

Aero India review Ex Cobra Warrior Exercises & visits HAL HLFT-42 MoD procurements LCA-N/MiG-29K on R11

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THE DEFEXPO 2022 ISSUE











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Vayu Aerospace Review, D-43, Sujan Singh Park, New Delhi 110003 India Tel: 91 11 24626183, 24617234 Fax: 91 11 24628615 • E-mail: vayuaerospace@lycos.com



Cover: IAF Su-30MKI at Aero India 2023. Photo by Angad Singh (Twitter @zone5aviation)

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BUSINESS DEVELOPMENT MANAGER Premjit Singh

Published By

Vayu Aerospace Pvt. Ltd. E-52, Sujan Singh Park, New Delhi 110 003 India Tel: +91 11 24617234 Fax: +91 11 24628615 e-mail: vayuaerospace@lycos.com e-mail: vayu@vayuaerospace.in

Printed at Aegean Offset Printers

The opinions expressed in the articles published in the Vayu Aerospace & Defence Review do not necessarily reflect the views or policies of the Publishers.

Arerospace-& Defence Review

21 India's Defence Budget 2023-24



The Union Budget for Financial Year 2023-24 envisages a total outlay of Rs 45,03,097 crore. Of this, Ministry of Defence has been allocated a total Budget of Rs 5,93,537.64 crore, which is 13.18% of the total budget.

23 Maiden landing of LCA-N & MiG-29K



The successful landing and takeoff of the indigenous LCA Navy and MiG-29K on India's first Indigenous Aircraft Carrier on 6 February 2023 "is a momentous step forward towards the realisation of our collective vision of AatmaNirbhar Bharat".

24 HAL's Helicopter Factory



In yet another step towards 'Aatmanirbharta' in defence, Prime Minister Narendra Modi dedicated to the nation a Helicopter Factory of Hindustan Aeronautics Limited (HAL) in Tumakuru, Karnataka.

25 Exercise Cobra Warrior



Vayu visited and covered Exercise Cobra Warrior at RAF Waddington. This exercise is run biannually and is the largest air exercise run by the Royal Air Force. The IAF participated along with 6 other air forces.

44 Aero India 2023



From the very first international Air Show organised and held in India in 1993, Vayu Aerospace Review continues to be at the forefront of this biennial event held at AFS Yelahanka, near Bangalore now in its 14th edition. The world's leading aviation companies along with hundreds of Indian companies took part, showcasing their capabilities, many of which are highlighted in this special section.

90 HLFT-42, The 'Marut'



Sankalan Chattopadhyay reports on the recently unveiled HLFT-42 from HAL at Aero India 2023. A detailed analysis can be found in the article.





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The Aeronautica Militare (AM-Italian Air Force) has allocated considerable resources (in human, financial and material terms) in its Flying Schools to maintain its pilot training syllabus at the "state-of-the-art" facilities in order to guarantee high training standards to its own pilots and for those sent by Allies and partner nations.

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III Dutch F-16's relocation



On 30 June 2021, the Netherlands MoD announced it sold 12 of its F-16's to Draken as part of its End Of Life Type (ELOT) programme. Details inside the article.

114 Integrating the 5th Gen F-35 in Italian Ops



With deliveries of the F-35 well underway, Italian defence is integrating the country's 5th generation fighter aircraft operations for the coming future.

Regular features :

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

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VIEWPOINT

Admiral Arun Prakash says....

US-India technology initiative and the recent iCET

In his 2019 book, The Hundred Year Marathon, Michael Pillsbury, a foreign policy strategist, who has held positions in the US administration and Senate, says, "...not only has China's rise happened right under our noses, but also the US and the West have helped the Chinese accomplish their goals from the beginning... For decades, the US government freely handed over sensitive information, technology, military know-how and expert advice to China." Ominously, he adds, "The American public is unaware of the extent of covert cooperation between Washington and Beijing over the past forty years."

If Pillsbury's account is to be believed, the dramatic ascent of a prosperous, technologically advanced and militaristic China — leaving India far behind in its wake - owes much to the close multidimensional cooperation extended to it by the US since the 1980s. In which case, the recent unveiling of a US-India Initiative on Critical and Emerging Technologies (iCET) comes half a century too late for India. Seen in the light of President Biden's 2021 undertaking to transfer multiple advanced technologies, including submarine nuclear propulsion to Australia, it starkly highlights the absence of any significant offer of high tech by the US to India, despite bilateral ties, growing steadily in warmth and closeness.

There has, however, been no dearth of accords and agreements, with lofty titles, framed to enhance Indo-US cooperation in the security and technology domains. Some examples: "Next Steps in Strategic Partnership" in 2004; "Defence Framework Agreement" in 2005: the pathbreaking "Indo-US Civil Nuclear Agreement" in 2008; launching of the "Defence Technology and Trade Initiative" in 2012; accord of "Major Defence Partner" status by US Congress in 2016; and institution of "2+2 talks" in 2018. The signing of the fourth and last of the key "foundational agreements" in 2020 was supposed to have eliminated the final impediment to closer security cooperation. However, after nearly two decades of this pretentious "pas de deux", all that the Indo-US "strategic partnership" had delivered

was \$22 billion worth of military hardware, purchased by India via the foreign military sales programme.

In a determined bid at the highest level to address this state of stasis, a communique following the May 2022 Biden-Modi quadrilateral summit in Tokyo announced "the launch of a US-India Initiative on Critical and Emerging Technologies spearheaded by the National Security Councils (NSC) of the two countries". Following this, a team of top Indian scientists, including the heads of ISRO and DRDO, recently held the first formal talks in Washington with their US counterparts; both teams being led by respective NSAs.

Pitched at the exalted level of the two NSCs, the iCET could become a "game changer" in catalysing Indo-US technology cooperation by persuading the US to lift existing export control restrictions, and encouraging the private sector of both countries to cooperate in sensitive sectors. The most important outcome, however, would be to dispel the cloud of mistrust that has hung over this relationship and to demonstrate a mutual commitment to investing in advanced technologies, such as quantum computing, AI and space, as well as the critical field of semiconductor design and manufacture.

While many of these emerging technologies have huge future potential, both in the civil sector and the security domain, there are other areas — less esoteric but equally important in which India's defence industrial complex has been struggling for decades and on which iCET must focus urgently.

This issue is best illustrated by citing the cautionary tale of the six-decade-long association of India's massive defence industrial complex, comprising the DRDO, defence public sector undertakings (DPSU) and the (erstwhile) Ordnance Factory Board, with the Soviet/Russian arms industry. Commencing in the mid-1960s, our DPSUs built, under licence, 800 or more fighters of the MiG series along with about 2,000 aero engines as well as a few thousand battle-tanks, armoured vehicles and their engines.

While the DPSUs consistently claimed transfer of technology (ToT) in the process of licenced production, the fact is Indian engineers and designers acquired only the "knowhow" of methods and procedures required for assembling or building aircraft, aero engines and armoured vehicles from parts or material supplied. We neither asked nor were offered (by the Soviets/Russians) the "know-what" and "know-why" involving the principles and laws that would have enabled us to design and build our own weapon-systems. As a direct consequence of this oversight or lapse, India has remained amongst the world's largest importer of arms; buying from abroad weapons ranging from rifles and machine guns to battle tanks and fighters, and prime movers from diesel and aero engines to nuclear reactors.

While the iCET promises a long overdue transformation, four aspects demand wariness on India's part. First, even though ownership of technology in the US may lie with the private sector, the US Arms Export Control Act not only requires clearances from the Departments of State and Defence for ToT but also imposes certain restrictions on the recipient state.

Second, an unstated but significant, longterm objective of the iCET is, surely, to wean India off its dependency on Russian military hardware. This is likely to face stiff resistance on various grounds from Moscow as well as from domestic quarters, but national interest must prevail. Over the past 60 years, neither the quality of Soviet/Russian hardware nor the product support has ever matched that of its western counterparts, and the disruption caused by the Russia-Ukraine conflict will further aggravate the situation. The time has come for India to break free of Russia's apron strings and regain "strategic autonomy" in international affairs.

Third, while India is in dire need of technology, the US industry remains firmly focused on trade. India will, therefore, need to leverage its considerable purchases in the arms, energy, civil aviation, nuclear and other sectors in a holistic manner to extract technology from the US.

Finally, we must bear in mind that merely switching from Russian to American military hardware will be a case of "jumping from the frying pan into the fire". Atmanirbharta must remain our ultimate aim.

Admiral Arun Prakash says.... The Rule of detachment

The events of 6 January 2021, in Washington were the first occasion in the USA, when an orderly postelection transfer of political power faced a serious threat. The underlying political environment of divisiveness and polarisation that led to these events has created serious concerns amongst American military veterans as well as politicians. They fear that the upsurge of toxic politics that looms over America, also threatens the "non-partisan" ethic of the armed forces, considered vital for the survival of its democracy.

Unlike in India, the American ethos does not require the military to remain "apolitical", but demands a commitment to being "non-partisan" in their professional conduct. While the former term suggests total non-involvement in politics, the latter implies, that regardless of personal political inclinations, military officers, while upholding the constitution, must give the elected civilian leadership their best professional advice and execute their lawful orders.

Alarmed at the polarisation of American society, a vigilant media has been commenting on the increasing enlistment of military veterans by politicians for boosting personal/political electoral prospects. In a co-authored article in a recent issue of Foreign Affairs magazine, General Dunford, former Chairman, US Joint Chiefs of Staff (JCS), declared that maintaining a nonpartisan military is a matter of "sacred trust"; not just for military officers but also for political leaders and citizens.

Dunford points to a recent "open letter" signed by 13 former US Secretaries (ministers', of Defence and Chairmen JCS, warontherocks.com/2022/09/to-spport-anddefend-principles-of-civilian-control-andbest-practices-of-civil-military-relations/) that outlines the rules and best practices of civilmilitary relations. Impressing upon serving personnel, veterans and political leaders the urgent need to counter forces that threaten the military's nonpartisan ethos, these eminent Americans not only call upon politicians to desist from "dragging the military into partisan activity" but also urge them and the media to call out offenders who violate norms of nonpartisanship.

Interestingly, the Foreign Affairs article also speculates about the risks that could be posed by a president, intent on politicising the military. It asks, whether a US President, who is also the commander-in-chief (C-in-C) and approving authority for general-rank promotions, could manipulate the process to fill senior military leadership positions with party/personal loyalists.

We need to pay heed to the ongoing discourse in America, because, despite the economic and technological chasm that separates them, there is an uncanny similarity in the challenges that currently face American and Indian democracies, spanning their political, societal and military domains. In India, too, active-duty military personnel are prohibited from engaging in any kind of political activity by Acts of Parliament and service rules. Moreover, their conduct is circumscribed by the solemn oath of allegiance to the Constitution that each serviceman swears on recruitment/commissioning. By tradition, India's military veterans had also, till a few years ago, remained aloof from overt political activity.

