.

Indo–Russian Defence Co–operation

Fine tuning the framework that will facilitate Indo–Russian Defence Co–operation till the year 2010 will be the main agenda for the next meeting of the Joint Working Group on military technology cooperation to be held in Moscow from 10 to 12 November.

Army Aviation 12th Anniversary

The Indian Army's Aviation Corps marked its 12th Anniversary on 1 November 1998 even as its many Squadrons and Flights in various sectors of the country remain vigorously engaged in support of the ground forces, particularly in Jammu & Kashmir as also in the North–East.

Modernisation plan for the Army

The Indian Army is planning to use state of the art surveillance equipment to detect trans–border movement of militants at the Line of Control (LoC), in J&K. The high tech equipment, which includes Unattended Ground Sensors (UGS) and Thermal Imager Sights (TIS) will be positioned at the LoC by March 1999.

Air India seeks A.310s

Air India has plans to lease two wide–bodied Airbus A.310s to meet its winter schedule traffic requirements, particularly air services between Calicut in Kerala and the Gulf. Air India thus plan to 'up–stage' Indian Airlines which have operated the single–aisle A.320 from Calicut's short (6000 foot) runway but which has now been lengthened to 7500 feet.

IA Board approves ATR–42–500

On 28 September, the Indian Airlines Board formally approved acquisition of six ATR–42–500 airliners to be deployed on regional routes of the country and also accepted the joint bid offer of the Aero Transport Regional of France and Hindustan Aeronautics Limited.

AIR'98 focuses on indigenisation

An Indian Air Force/Confederation of Indian Industry interaction (AIR '98) was held at No.3 Base Repair Depot of the Indian Air Force at Chandigarh on 2 and 3 November 1998. After the meeting, the IAF estimates that there is a requirement for some Rs 400 crore worth of indigenous products over the next 3 years.

The IAF suffers spare squeeze

As reported from Chandigarh, 'Reeling under 300 to 800 per cent escalation in the cost of increasingly scarce supplies of critical spare parts of Russian fighters, transport aircraft and helicopters, Indian Air Force Base Repair Depots are struggling hard to maintain operational preparedness.

India to launch Korean, German satellites

South Korean and German satellites are also to be included on board the PSLV–C2, along with the Indian Remote Sensing Satellite P4, thus signifying to start of marketing of India's space launch services.

Helicopter services to Sikkim

Pawan Hans Helicopters have commenced daily helicopter services from 31 October 98 on the Gangtok–Bagdogra–Gangtok sector, under aegis of the Government of Sikkim. This service is being operated by a 5 seater Bell 206L4 helicopter.

Tale Spin

Hi and Bye!

Now that the IAF Day is over (8 October 2023), this is one of our favourite photos from the event: an airman sitting in the CH–47F Chinook waving to the crowd with two big hands. Cheers to that! (Photos: Mayyank Kaul)

Want a big Spitfire for your room?

Then travel to Brighton, UK and visit this great store and stock up on all kinds of aviation goodies. You won't be disappointed.

Another dream store for aviation enthusiasts

Waiting for the day when an aviation store like this one opens here in India! This heavily laden shop is in London (Aviation Retail Direct, Hillingdon) and one can visit whenever you are there.

Now this is what you call sweet dreams!

Sighhh! We love it. We want it. Right now. An additional bonus would be if it actually took off!

Afterburner

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- Demilitarization

U.S. Marine Corps photo by Sgt. Luke Kuennen

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