As a measure of insulation, India's armed forces, despite occasional criticism, had persevered with the "seniority-cum-merit" principle for promotion from the pool of C- in-Cs to the post of chief. The rationale was that every officer who reached the penultimate rank of C-in-C, after 35 odd years of unblemished service, having been filtered by three successive promotion boards — each with an attrition rate of 60 per cent to 70 per cent — was equally fit for the chief's job. Whatever the drawbacks of this approach, promoting the "senior-most of equals" obviated the possibility of political interference or nepotism in military promotions.

While this principle had been accepted and upheld, with some exceptions, in the past, the present government seems to have shrugged off the constraint of "seniority", and has started using an alternate definition of "merit", has promoted military officers over the head of their seniors. Since selection for senior military posts remains the prerogative of the government, one cannot take exception to its discarding the seniority principle. However, by doing so, it faces an inherent risk: A selectee who considers himself beholden or indebted to the political establishment, for his out-of-turn promotion, could become a political "echo chamber" rather than a source of sound and candid professional military advice.

An even greater risk of politicisation has been created by the latest rules framed for selection of the Chief of Defence Staff (CDS). By a Gazette of India notification, the Army, Navy and Air Force Acts have been amended to open the eligibility for CDS candidature, apart from serving and retired chiefs, to serving and retired officers of 3-star (Lt. Gen/equivalent) rank, with an upper age limit of 62 years for all. The retirement age of CDS has been fixed at 65 years. Without going into an extensive critique of this amendment, which has needlessly expanded the CDS candidate-pool, a few salient issues deserve the attention of decision-makers.

In almost all countries, the CDS, as the highest-ranking military officer who presides over the chiefs of staff committee, is chosen from amongst the serving chiefs. If our government wanted to enlarge its choices, it could have included recently retired chiefs in the pool. But the age limit of 62 years (at which chiefs retire), has eliminated this option. At the same time, placing serving/retired 3-star officers (some who possibly missed promotion to C-in-C rank) in the same candidate-pool as serving chiefs, not only ignores the inherent merit and vast experience - military as well as politico-strategic - of the chiefs, but also casts into doubt, the credibility of our promotion system.

Lastly, with a mixed bag of serving and retired officers to choose from, and with no methodology available for assessment of professional competence, selection will have to be on spoken reputation, political loyalty and personal preference. Such subjective and problematic criteria are an invitation to arbitrariness and politicisation.

Our apolitical and non-partisan military has remained a steadfast pillar of India's democracy, silently underpinning the peaceful transfer of power after 17 general elections. Exposure of the military to political influence risks their divergence from the normative constitutional framework within which they are duty-bound to function.

Sustaining India's democracy requires that our armed forces remain detached from politics, and the nation's security demands that military leaders render unbiased professional advice to the government, without fear or favour.

HAL contracted for 70 HTT-40s



Ministry of Defence has signed a contract with Hindustan Aeronautics Limited (HAL) for procurement of 70 HTT-40 Basic Trainer Aircraft. Defence Secretary Giridhar Aramane along with other senior civil and military officials of MoD and representatives of HAL were present during the signing and exchanging of contracts. In a major boost to the Government's efforts to achieve 'Aatmanirbharta' in defence, the Union Cabinet had, on 1 March 2023, approved the procurement of 70 HTT-40 trainer aircraft from HAL at a cost of over Rs 6,800 crore.

HAL contracted for 6 six Dornier-228s



Ministry of Defence, on 10 March 2023, signed a contract for procurement of six Dornier-228 aircraft for the Indian Air Force (IAF) from Hindustan Aeronautics Limited (HAL) at a cost of Rs 667 crore. The aircraft will be used by IAF for Route Transport Role and communication duties. Subsequently, it will be used for training of transport pilots of the IAF. The present lot of six aircraft will be procured with an upgraded fuel-efficient engine coupled with a five bladed composite propeller.

L&T contracted for three Cadet Training Ships

The Cabinet signed a contract with L&T for acquisition of three Cadet Training Ships worth more than Rs 3,100 crore under Buy {Indian-IDDM (Indigenously Designed, Developed and Manufactured)} category. The ships will cater to the training of officer cadets, including women, at sea after their basic training to



meet the future requirements of the Indian Navy. The ships would also provide training to cadets from friendly countries with the aim to strengthen diplomatic relations. The ships can also be deployed for evacuation of people from distress areas, Search & Rescue and Humanitarian Assistance and Disaster Relief (HADR) operations. The delivery of ships is scheduled to commence from 2026.

L&T contract for 41 Modular Bridges

Ministry of Defence has approved the proposal for indigenous manufacture of 41 sets of Modular Bridges for the Corps of Engineers of the Indian Army. These bridges have been designed and developed by Defence Research and Development Organisation (DRDO) and shall be produced by Larsen & Toubro (L&T) as DRDO-nominated production agency. The contract for the procurement of Modular Bridges was signed with L&T on 8 February 2023 at an estimated cost of over Rs 2,585 crore. Each set of Modular Bridge shall consist of seven carrier vehicles based on 8x8 Heavy Mobility Vehicles and two launcher vehicles based on 10x10 Heavy Mobility Vehicles. Each set shall be capable of mechanically launching a single span fully decked 46-meter assault bridge.

DRDO conducts two tests of VSHORADS

Defence Research and Development Organisation (DRDO) conducted two consecutive successful flight tests of Very Short Range Air Defence System (VSHORADS) missile at the Integrated Test Range, Chandipur off the coast of Odisha on 14 March 2023.



The flight tests were carried out from a ground-based man portable launcher against high speed unmanned aerial targets, mimicking approaching and receding aircraft. The targets were successfully intercepted, meeting all mission objectives. VSHORADS is a Man Portable Air Defence System (MANPAD) meant for neutralising low altitude aerial threats at short ranges. It has been designed and developed indigenously by Research Centre Imarat, Hyderabad in collaboration with other DRDO laboratories and Indian Industry Partners. The missile incorporates many technologies including Dual-band IIR Seeker, miniaturised Reaction Control System and integrated avionics. The propulsion is provided by a dual thrust solid motor.

DRDO's Power Take Off Shaft tested on LCA



Maiden successful flight-test of Power Take off (PTO) Shaft was conducted on Light Combat Aircraft (LCA Tejas) Limited Series Production (LSP) - 3 aircraft in Bengaluru on 14 March 2023. The PTO shaft is indigenously designed and developed by Combat Vehicles Research & Development Establishment (CVRDE), Chennai of Defence Research and Development Organisation (DRDO). The PTO shaft, which is a critical component in the aircraft, will support the requirements of future fighter aircraft and their variants and offers competitive cost and reduced time of availability. With this successful test, the DRDO has achieved a greater technological feat by realisation of complex high-speed rotor technology which only few countries have achieved. The PTO shaft technology has already been transferred to Godrej & Boyce, Mumbai and Lakshmi Technology and Engineering, Coimbatore.

Rs 934 crore contract for normal refit of Sindhukirti at HSL

The Ministry of Defence, on 13 March 2023, signed a contract for Normal Refit of Sindhukirti submarine at Hindustan Shipyard Limited (HSL), Visakhapatnam at an overall cost of Rs 934 crore. Sindhukirti is 3rd Kilo Class diesel electric submarine. After completion of refit, Sindhukirti will be combat worthy and will join the active submarine fleet of the Indian Navy.



This refit has been offloaded to develop alternate repair facility for submarines and is a further step towards undertaking Medium refit with Life Certification at HSL. The project involves more than 20 Micro Small and Medium Enterprises (MSMEs).

Operational capabilities of IN reviewed

Rcapabilities of the Indian Navy during the Naval Commanders' Conference held aboard India's first Indigenous Aircraft Carrier INS Vikrant on 6 March 2023. He interacted with the Naval Commanders and witnessed the operational demonstrations at sea, highlighting the Navy's capability to undertake multi-dimensional missions towards safeguarding the maritime interests of the country.

In his address to the Commanders, the Raksha Mantri lauded the Navy for standing firm and protecting national interests with courage and dedication. He exhorted them to continue focussing on futuristic capability development to effectively overcome the emerging security challenges in the maritime domain.



President's Colour to INS Dronacharya



INS Dronacharya, the Gunnery School of the Indian Navy, was awarded the prestigious President's Colour on 16 March 2023 by the President of India, Smt Droupadi Murmu. The President's Colour or the Nishan is considered the highest honour that the Supreme Commander, President of India, bestows on a unit for its exceptional service to the Nation.

INS Dronacharya is entrusted with the training of officers and sailors of the Navy, Coast Guard and friendly foreign maritime forces on all aspects of gunnery and missile warfare. Training of Officers and sailors to deliver ordnance on target effectively is the core focus of INS Dronacharya.

Indian Army awards contract for iDEX project with HSTPL

The Indian Army has taken a lead in awarding the first ever procurement order of an Innovations for Defence Excellence



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(iDEX) project as per the revised procedure. The contract for procurement of an indigenously developed 'Integrated Mobile Camouflage System (IMCS)' for Mechanised Forces was signed with Indian Startup Hyper Stealth Technologies Pvt Ltd (HSTPL) on 14 March 2023. The Integrated Mobile Camouflage System (IMCS) comprises of low emissivity and/or CAM-IIR coatings and Mobile Camouflage System materials providing the ability to the Armoured Fighting Vehicle (AFV) to merge with a terrain background.

US Embassy visits IN Station operating MQ-9



The Indian Navy has been operating General Atomics Aeronautical Systems (GA-ASI) manufactured MQ-9 Remotely Piloted Aircraft Systems (RPAS) under lease for over two years. Recently, Senior Staff from the US Embassy of India visited the operating location. The US Embassy Staff were familiarised with the ongoing operation by a tour of the GA-ASI facilities set up within the Indian Naval Station by Indian Navy personnel on 8 February 2023. The US Embassy Staff were briefed by the Indian Navy about the capabilities of the remotely piloted aircraft and its various sensors, their roles in aiding Indian Navy surveillance tasking, maintenance and logistical support.

Godrej Aerospace order for 8 modules of DRDO turbojet engine

Godrej & Boyce, the flagship company of the Godrej Group, has announced that its business Godrej Aerospace was the first Indian private company to win the order for manufacturing



Maneck Behramkamdin, AVP & Business Head, Godrej Aerospace

eight modules of the DRDO engine for aerial applications. Godrej Aerospace won the order competing with over 25 companies owing to its "strong infrastructure, proficiency in working with unique materials and decades of experience in producing liquid engines for rockets, as well as its service to global aviation majors".

Airbus sells 2 ACH160s in India



Airbus Corporate Helicopters has won an order for two ACH160 helicopters in India – the first sale of the type in the region. The helicopters will be delivered with the ACH160 Exclusive configuration for business use by the customer who is an experienced helicopter operator. Under the terms of the contract, Airbus Corporate Helicopters will provide a turnkey solution to ensure smooth entry into service of both the helicopters.

Privately manufactured indigenised fuze of ASW rocket

Indian Navy has received a fully indigenised fuze YDB-60 for underwater Rocket RGB 60 manufactured for the first time by a private Indian industry. In order to provide major boost to AatmaNirbharta in Armament and Ammunition, Indian Navy received for the first time a fully indigenised fuze YDB-60 for underwater Anti-Submarine Warfare (ASW) Rocket RGB-60 used from major warships, through a private manufacturer Economic Explosives Limited (EEL), Nagpur.



Digilogic Systems MoU with ERAP Korea



Digilogic Systems, a Hyderabad based company providing systems, solutions and products for defence, aerospace, automotive and manufacturing market segments, has entered into a strategic partnership with ERAP Korea. Under the agreement, both companies will mutually explore and expand their business/ operations in national and international markets especially South Korea, USA and Europe besides others. The partnership will enable ERAP Korea to strategically strengthen footprint in the Indian defence and aerospace market, by teaming up with Digilogic systems.

GRSE MoU with KEL for Light Weight Bailey Bridges



Garden Reach Shipbuilders and Engineers (GRSE) Ltd, pioneers in the development of Bailey Type Portable Bridges for disaster management and connecting difficult terrains, signed a Memorandum of Understanding (MoU) with Kerala Electrical & Allied Engineering (KEL), a state-owned enterprise of Kerala, for the joint research and development of a lightweight Bailey Bridge with a Carbon Fiber Composite Deck.

Visit of US JWG on aircraft carrier technology





The 6th meeting of Joint Working Group on Aircraft Carrier Technology Co-operation (JWGACTC), constituted under the auspices of the Indo–US Defence Technology and Trade Initiative (DTTI), was organised in India from 27 February to 3 March. An 11 member US delegation headed by RAdm James Downey, Programme Executive Officer (PEO), Carriers visited various defence/industrial installations in Delhi and Kochi. During the meeting, RAdm Downey acknowledged India's status as one of the very few countries capable of constructing aircraft carriers and appreciated India's landmark achievement of operating the indigenous aircraft, LCA from the indigenous carrier in a short span of time post commissioning of the Ship.

BrahMos tested with DRDO seeker

Indian Navy successfully ship launched the BrahMos missile with a DRDO designed indigenous seeker and booster in the Arabian Sea.



IAFs 'First Supersonics' is 60

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On the occasion of the IAF No 28 Sqn 'First Supersonics' completing 60 years, the CAS Air Chief Marshal VR Chaudhari and AOC-in-C Air Marshal PM Sinha flew in an exercise comprising of 14 MiG-29 aircraft. With the induction of MiG-21 in March 1963, the Sqn heralded the arrival of the first supersonic aircraft in IAF inventory. The CAS had commanded the First Supersonics Squadron from 2001 to 2003.



Lockheed Martin and Tata Group in MoU for fighter wing production

James D. Taiclet, Lockheed Martin Chairman, President & CEO, United States Secretary of Commerce, Gina M. Raimondo, and Natarajan Chandrasekaran, Chairman of Tata Sons recognise a Memorandum of Understanding (MOU) signed between Lockheed Martin Aeronautics and Tata Lockheed Martin Aerostructures Limited.

Lockheed Martin and Tata Group have reached an agreement to begin the implementation of fighter wing production at the companies' joint venture, Tata Lockheed Martin Aerostructures Limited (TLMAL), in Hyderabad, India. The Memorandum of Understanding (MOU) envisions production of 29 fighter wing shipsets, with an option of additional shipsets, and deliveries commencing in 2025.

Lockheed Martin formally recognised TLMAL as a potential co-producer of fighter wings in October 2021 following TLMAL's successful production and qualification of a prototype fighter wing shipset. Through this prototype project, TLMAL was required to demonstrate the capability to perform detailed part manufacturing and delivery of a fully compliant fuel-carrying 9-g, 12,000 hour, interchangeable/replaceable representative fighter wing. That achievement further strengthened Lockheed Martin's partnership with India; and supports its F-21 offering for procurement of 114 new fighter aircraft — exclusively for India and the Indian Air Force — by proving additional indigenous production capability. "The India F-21 represents an unprecedented strategic and economic opportunity for the United States-India relationship and represents a catalyst to future advanced technology cooperation" stated the company.



Tata Advanced Systems Limited and Lockheed Martin Aeronautics

established TLMAL as a joint venture in 2010. TLMAL demonstrates the government of India's Aatmanirbhar Bharat 'Make in India' and 'Skills India' goals and serves as the single global source of C-130J empennage assemblies that are installed on all new Super Hercules aircraft. To date, TLMAL has manufactured and delivered nearly 200 C-130J empennages.

Keel laying of fourth ship - Diving Support Craft

Keel laying for the fourth Diving Support Craft, DSC A23 (Y-328) project was held on 17 January 2023 at Titagarh Wagons Ltd, Kolkata. The ships are scheduled to be inducted into the Indian Navy commencing end 2023 onwards to provide diving assistance for ships close to harbour, for underwater repairs, maintenance and salvage. Further, main and auxiliary equipment are being sourced from indigenous manufacturers.



Keel laying of BY 524 Malwan and BY 525 Mangrol



Keel laying of Second ship (BY 524, Malwan) and third ship (BY 525, Mangrol) of Anti-Submarine Warfare Shallow Water Craft (ASW SWC) (CSL) project was presided by R Adm Sandeep Mehta, ACWP&A and R Adm I B Uthaiah, DG WDB, respectively

on 21 February 2023, in presence of Madhu S Nair, CMD, CSL and other senior officials of Indian Navy and CSL at CSL, Kochi. Contract for construction of eight ASW SWC vessels was concluded with CSL, Kochi, in consonance with "Aatmanirbhar Bharat" initiatives of the Government of India. These ships are being built with a service life of 25 years. The availability of these vessels will provide sub-surface surveillance in coastal areas with the purpose of detecting and neutralising underwater threats.

Launch of first MCA barge, Yard 75 (LSAM 7)



M⁷) was launched by RAdm Sandeep Mehta, ACWP&A on 24 February 2023 at Guttenedevi, launch site of SECON, Visakhapatnam. With all major and auxiliary equipment/systems sourced from indigenous manufacturers, this Barge is proud flag bearer of "Make in India" initiative of Ministry of Defence. Contract is for construction of 8 MCA Barges.

Launch of first ACTCM barge, Yard 125

A mmunition Cum Torpedo Cum Missile (ACTCM) Barge, Yard 125 (LSAM 15) was launched by Capt Prashant Saxena, AWPS (Mbi) on 10 February 2023 at Suryadipta Projects Pvt Ltd, Thane.



Indian Coast Guard is 47

The Indian Coast Guard (ICG) celebrated its 47th Raising Day on 1 February 2023. From a modest beginning with just 7 surface platforms in 1978, ICG has grown into a formidable force with 158 ships and 78 aircraft in its inventory and is likely to achieve targeted force levels of 200 surface platforms and 80 aircraft by 2025.



Naval Commanders' Conference 23/1





The first edition of the Naval Commanders' Conference of 2023 commenced on 6 March 2023. The conference serves as a platform for Naval Commanders to discuss important security issues at the military-strategic level as well as interact with Senior Government functionaries through an institutionalised forum. The novelty of this year's conference was that the first phase of the Commanders' Conference was held at sea, and for the first-time, onboard India's first indigenous aircraft carrier, INS Vikrant. Raksha Mantri Rajnath Singh addressed the Naval Commanders onboard INS Vikrant on the conference's opening day. The Chief of Defence Staff and the Chiefs of the Indian Army and Indian Air Force also interacted with the Naval Commanders on subsequent days to address the convergence of the three Services.

Rolls-Royce and GRSE MoU for marine engines



Garden Reach Shipbuilders and Engineers (GRSE) Ltd signed a Memorandum of Understanding (MoU) with Rolls Royce Solutions of Germany for manufacture of high quality marine diesel engines. Under the agreement, GRSE and Rolls Royce Solutions will co-operate in the licence production and localisation of the technologically advanced MTU S4000 governmental marine engines. These engines, with a power output of 746-4300 KW, are compact, reliable and easy to maintain. They are used for fast patrol vessels, interceptor boats and fast attack craft built by GRSE and other shipyards around the country. The MoU deals with Transfer of Technology related to engine assembly, painting, parts sourcing and after sales service for these engines that are to be assembled at GRSE's Diesel Engine Plant in Ranchi.

Pratt & Whitney expands Bengaluru operations

Pratt & Whitney, a Raytheon Technologies business, has officially opened the doors to its new India Engineering Centre (IEC) in Bengaluru. The facility is co-located with Pratt & Whitney's India Capabilities Center (ICC), which opened in 2022 to provide integrated global supply chain support, and the recently inaugurated Collins Aerospace engineering and global operations centers. The IEC, which was designed to meet the LEED Platinum certification, further enhances Raytheon Technologies' combined presence in India of over 5,000 employees and facilitates collaboration across the company's businesses.



Boeing and GMR Aero Technic in agreement



Boeing has announced an agreement with GMR Aero Technic to establish a new Boeing Converted Freighter (BCF) line in Hyderabad. GMR Aero Technic is the first Boeing supplier in India that will have the capability to support future conversions of both domestic and foreign aircraft.

The collaboration adds to Boeing's continued investments to support the growth of cargo and help expand complex aircraft modification capabilities and Maintenance, Repair and Overhaul (MRO) in India, supporting India's aspiration to become an aviation and aerospace hub for the region. "Our cooperation with GMR Aero Technic not only a testimony of the maturation of Indian MROs in the country to support the vision of Aatmanirbhar Bharat, but also supports the anticipated growth of the cargo sector in the region," stated Salil Gupte, President, Boeing India.

Boeing has more than 40 years of successful experience in passenger-to-freighter conversions, relying on original design data and a deep understanding of the needs of the air cargo industry to deliver a superior, integrated product. According to Boeing's Commercial Market Outlook, India's air cargo growth is expected to average 6.3% annually, driven by the country's manufacturing and e-commerce sectors, including its Make in India initiative. Boeing forecasts demand for more than 75 freighters, including production and converted freighters.

Indra to improve flight capacity and safety in India



Indra, a leading global technological engineering company for the aerospace, defence and mobility sectors, will deploy an integrated system to centralise all the phases of air traffic surveillance and control in India, helping to improve flight safety, increase management capacity and efficiency and reduce delays, emissions and noise pollution. Following a demanding open international bidding process that has lasted over two years, the Airports Authority of India (AAI) awarded Indra and their local partners a contract worth more than 55 million euros to deploy its solution at five of the country's main air traffic control centers and airports: Mumbai, Hyderabad, Bangalore, Navi Mumbai and Mopa.

Air India to acquire 250 Airbus aircraft



The Tata Group-owned Air India has announced its commitment to order 250 Airbus aircraft to boost its domestic and international operations. The commitment includes 140 A320neo and 70 A321neo single-aisle aircraft as well as 34 A350-1000 and six A350-900 wide-body jets that will mark a new era for the country as the all-new, long-range aircraft celebrates its debut in the Indian market. The order aims to both modernise and expand the airline's fleet with the objective of creating a larger and premium full-service carrier that will cater to the growing travel demand in the region. Deliveries are set to commence with the first A350-900 arriving by late-2023.

IndiGo inducts its first Boeing 777



IndiGo will be operating leased Turkish Airlines Boeing 777 aircraft on Delhi- Istanbul route on damp lease, to cater to the increasing demand for travel to and from India. The Boeing 777 aircraft has the seating capacity of 400 passengers in a dual class configuration. IndiGo is bringing in a whole new menu with hot meals options for the first time for customers flying aboard this aircraft.

Avolon delivers 15 Airbus A320/ A321neo's to Indigo

Avolon, the international aircraft leasing company, announced it has completed the delivery of 15 A320neo family aircraft to IndiGo, India's largest passenger airline. Delivery of the aircraft commenced in September 2022 and was completed in February 2023. The sale and leaseback transaction comprised a mix of six A320neo aircraft and nine A321neo aircraft. Avolon now has a total of 21 aircraft on lease with IndiGo.



Avolon delivers 5 Boeing 737-8 MAX to Akasa Air

Avolon announced it had completed the delivery of 5 new Boeing 737-8 MAX aircraft to Akasa Air, India's newest airline. Delivery of the aircraft commenced in December 2022 and was completed in January 2023. This sale and leaseback transaction is Avolon's first deal with Akasa.



Airways Aviation and APFT in partnership



With Indian aviation on an exponential growth trajectory and burgeoning demand for quality pilots, the global aviation education and training group - Airways Aviation Group operating in Europe, Australia, Middle East and Africa and Asia Pacific Flight Training Academy Limited (APFT) India, has announced the coming together of a new strategic alliance partnership. The Dubai headquartered Airways Aviation

and Hyderabad based Asia Pacific Flight Training Academy Limited (APFT) signed a new strategic alliance partnership that will provide prospective Indian students and airline cadets access to a new and innovative Pilot Pathway Programme from May 2023.

Smiths Detection to supply NIA security and screening technology

S miths Detection has announced that it has signed an agreement to supply Noida International Airport with both passenger and hold baggage screening equipment to help ensure safety and efficiency for passengers and operators. Smiths Detection will supply the HI-SCAN 6040 DV, an advanced high resolution, dual-view X-ray screening system that will be used to screen passenger carry-





on baggage; the HI-SCAN 10080 XCT, a next generation highspeed computed tomography (CT) explosives detection system that complies with TSA and ECAC regulations and BCAS standards; the iLane A20, a newly launched next generation automatic tray return system which delivers a steady flow of trays, removing bottlenecks and providing a seamless checkpoint journey; and the IONSCAN 600, a portable explosives and narcotics trace detector; and multiple additional X-ray screening systems to screen oversized goods.

Menzies Aviation selects Wipro

Wipro Limited announced that it had been selected by Menzies Aviation, the world's largest aviation services company, to transform its air cargo management services. The partnership will help fortify Menzies' position as the leading cargo handler in the market, enabling the company to grow its services and use of new technologies. It will also accelerate competitiveness while keeping customers, partners, employees, and the environment at the center of this transformation.

APPOINTMENTS

Air Marshal AP Singh is VCAS



A ir Marshal AP Singh took over as the Vice Chief of the Air Staff (VCAS) on 1 February 2023. On the occasion of taking over of the office of VCAS, he laid a wreath at the National War Memorial to honour those Armed Forces personnel who have made the supreme sacrifice for the nation. Following this, he was accorded a ceremonial Guard of Honour at Air Headquarters (Vayu Bhavan). An alumnus of the National Defence Academy, Defence Services Staff College and National Defence College, the Air Marshal was commissioned into the Fighter Stream of the IAF on 21 December 1984. The Air Officer is a Qualified Flying Instructor and an Experimental Test Pilot with more than 5000 hours of flying experience on a variety of fixed and rotary wing aircraft.

Vice Admiral Dinesh K Tripathi is FOC-in-C WNC

Vice Admiral Dinesh K Tripathi took over as Flag Officer Commanding-in-Chief (FOC-in-C), Western Naval



Command (WNC) from Vice Admiral Ajendra Bahadur Singh at a Ceremonial Parade held at INS Shikra on 28 February 2023. On taking over, the Flag Officer paid homage to all personnel who made the supreme sacrifice in service of the Nation by placing a floral wreath at the Gaurav Stambh (the Victory at Sea Memorial at Naval Dockyard, Mumbai). Prior to taking over as Flag Officer Commanding-in-Chief, Vice Admiral Tripathi served as the Chief of Personnel at the Integrated Headquarters of the Ministry of Defence (Navy).

Lt Gen MV Suchindra Kumar is Vice Chief of the Army Staff

Lieutenant General MV Suchindra Kumar assumed the appointment of the Vice Chief of the Army Staff on 1 March 2023. Prior to taking over as the Vice Chief of the Army Staff, Lieutenant General MV Suchindra Kumar was tenanting the appointment of Deputy Chief of Army Staff (Strategy) at Army HQ. He has experience in intelligence, operations, force structuring, operational logistics and tech infusion in his recent appointments. An alumnus of



Sainik School Bijapur and National Defence Academy, the General Officer was commissioned into 1 Assam Regiment in June 1985. He has commanded 59 Rashtriya Rifles Battalion (Assam), an Infantry Brigade and an Infantry Division on the Line of Control and the highly active White Knight Corps in Northern Command.

Rear Admiral IB Uthaiah is DG Warship Design Bureau

R Adm IB Uthaiah took over as the Director General, Warship Design Bureau, New Delhi, from RAdm Bimal Kumar on 1 February 2023. Commissioned into the Indian Navy in November 1987, RAdm IB Uthaiah is an alumnus of the Naval College of Engineering, INS Shivaji, Lonavala, and holds an M. Tech and M. Phil degree in addition. In a career spanning over 35 years, he has served the Indian Navy in various capacities; with appointments at the Warship Design Bureau, Training



Academies, Naval Dockyard (Vzg), all Naval Commands and the Naval Headquarters.

News from ISRO

ISRO's LVM3 M3/ OneWeb India-2 Mission

LVM3 M3/ OneWeb India-2 Mission was successfully launched on 26 March 2023. In its sixth consecutive successful flight of LVM3, the vehicle placed 36 satellites belonging to the OneWeb Group Company in their intended 450 km circular orbit with an inclination of 87.4 degrees.

The vehicle took off with a total payload of 5,805 kg at 09:00:20 hours IST from the second launch pad at SDSC-SHAR, Sriharikota. It achieved satellite injection conditions in about 17 minutes and began injecting the satellites from the twentieth minute. The vehicle performed a sophisticated manoeuvre to orient in orthogonal directions and injected the satellites into precise orbits with defined time-gaps to avoid collision of the satellites.

Godrej Aerospace contributes to ISRO's heaviest rocket LVM3

Godrej Aerospace, a business unit of Godrej & Boyce, the flagship company of the Godrej Group, has contributed to the LVM3 (Launch Vehicle Mark III), ISRO's heaviest launcher till date. For this mission, the L110 engine for the core stage and the CE20





engine thrust chamber for the upper stage have been made by Godrej Aerospace. With a steadfast dedication to indigenous manufacturing for India's space endeavours, Godrej Aerospace has contributed to all PSLV and GSLV launches in the country and has delivered over 175 engines and other critical equipment till date.

ISRO conducts Rail Track Rocket Sled deployment tests

ISRO conducted the Rail Track Rocket Sled deployment tests of the Gaganyaan Pilot and Apex Cover Separation (ACS) parachutes in cluster configurations at the Terminal Ballistics Research Laboratory (TBRL), Chandigarh, in March 2023. The first test simulated the clustered deployment of two pilot parachutes. One parachute was





subjected to a minimum angle with respect to flow conditions and the second parachute was subjected to a maximum angle with respect to flow. These pilot parachutes are used in the Gaganyaan mission to extract and deploy the main parachutes independently.

The second test simulated the clustered deployment of two ACS parachutes under maximum dynamic pressure conditions. The test also simulated clustered deployment at a 90-degree angle of attack conditions for the crew module. The ACS parachutes are used in the Gaganyaan mission for the separation of the apex cover mounted on the Crew Module. Both pilot and ACS parachutes were deployed using a pyrotechnic mortar device.

The Gaganyaan parachute system development has been a joint effort by VSSC, Thiruvananthapuram and Aerial Delivery Research and Development Establishment (ADRDE), Agra.

Chandrayaan-3 undergoes Integrated Module Dynamic Tests

Chandrayaan-3 spacecraft successfully completed the essential tests that validated its capability to withstand the harsh vibration and acoustic environment that the spacecraft would face during

its launch. These tests were conducted during the first week of March 2023 at the test facilities located at the UR Rao Satellite Centre in Bengaluru. These tests are an essential part of the qualification and acceptance process for any spacecraft. These tests were particularly challenging, considering the fact that the Chandrayaan-3 spacecraft is a composite of three modules viz. Propulsion Module, Lander Module and the Rover module.







Major orders for Bharat Electronics Limited (BEL)

10 contracts worth Rs. 5,498 Cr with BEL for Indian Armed Forces

Indian Air Force Projects: EW Suite Equipment for Medium Lift Helicopter (90 Nos.) has been signed with BEL-Bangalore. AMC for the IAF Akash Missile System has been signed for maintenance of two Squadrons with BEL-Bangalore. The Akash Missile System (AMS) is a mediumrange, surface-to-air missile (SAM) system, developed by DRDO and manufactured by BEL. AMS includes Surveillance Radar, Fire Control Radar, Control and Command Centre developed by BEL. The Akash Missile system can target aircraft up to 30 km away and has the capabilities to neutralise aerial threats like fighter jets, cruise missiles and air-to-surface missiles. It is fully integrated with C4I and equipped with ECCM features.



It is indigenously designed and developed by the DRDO lab, Combat Aircraft Systems Development & Integration Centre (CASDIC). It comprises Radar Warning Receiver (RWR), Missile Approach Warning System (MAWS) and Counter Measure Dispensing System (CMDS) and will significantly enhance the combatsurvivability of IAF helicopters while undertaking operational missions against adversaries — ground-based as well as airborne radars and heat-seeking, shoulderfired missiles with effective countermeasures.





Indian Army projects: Automated Air Defence Control & Reporting System (Project Akashteer) has been signed with BEL-Ghaziabad. It will enable monitoring of low-level airspace over the battle areas of Indian Army and effectively control the Ground-Based Air Defence Weapon Systems. Additionally, Instant Fire Detection and Suppressing System (IFDSS) for T-72 MBT has been signed with BEL-Kotdwara. IFDSS is indigenously designed by DRDO and will be manufactured by BEL-Kotdwara. Indian Navy projects: Software Defined Radio (SDR) (1265 Nos.) - Portables for Indian Navy are latest state-of-the-art radios which have been indigenously developed, jointly by DEAL (DRDO) and BEL. The SDR portables are developed in three configurations viz. SDR Manpack, SDR Fixed Pack and SDR hand-held, to meet the specific operational requirements of the Indian Navy. SDR Portables are new generation software defined radio that supports multi band, multi-channel, multi role/mission operation with voice/data to



meet the needs of network-centric warfare of Indian Navy. These radios are feature rich compact radios which provides the flexibility of enhancing the performance by implementation of futuristic waveforms on the same hardware using software programmability.

Also for the Indian Navy is the HDVLF HF Receiver (1178 Nos.) which is a communication equipment, designed to receive and demodulate Data/Voice in VLF and HF Band of operation in the ships and submarines of Indian Navy. The equipment incorporates advanced DSP technology with inbuilt high grade encryption. With induction of this state-of-the-art equipment, naval forces will be modernised for secure and higher data capability. The equipment is productionised by BEL-Panchkula with ToT from design agency DEAL DRDO Dehradun.

Plus, the Sarang (12 Nos.) will be installed on Kamov-31 helicopters of the Indian Navy which intercepts, detects and identifies the Radar emitters comprising state-of-the-art technologies. The project is indigenously designed and developed by DLRL and manufactured by BEL-Hyderabad.

Three more projects were signed with Indian Navy - INS-SA, CMS for P17 and P28 and Varuna EW system.



All these are flagship projects showcasing the indigenous design and manufacturing capabilities of Indian Defence industry led by BEL, involves other Public Sectors, Private Sectors and MSMEs. These projects will add another milestone to the 'Atmanirbhar Bharat Abhiyaan' and 'Make in India' initiative of the Government of India.

Rs 3,700 crore for Arudhra radars and 129 DR-118 RWRs

Ministry of Defence signed two separate contracts with Bharat Electronics Limited (BEL), at a total cost of over Rs 3,700 crore, to enhance the operational capabilities of the Indian Air Force. The first contract, worth over Rs 2,800 crore, pertains to the supply of Medium Power Radars (MPR) 'Arudhra' for the Indian Air Force. The second contract, at an overall cost of approx. Rs 950 crore, relates to 129 DR-118 Radar Warning Receivers (RWR). Both projects are under Buy Indian – IDMM (Indigenously Designed Developed and Manufactured) category.



Rs 3,000 crore contract for EWS 'Project Himshakti'

Ministry of Defence signed a contract with Bharat Electronics Limited (BEL), Hyderabad for procurement of two Integrated Electronic Warfare Systems 'Project Himshakti' at an overall cost of approximately Rs 3,000 crore. The project is under the Buy Indian – IDMM (Indigenously Designed Developed and Manufactured) category comprising contemporary and niche technologies. 'Project Himshakti' will Support Measure (ESM) systems along with associated Engineering Support Package from BEL, Hyderabad at an overall cost of Rs 412 crore for the Indian Navy.

The contract with NSIL, a Central Public Sector Enterprise under Department of Space, Bengaluru pertains to procurement of an advanced Communication Satellite, GSAT 7B, which will provide High Throughput Services to the Indian Army at an overall cost of Rs 2,963 crore. All these projects are under Buy {Indian – IDMM associated industries, including MSMEs, who are sub vendors of BEL.

Advanced Communication Satellite: The satellite will considerably enhance the communication capability of the Indian Army by providing mission critical beyond line of sight communication to troops and formations as well as weapon and airborne platforms. The geostationary satellite, being a first-of-its-kind in the five-tonne category, will be developed indigenously by Indian Space Research Organisation (ISRO).



encourage participation of Indian Electronics and associated industries, including MSMEs, which are sub vendors of BEL. It will generate employment of approximately three lakh man-days over a period of two years.

Two contracts worth Rs 2,400 crore for 'Project Akashteer' and Sarang ESM

In another boost to 'Aatmanirbharta' in defence, Ministry of Defence, on 29 March 2023, signed three contracts – two with Bharat Electronics Limited (BEL), Ghaziabad and one with NewSpace India Limited (NSIL) – at a total cost nearly Rs 5,400 crore, to bolster the defence capabilities of the country. The first contract with BEL pertains to procurement of Automated Air Defence Control & Reporting System 'Project Akashteer' worth Rs 1,982 crore for the Indian Army. The second contract with BEL relates to acquisition of Sarang Electronic (Indigenously Designed Developed and Manufactured)} category.

Project Akashteer: The Automated Air Defence Control & Reporting System 'Project Akashteer' will empower the Air Defence units of the Indian Army with an indigenous, state-of-the-art capability, to effectively operate in an integrated manner. Akashteer will enable monitoring of low level airspace over the battle areas of Indian Army and effectively control the Ground Based Air Defence Weapon Systems.

Sarang systems: Sarang is an advanced Electronic Support Measure system for helicopters of the Indian Navy, designed and developed indigenously by Defence Electronics Research Laboratory, Hyderabad under programme Samudrika. The scheme will generate an employment of approximately two lakh man-days over a period of three years.

Both the projects will encourage participation of Indian Electronics and

Contract for 13 Lynx-U2 FCS for IN Navy worth Rs 1,700 crore

Ministry of Defence, on 30 March 2023, signed a contract with Bharat Electronics Limited, Bangalore for procurement of 13 Lynx-U2 Fire Control Systems for Indian Navy at a total cost of over Rs 1,700 crore under Buy Indian – IDMM (Indigenously Designed Developed and Manufactured) category. The Lynx-U2 System is a Naval Gun Fire Control System designed and developed indigenously. It is capable of accurately tracking and engaging targets amidst sea clutter as well as air/surface targets.

The 4th generation, completely indigenous systems, will be installed on New Generation Offshore Patrol Vessels to be built indigenously at Garden Reach Shipbuilders & Engineers and Goa Shipyard Limited.

India's Defence Budget 2023-24



The Union Budget for Financial Year 2023-24 envisages a total outlay of Rs 45,03,097 crore. Of this, Ministry of Defence has been allocated a total Budget of Rs 5,93,537.64 crore, which is 13.18 % of the total budget. This includes an amount of Rs 1,38,205 crore for Defence Pensions. The total Defence Budget represents an enhancement of Rs 68,371.49 crore (13%) over the Budget of 2022-23.

In keeping with the Government's resolve and focus towards maintaining a high level of Operational Preparedness of the Defence Services to face current and future challenges, the Non-Salary Revenue/operational allocation gets a boost of Rs 27,570 Crore, with the budgetary outlay under this segment augmented from Rs 62,431 crore in BE 2022-23 to Rs 90,000 crore in BE 2023-24. This will cater to sustenance of Weapon Systems, Platforms including Ships/Aircraft and their logistics; boost fleet serviceability; emergency procurement of critical ammunition and spares; procuring/hiring of niche capabilities to mitigate capability gaps wherever required; progress stocking of military reserves, strengthening forward defences, amongst others.

As a precursor to this increase in the Non-Salary Revenue segment, the government during the Mid-term review had also enhanced the operational allotments of the current financial year by Rs 26,000 crore, which works out as 42% of the present allocation. This unprecedented increase in the Revised Estimates 2022-23 has ensured liquidation of the entire carry over liabilities during the current year thereby ensuring that there is no dent in the next year's operational outlay of the Services.

In the Union Budget 2023-24, the Capital Investment Outlay has been increased steeply for the third year in a row by 33 per cent to Rs 10 lakh crore, which would be 3.3 per cent of GDP. This will be almost three times the outlay in 2019-20.

Accordingly, the Capital Allocations pertaining to modernisation and infrastructure development of the Defence Services has been increased to Rs 1,62,600 crore representing a rise of Rs 10,230 crore (6.7%) over FY 2022-23. Also, the increase in the Capital Budget since 2019-20 has been Rs 59,200 crore (57%). This increase is a reflection of the Government's commitment towards sustainable augmentation in the area of modernisation and infrastructure development of the Defence Services.

Accordingly, the Capital Budget of Border Roads Organisation (BRO) has been increased by 43% to Rs 5,000 crore in FY 2023-24 as against Rs 3,500 crore in FY 2022-23. Also, the allocation under this segment has doubled in two years since FY 2021-22. This will boost the Border infrastructure thereby creating strategically important assets like Sela Tunnel, Nechipu Tunnel and Sela-Chhabrela Tunnel and will also enhance border connectivity.

Towards strengthening Research and Development in Defence, the allocation to DRDO has been enhanced by 9%, with a total allocation of Rs 23,264 crore in BE 2023-24.

To further foster innovation, encourage technology development and strengthen the Defence Industrial ecosystem in the country, iDEX and DTIS have been allocated Rs 116 crore and Rs 45 crore respectively representing an enhancement of 93% for iDEX and 95% for DTIS over 2022-23. This will fulfill the Ministry of Defence's vision to leverage ideas from bright young minds across the country.

The Union Budget 2023-24 has announced a National Data Governance Policy to unleash innovation and research by start-ups and academia. This will enable access to anonymized data which will further boost the Defence Start-ups and iDEX scheme.

The Union Budget 2023-24 has also announced that the revamped Credit Guarantee scheme for MSMEs which will take effect from 1st April 2023 through infusion of Rs. 9,000 Crore in the corpus. This will enable additional collateral-free guaranteed credit of Rs 2 lakh crore. Further, the cost of the credit has also been reduced by about 1 per cent. This scheme will give a further fillip the MSMEs associated with the Defence Sector.

The Defence Pension Budget registers a notable jump of 15.5 % in FY 2023-24. In absolute terms, this amount is Rs 1,38, 205 Crore in BE 2023-24 against Rs 1,19,696 crore in BE 2022-23. Further, RE 2022-23 allocations at Rs 1,53,415 crore records a significant jump of 28%, amounting to Rs 33, 718 crores. This includes an amount of Rs 28,138 Crore to meet the requirement on account of revision of Armed Forces Pensioners/ Family Pensioners under One Rank One Pension (OROP).

Towards the Government's commitment in transforming Healthcare outreach to our veterans, Defence Budget 2023-24 registers a notable increase of 52% in the allotment for Ex-Servicemen Contributory Health Scheme (ECHS) with BE allocation of Rs. 5431.56 Crore in FY 2023-24 against Rs. 3582.51 Crore in FY 2022-23. This enhancement will ensure 'Cashless Health Services' and improved 'Service Delivery' to our veterans and their dependents across India.

DAC approves proposals worth Rs 70,500 crore for Armed Forces



Meeting of Defence Acquisition Council (DAC), held on 16 March 2023 under the chairmanship of Raksha Mantri Rajnath Singh, accorded Acceptance of Necessity (AoN) for capital acquisition amounting to over Rs 70,500 crore under Buy {Indian-IDDM (Indigenously Designed, Developed and Manufactured)}. Out of the total proposals, Indian Navy proposals constitute more than Rs 56,000 crore, which largely includes indigenous BrahMos missiles, Shakti Electronic Warfare (EW) systems, Utility Helicopters-Maritime etc.

While this additional procurement of BrahMos missile system will enhance the maritime strike capabilities and anti-surface warfare operation, the addition of Utility Helicopters will multiply the operational readiness of the Indian Navy in the domain of Search & Rescue operations, Casualty Evacuation, Humanitarian Assistance Disaster Relief (HADR) etc. Similarly, Shakti EW systems will equip and modernise the frontline naval ships to counter any naval operations by the adversaries.

Accordance of AoN for Medium Speed Marine Diesel Engine under Make-I category is a significant step as, for the first time, India is venturing into the development and manufacturing of such engines indigenously to achieve selfreliance and leverage the capabilities of the industries towards the goal of 'Aatmanirbhar





Bharat'. To keep pace with the emerging technologies and counter the adversaries in the Western and Northern front, the necessity of the new weapons and its integration with the delivery platforms was felt by the Government. To achieve the same objectives, the DAC accorded the approval to Indian Air Force's proposal for Long Range Stand-Off Weapon (LRSOW) which will be indigenously designed, developed and integrated on Su-30MKI aircraft.

For Artillery modernisation, in addition to the ongoing Dhanush Gun System and K-9 Vajra-T Gun System, AoN for procurement of 155mm/52 Caliber Advanced Towed Artillery Gun System (ATAGS) along with High Mobility Vehicles (HMVs) and Gun Towing Vehicles (GTVs) for the Indian Army was accorded by the DAC. It also accorded AoN for procurement of Advance Light Helicopters (ALH) MK-III from Hindustan Aeronautics Limited (HAL) for the Indian Coast Guard. The helicopter will be able to carry a suite of surveillance sensors which will enhance the surveillance capabilities. It will also give full night capability and Instrument Flight Rules (IFR) capability for operations of the Indian Coast Guard.

Including these proposals, the total AoN granted for Capital Acquisition in the Financial Year 2022-23 is over Rs 2.71 lakh crore, out of which 99% of the procurement will be sourced from Indian industries.

(All representative images. Photos: Vayu)





Maiden landing of LCA Navy and MiG-29K onboard INS Vikrant

"The successful landing and takeoff of the indigenous LCA Navy on India's first Indigenous Aircraft Carrier on 6 February 2023 is a momentous step forward towards the realisation of our collective vision of AatmaNirbhar Bharat. The maiden landing of the MiG-29K also heralds the integration of the fighter aircraft with INS Vikrant. Congratulations to all those who made it happen", stated Admiral R Hari Kumar, Chief of the Naval Staff.

The Carrier has been undertaking extensive Air Operations with Rotary Wing and Fixed Wing aircraft since 13 December 2022 towards Air Certification and Flight Integration Trials for achieving the ultimate aim of being 'Combat Ready'. As part of the aviation trials, landing of LCA (Navy) and MiG-29K onboard INS Vikrant was carried out on 6 February 2023 by Indian Naval Test Pilots.

"The landing of LCA (Navy) on deck has demonstrated India's capability to design, develop, construct and operate indigenous Aircraft Carrier with indigenous fighter aircraft. It is indeed a landmark achievement being the first time that trials of a prototype aircraft - indigenously designed and produced by Aeronautical Development Agency (ADA) and Hindustan Aeronautics Limited (HAL), has been successfully undertaken on an indigenous Aircraft Carrier. Further, the landing of MiG-29K onboard INS Vikrant is also a significant achievement as it marks the successful integration of the aircraft with the indigenous carrier as well as further enhances the Combat Readiness of the Navy", stated officials.



Prime Minister Modi dedicates to the nation HAL's Helicopter Factory at Tumakuru









n yet another step towards 'Aatmanirbharta' in defence, Prime Minister Narendra Modi dedicated to the nation a Helicopter Factory of Hindustan Aeronautics Limited (HAL) in Tumakuru, Karnataka on 6 February 2023. Raksha Mantri Mr. Rajnath Singh and senior officials of Ministry of Defence were present on the occasion.

The Greenfield Helicopter Factory, spread across 615 acres of land, is planned with a vision to become a one-stop solution for all helicopter requirements of the country. It is India's largest helicopter manufacturing facility and will initially produce Light Utility Helicopters (LUHs). The LUH is an indigenously designed and developed 3-ton class, single engine multipurpose utility helicopter with unique features of high maneuverability. Initially, this factory will produce around 30 helicopters per year and can be enhanced to 60 and then 90 per year in a phased manner. The first LUH has been flight tested and is ready for unveiling.

The factory will be augmented to produce other helicopters such as Light Combat Helicopters (LCHs) and Indian Multirole Helicopters (IMRHs). It will also be used for Maintenance, Repair and Overhaul of LCH, LUH, Civil Advanced Light Helicopter (ALH) and IMRH in the



future. Potential exports of civil LUH will also be catered to from this factory.

HAL plans to produce more than 1,000 helicopters in the range of 3-15 tonnes, with a total business of over Rs four lakh crores over a period of 20 years. Besides generating direct and indirect employment, the Tumakuru facility will boost the development of surrounding areas through its CSR activities with largescale community centric programmes on which the company will spend substantial amounts. All this will result in improvement in the people's lives in the region.

The proximity of the factory, with the existing HAL facilities in Bengaluru, will boost the aerospace manufacturing ecosystem in the region and support skill and infrastructure development such as schools, colleges and residential areas. Medical and health care would also reach the community residing in the various nearby Panchayats.

With the establishment of facilities like Heli-Runway, Flight Hangar, Final Assembly Hangar, Structure Assembly Hangar, Air Traffic Control and various supporting service facilities, the factory is fully operational. This factory is being equipped with state-of-the-art Industry 4.0 standard tools and techniques for its operations.

VAYU on-the-spot report



RAF hosts premier multilateral air Exercise Cobra Warrior

Participation from RAF, IAF, Finland, Sweden, South Africa, USA and Singapore

Rercise Cobra Warrior is run biannually and is the largest air exercise run by the Royal Air Force' Number 92 Squadron which is based at RAF Waddington. The exercise is designed to train exercise participants in high intensity large force tactical air war fighting operations. This edition of the exercise took place from the 2-24 March 2023 and saw over 70 aircraft taking part and was controlled by directing staff at RAF Waddington, Lincolnshire.

Exercise Cobra Warrior is the RAF's capstone tactical training event, allowing air forces from various nations across the globe to work hand-in-hand with their British counterparts on strategy and numerous military objectives. Last year's exercise

saw military from the United States, Italy, Germany and NATO attend.

Taking part this year for the first time were contingents from the Finnish, Indian and Royal Saudi Air Forces. The Saudis flew in six Typhoons from RAF Coningsby and the Indian Air Force brought five Mirage 2000 jets supported in the air-to-air fuelling from RAF Brize Norton.



Also, based at RAF Waddington were the Belgian Air Force F-16s and Finnish Air Force F-18 Hornets. The Finnish participation is part of a wider training activity in support of the UK led Joint Expeditionary Force that is known as JEF Warrior.

These fast jets were supported by RAF Voyagers conducting air-to-air Tanking operations, flying from RAF Brize Norton. In addition, UK Joint Helicopter command aircraft was based at RAF Leeming and participated in the exercise. The RAF's Air Mobility Force also took part in the exercise deploying elements of 16 Air Assault Brigade during an associated ground mission that formed part of the overall exercise scenario.

Officer Commanding 92 Squadron, Squadron Leader John McFadden,

from the squadron that coordinated this exercise stated, "We are looking forward to delivering Exercise Cobra Warrior 23-1. 92 Sqn have developed a challenging Air-led multi-domain exercise focussed on pitting our NATO, JEF and International partners against a capable peer adversary within a contested degraded and operationally limited threat environment. Over three weeks, we will bring together our capabilities and deliver the full spectrum of Air Operations, including Defensive and Offensive Counter-Air as well as Strike Operations. These will include RAF Regiment Precision Strike Teams, Air Manoeuvre operations to support ground forces, and also developing our Joint Personnel Recovery Capability".

Group Captain Jim Calvert, who was exercise director, stated, "What Cobra



Warrior provides us is what we call collective training. What nations and squadrons will do is they will train their crews to be tactical experts on their individual platforms. What an exercise such as Cobra Warrior does is it brings all of those platforms together, both UK and partner-nations. It just allows us to train and integrate together, so that we can prove, and we can test, and adjust and enhance our interoperability."

"It is wonderful once again to welcome our fellow RAF and international colleagues to RAF Waddington to participate in this world class air exercise," stated Group Captain Mark Lorriman-Hughes, the RAF Waddington Station Commander. "Cobra Warrior provides an invaluable opportunity for international Allies and Partners to train together in developing operational tactics in the air," he added.

For the RAF one other key aspect of the exercise is that it gives the opportunity to complete the training within the Mission Employment Phase for future RAF Weapons Instructors. The level of training combined with the variety of training partners helps to achieve the required standards within the Weapons School Criteria.

On 26 February 2023, an Indian Air Force contingent comprising 145 personnel departed Air Force Station Jamnagar for Waddington Air Force Base of the Royal Air Force in United Kingdom. As mentioned earlier, the IAF participated with five Mirage 2000s, two C-17 Globemaster III and an IL-78 mid-air refueller.



Flight Lieutenant Samarth Shukla of the Indian Air Force stated, "We have travelled halfway around the world, including stops in Saudi Arabia and Greece, to reach this place. Exercise Cobra Warrior is a great opportunity for us to learn and to fly with other nations. It has given us the opportunity to learn from other nations, share our experiences and, all in all, improve us. The aim of the exercise is to participate in diverse fighter aircraft engagements and learn from the best practices of various Air Forces When we get back, we will share our experiences and improve the Indian Air Force as a whole."

Six media persons from India were lucky enough to cover the event. A big thank you to the British High Commission, New Delhi for organising our trip. And ofcourse a special thank you to Sid Bhardwaj, Defence & Security Communications Campaign Manager, FCDO New Delhi who escorted us throughout the media tour- and who had to bear with us for those few days. Hopefully we did not make him too miserable! Once again, thanks all for the logistics, planning and implementation. It was worth it for us!

Text and photos: VAYU



Pre-sortie and daily briefings





















Flight planning room at RAF Waddington

Interactions and joint planning with Royal Saudi Air force and RAF pilots and instructors (in these photos).



The Balakot machines!!

IAF Mirage 2000s at Waddington















Chow time!

Nothing like fresh hot food at all times especially while it was cold, rainy and windy perpetually. IAF personnel (and RAF) seen here all eating together- though they thoroughly enjoyed the wide variety of food, after more than 3 weeks at RAF Waddington, couldn't but now want some "ghar ka khaana" or home food!





IAF/JASDF 'Veer Guardian 2023' concludes

The inaugural edition of the bilateral air exercise 'Veer Guardian 2023' between the Indian Air Force (IAF) and Japan Air Self Defence Force (JASDF) concluded in Japan on 26 January 2023.

The JASDF participated in the exercise with its F-2 and F-15 aircraft, while the IAF contingent participated with the Su-30MKI. The IAF fighter contingent was complemented by one IL-78 Flight Refueling Aircraft and two C-17 Globemaster strategic airlift transport aircraft.

During the joint training spanning 16 days, the two Air Forces engaged in complex and comprehensive aerial manoeuvres in multiple simulated operational scenarios. The exercise involved precise planning and skillful execution by both the air forces. IAF and JASDF engaged in air combat manoeuvring, interception and air defence missions, both in Visual and Beyond Visual Range settings. Aircrew of the two participating Air Forces also flew in each other's fighter aircraft to gain a deeper understanding of each other's operating philosophies.

All photos: IAF/JASDF



























India Singapore Exercise 'Bold Kurukshetra'

The Singapore Army and Indian Army participated in the 13th edition of Exercise Bold Kurukshetra, a bilateral armour exercise from 6-13 March 2023 at Jodhpur Military Station, India. For the first time in the exercise series, both armies participated in a command post Exercise, which involved Battalion and Brigade level planning elements and computer wargaming. Hosted by the Indian Army, the exercise involved soldiers from the 42nd Battalion, Singapore Armoured Regiment and an Armoured Brigade of Indian Army.



21st edition of India-France Varuna 2023

The 21st Edition of the Bilateral Naval Exercise between India and France, Exercise Varuna commenced on the Western Seaboard on 16 January 2023. While the bilateral exercise between the two navies was initiated in 1993, it was christened as 'VARUNA' in

Provence, support vessel FS Marne and maritime patrol aircraft Atlantique. The exercise was conducted over five days from 16 to 20 January 2023 and witnessed advanced air defence exercises, tactical manoeuvres, surface firings, underway replenishment and other maritime operations.

Photos: IN/French Embassy in India



2001 and has become a hallmark of India–France strategic bilateral relationship.

This edition witnessed participation of indigenous guided missile stealth destroyer INS Chennai, guided missile frigate INS Teg, maritime patrol aircraft P-8I and Dornier, integral helicopters and MiG-29K fighter aircraft. The French Navy was represented by the aircraft carrier Charles De Gaulle, frigates FS Forbin and


IAF participates with French NCSG





IAF participated in a bilateral exercise with the French Naval Carrier Strike Group (NCSG) Charles De Gaulle off the western coast near Bombay High on 29 January 2023. While IAF participated with Su-30MKI, AWACS and IL-78 AAR tanker, the French Navy participated with Rafale M and an E2C Hawkeye.

INS Delhi visits Trincomalee, Sri Lanka

India's first indigenously built destroyer, INS Delhi visited Trincomalee, Sri Lanka from 15–17 January 2023. During her stay at Trincomalee, the ship participated in a variety of activities with the Sri Lanka Navy (SLN), which included professional and social interactions, cross deck visits and sports fixtures. A familiarisation tour of the ship was also conducted for the officers of Sri Lanka Armed Forces undergoing the Junior Staff Course and trainees from the Sri Lanka



Naval and Maritime Academy, as well as several sailors from SLN. The ship's visit to Sri Lanka signifies the strong navy-to-navy links and interoperability between Indian Navy (IN) and Sri Lanka Navy (SLN).

Guided missile destroyer, INS Delhi was commissioned in November 1997. She is fitted with state-of-the-art weapons and sensors including BrahMos missiles which makes her capable of detecting and neutralising air, surface and sub-surface threats. The indigenously designed and built INS Delhi symbolises India's advanced warship building capability. The ship is a part of Indian Navy's Eastern Fleet based at Visakhapatnam and functions under the operational command of the Flag Officer Commanding-in-Chief, Eastern Naval Command.

Indo-Egypt joint training Exercise Cyclone

The first ever joint exercise between the special forces of the Indian Army and the Egyptian Army named "Exercise Cyclone-I" was conducted at Jaisalmer in Rajasthan on 14 January 2023. The





exercise aimed to bolster defence cooperation between the two nations and focus on sharing professional skills and interoperability of Special Forces in desert terrain while undertaking counter terrorism, reconnaissance, raids and other special operations.

Exercise "Cyclone - I" is the first exercise of its kind bringing the Special Forces of both the nations on a common platform. The 14 days long exercise which was carried out in the deserts of Rajasthan engaged both the contingents to advance special forces skills such as Sniping, Combat Free Fall, Reconnaissance, Surveillance and Target Designation, sharing of information on weapons, equipment, innovations, tactics, techniques and procedures. The participants undertook joint planning and drills for Special Forces operations in a mechanised warfare setting as well as surgical strikes on terrorist camps/hideouts to include sniping of High Value Targets.

Tri-services Amphibious Exercise AMPHEX 2023





The biennial Tri-Services Amphibious Exercise, AMPHEX 2023 was conducted at Kakinada, Andhra Pradesh from 17 to 22 January 2023. AMPHEX is aimed at joint training of elements of all three services in various facets of amphibious operations to enhance interoperability and synergy. AMPHEX 23 is the first time that the exercise was undertaken at Kakinada, and was the largest ever AMPHEX conducted till date. The participating forces undertook complex exercises in all domains



of amphibious operations over five days. The exercise witnessed the participation of a number of amphibious ships consisting of Large Platform Dock (LPD), Landing Ships and Landing Crafts, Marine Commandos (MARCOS), helicopters and aircraft from the Indian Navy. Indian Army participated in the exercise with over 900 troops which included Special Forces, Artillery and Armoured vehicles. Jaguar fighters and C-130 aircraft from the IAF also participated in the exercise.

Theatre level exercise TROPEX-23

The 2023 edition of Indian Navy's major maritime exercise TROPEX, was carried out in the Indian Ocean Region. This operational level exercise is conducted





biennially and witnesses participation not only by all Indian Navy units but also of Indian Army, Indian Airforce and Coast Guard assets.

TROPEX 23 was conducted over a duration of three months from Jan-March 2023. As part of the exercise, all surface combatants of the Indian Navy including destroyers, frigates, corvettes as well as submarines and aircraft are put through complex maritime operational deployments to validate and refine the Navy's Concept of Operations including operational logistics and interoperability with other Services. The exercise was conducted in different phases, both in harbour and at sea, encompassing various facets of combat operations, including live weapon firings.

Having grown in scope and complexity over the years, this exercise provides an opportunity to test the combat readiness of the combined Fleets of the Indian Navy to operate in a multi-threat environment. The maritime exercise also facilitates operational level interaction with the Indian Army, Indian Airforce and the Coast Guard, which will further strengthen interoperability and joint operations in a complex environment. (All file photos)





Indo-Japan Exercise "DHARMA GUARDIAN"

The 4th edition of joint military exercise, "EX DHARMA GUARDIAN", between India and Japan was conducted at Camp Imazu in Shiga province, Japan from 17 February to 2 March 2023. Notably, in the series of military training exercises





undertaken by India with various countries, Exercise DHARMA GUARDIAN which is an annual training event with Japan, is crucial and significant in terms of security challenges faced by both nations in the backdrop of current global situation. The scope of this exercise covers platoon level joint training on operations in jungle and semi urban/urban terrain.

Troops of the Garhwal Rifles Regiment of the Indian Army and an Infantry Regiment from the Middle Army of the Japan Ground Self Defence Force (JGSDF) participated in the exercise this year to share experiences gained during operations in order to enhance inter-operability in planning and execution.

India-Japan Exercise Shinyuu Maitri

The Indian Air Force (IAF) participated in Exercise Shinyuu Maitri with the Japan Air Self Defence Force (JASDF). The exercise was organised on the side-lines of the Indo-Japan Joint Army Exercise, Dharma Guardian, which was conducted from 13 February 2023 to 2 March 2023 at Komatsu, Japan.



The IAF contingent participated in Exercise Shinyuu Maitri 23 with one C-17 Globemaster III aircraft. The first phase of the exercise consisted of discussions on transport operations and tactical manoeuvring, followed by the second phase of flying drills by IAF's C-17 and JASDF C-2 transport aircraft. "The exercise gives an opportunity for the respective subject matter experts to interact and study each other's operational philosophies and best practices. The exercise shall also enhance mutual understanding and interoperability between the IAF and the JASDF", said a statement.

Visit of Japanese naval ships to Kochi





Japan Maritime Self Defence Force (JMSDF) Ships Uraga and Awaji made port call at Kochi from 14-16 February 2023. Commanding Officers of JS Uraga and JS Awaji called on Commodore Upal Kundu, Chief Staff Officer (Training), Southern Naval Command and discussed matters of mutual interest. The ship's crew visited professional training schools and ship of Southern Naval Command. During the visit, they were familarised with various training facilities and activities undertaken at the Training Command of the Indian Navy. Visit and professional interaction onboard Japanese ships were conducted to enhance interoperability and "share best practices between the Navies".

INS Sumedha participates at IDEX and NAVDEX 23





Indian Naval Ship Sumedha arrived at Abu Dhabi, UAE on 20 February 2023 and participated in NAVDEX 23 (Naval Defence Exhibition) and IDEX 23 (International Defence Exhibition), from 20 to 24 February 2023. The ship's participation in two leading regional naval and defence exhibitions showcases the strengths of India's indigenous shipbuilding.

INS Sumedha is the third ship of the indigenously built Saryu class Naval Offshore Patrol Vessels (NOPV) and was commissioned into the Indian Navy on 7 March 2014. Built indigenously at Goa Shipyard Limited, she is fitted with an array of weapons and sensors, can carry an integral helicopter and boasts of long endurance. Her participation in a marquee event conducted by UAE also highlighted the close strategic and cultural relations between India and UAE.

Indo-Uzbekistan exercise 'DUSTLIK'

The 4th edition of joint military exercise 'DUSTLIK' between the Indian Army and Uzbekistan Army was conducted end-February 2023 in Foreign Training Node, Pithoragarh (Uttarakhand). 45 soldiers each from Uzbekistan and Indian Army participated in this exercise which was aimed at promoting positive relations between both the armies. The Indian Army







contingent comprised of troops from an Infantry Battalion from the Garhwal Rifles Regiment. The first edition of the exercise was held at Uzbekistan in November 2019.

The 14 days long joint exercise focused on joint counter-terrorist operations in mountainous and semi-urban scenario under UN mandate and included field training exercises, combat discussions, lectures, demonstrations and culminated with a validation exercise. Both sides jointly trained, planned and executed a series of tactical drills for neutralisation of likely threats, while learning to exploit new generation equipment and technology for conducting joint operations.

IAF at Exercise Desert Flag VIII





An Indian Air Force contingent comprising of 110 Air Warriors arrived at Al Dahfra airbase of United Arab Emirates and participated in Exercise Desert Flag VIII. The IAF participated with five LCA Tejas and two C-17 Globemaster III aircraft. This is the first occasion when the LCA Tejas has participated in an international flying exercise outside India. Exercise Desert Flag is a multilateral air exercise in which Air Forces from UAE, France, Kuwait, Australia, UK, Bahrain, Morocco, Spain, Republic of Korea and USA also participated. The exercise was conducted from 27 February 2023 to 17 March 2023. The aim of the exercise was to participate in diverse fighter engagements and learn from the best practices of various Air Forces.

Exercise Cobra Warrior at Waddington, UK





An Indian Air Force contingent comprising 145 Air Warriors departed Air Force Station Jamnagar and participated in Exercise Cobra Warrior at the Waddington Air Force Base of the Royal Air Force in the United Kingdom. The exercise was conducted from 6 to 24 March 2023.

The Exercise Cobra Warrior is a multilateral Air exercise in which Air Forces from Finland, Sweden, South Africa, United States of America and Singapore participated alongside Royal Air Force and IAF. The IAF participated in the exercise this year with five Mirage 2000 fighters, two C-17 Globemaster III and an IL-78 mid-air refueller aircraft.

ICGS Samudra Paherdar overseas deployment

Indian Coast Guard ship Samudra Paheredar was on an overseas deployment to Asian countries that included Singapore, Cambodia and Malaysia from 1-19



March 2023. This is a Government of India's vision to formulate Indo-Asian collaborative approach towards marine response and to spread awareness about clean sea under 'Puneet Sagar Abhiyan'.

Indian Army exercises

The Indian Army's Rising Star Corps carried out integrated firing of tanks with ALH WSI Rudra at Field Firing Ranges on 2 March 2023.









INS Trikand at Cutlass Express 23 (IMX/CE-23)





INS Trikand participated in the International Maritime Exercise/Cutlass Express 2023 (IMX/CE-23) held in the Gulf region from 26 February to 16 March 2023. She exercised with participants from over 50 nations and international maritime agencies with the common aim of enhancing maritime security and keeping sea lanes in the region safe for maritime commerce. IMX/CE-23 is one of the largest multinational maritime exercises in the world. While this was Indian Navy's maiden IMX participation, it also marked the second occasion where an Indian Naval ship participated in an exercise conducted by the CMF. Earlier, in November 2022, INS Trikand had participated in the CMF led Operation Sea Sword 2.

Theatre level Exercise TROPEX-23

Indian Navy's major Operational level exercise TROPEX for the year 2023, conducted across the expanse of IOR over a duration of four months from November 2022 till March 2023, culminated in the Arabian Sea. The overall exercise construct included Coastal Defence exercise Sea Vigil and the Amphibious Exercise AMPHEX. Together, these exercises also witnessed significant participation from the Indian











Army, the Indian Air Force and the Coast Guard.

Set in the Indian Ocean including the Arabian Sea and the Bay of Bengal, the theatre of operations for the exercise extended approximately 4300 nm from North to South upto 35 deg South Latitude and 5000 nm from Persian Gulf in the West to North Australia coast in the East, spanning an area of over 21 million square nautical miles. TROPEX 23 witnessed participation of approximately 70 Indian Navy ships, six submarines and over 75 aircraft.

The culmination of TROPEX 23 brought to an end an intense operational phase for the Indian Navy that commenced in November 2022. As part of the final Joint Phase, the Raksha Mantri spent a day at sea onboard the newly commissioned Indigenous Aircraft Carrier Vikrant on 6 March 2023. He reviewed the Indian Navy's operational preparedness and material readiness wherein the Navy demonstrated operational manoeuvers and various facets of combat operations, including deck operations of indigenous LCA and live weapon firings. While addressing the Fleets, he lauded the Operational preparedness of the Indian Navy and emphasised that the country looked up to the Navy to ensure that the economic lifelines and "military capabilities of our adversaries are disrupted to the extent where their warfighting endeavours can no longer be sustained".

Indo-France Exercise FRINJEX-2023



The maiden joint military Exercise FRINJEX-23 between Indian Army and French Army was conducted at Pangode Military Station, Thiruvananthapuram, Kerala on 7 and 8 March 2023. It was for the first time armies of both the nations engaged in this format with each contingent comprising of a Company Group each from the Thiruvananthapuram based Indian Army troops and French 6th Light Armoured Brigade.

The exercise was aimed at enhancing inter-operability, coordination and cooperation between both forces at tactical level. The scope of the exercise involved establishment and operationalisation of a joint command post to secure an envisaged area for undertaking joint humanitarian assistance and disaster relief, establishing an Internally Displaced Population (IDP) camp and move of disaster relief material.





French Navy ships at Kochi

French Navy Ships FS Dixmude, an amphibious helicopter carrier and La Fayette, frigate were on a visit to Kochi from 6-10 March 2023 as part of circumnavigation mission. Rear Adm Emmanuel Slaars (ALINDIEN), Capt Emmanuel Mocard and Lt Cdr Ghislain Deleplanque called on Rear Admiral J Singh, Chief of Staff, Southern Naval Command and discussed wide range of issues of maritime cooperation between the two Navies.

During the visit, the French team visited professional training schools and ships of Southern Naval Command. Cross training visits, professional and social interaction including sports fixtures were some of the highlights of the visit. The French Army embarked onboard ships also conducted a joint military exercise with the Indian Army.



Some more images from Exercise Cobra Warrior, UK













(All photos: IAF)

Maritime Exercise with French Navy



Indian Navy's indigenously built guided missile frigate, INS Sahyadri participated in a Maritime Partnership Exercise (MPX) with French Navy (FN) ships FS Dixmude, a Mistral Class Amphibious Assault Ship and FS La Fayette, a La Fayette Class Frigate, in the Arabian Sea on 10–11 March 2023. The exercise witnessed a wide spectrum of evolutions at sea which included cross deck landings, boarding exercises and seamanship evolutions.

INS Sahyadri is fitted with state-of –the art weapons and sensors, which makes her capable of detecting and neutralising air, surface and sub-surface threats. The ship is a part of Indian Navy's Eastern Fleet based at Visakhapatnam, under operational control of FOCinC (East).

Exercise La Perouse 2023

The third edition of the multilateral exercise La Perouse was conducted in the Indian Ocean Region from 13 to 14 March 2023. This edition witnessed participation of personnel, ships and integral helicopters of Royal Australian Navy, French Navy, Indian Navy, Japanese Maritime Self Defence Force, Royal Navy and the United States Navy.



The biennial exercise La Perouse is conducted by the French Navy, and is aimed at enhancing maritime domain awareness and optimising maritime coordination amongst the participating navies in the Indo-Pacific Region. The two day exercise provided an opportunity for like minded navies to develop closer links in planning, coordination and information sharing for seamless maritime operations.

Indigenously built guided missile frigate INS Sahyadri and fleet tanker INS Jyoti participated in this edition of the exercise. (Photos: Indian Navy and French Navy)





Maritime Exercise with JMSDF

Continuing with the conduct of Maritime Partnership Exercises (MPX) with Friendly Foreign Countries, INS Sahyadri exercised with Japanese Maritime Self Defence Force (JMSDF) ship JS Suzutsuki, an Akizuki Class Destroyer in the Arabian Sea on 11 March 2023.



Aimed at consolidating their shared commitment to regional and global security challenges, the exercise witnessed cross deck landings by integral helicopters, tactical manoeuvres and a customary steampast by the ships. Indian Navy and JMSDF have been collaborating closely on various fronts and playing a key role in ensuring safety of international maritime trade and working towards global commons.

Exercise Sea Dragon 23



A P8 aircraft of the Indian Navy arrived at Guam, USA on 14 March 2023 to participate in 'Exercise Sea Dragon 23', the third edition of the coordinated multi-lateral ASW exercise for Long Range MR ASW aircraft, conducted by the US Navy. Ex Sea Dragon 23 tested the capabilities of participating aircraft in tracking simulated and live underwater targets, whilst also sharing mutual expertise. The Exercise witnessed representation by an Indian Navy P8I, along with P8A of the US Navy, P1 from the Japanese Maritime Self Defence Force, CP 140 from the Royal Canadian Air Force and P3C from the RoKN.

Algerian Navy Ship El Moutassadi visits Mumbai

Algerian Navy Patrol Ship El Moutassadi visited Mumbai from 13 to 16 March 2023. The ship is commanded by Commandant





Takia Fouad and Colonel Arabi Belhamed, Commander of the Anti-Submarine Division of the Algerian Navy and Senior Officer present onboard. Algerian Navy ships had earlier visited Kochi in 2016. Over the decades, India and Algeria have cooperated in various international forums and initiatives, most notably the Non-Aligned Movement, and supported each other in numerous international events.

More images from Exercise Desert Flag VIII

An Indian Air Force contingent was at Al Dahfra airbase of United Arab Emirates and participated in Exercise Desert Flag VIII which culminated on 17 March 2023.





Photo taken by us from the strategically located office of 'RE Rogers' giving a wonderful view of the lineup. Plus a special thanks to them for always supporting us during these exhibitions!

hat an event! It just seems to get better year after year. We've been attending Aero India since 1993 when it was called "Avia India" only to be renamed "Aero India" for the next edition onwards. From a small show in 1993 to this current edition in 2023, how the platform has grown in terms of exhibitors, aircraft on static/flying display, contracts/MoUs etc! It was fun, hard work and we as a magazine were very busy throughout the event collecting material, taking photographs of hall/stalls, static displays, flying displays and interviewing executives for our ever popular Show Dailies!

Except for two glitches we faced, the rest went off perfectly. Glitch number one was pre-event where IAF personnel/gate personnel were not informed about the protocols for exhibitors, service providers



etc bringing in their laptops and mobile phones during stall setting up times. We were sent counter to counter (all empty) across the venue to get long tedious forms filled in and signed for security clearance. Everyone was clueless to this protocol as it



had never happened in all these years and we wasted hours sweltering in the Bangalore heat. In the end, we were let in after heated arguments (plus everyone else exasperated as well) without any security checks at all. Amazing and absurd! त्मच साथ अ

Glitch number 2: At arrival on the opening day of the event on 13 February, we barely reached our hall/stand at 7:30am before the PM's security decided nobody would roam around etc till the inauguration ceremony was completely over—that meant we were physically barricaded within our hall for 4 hours. This has never happened before. The same rule was true for all halls and exhibitors where no one was allowed out. It felt like a prison. And thanks to being in the temporary 'Yelahanka Prison', we missed the flying display and inaugural ceremony completely. What a pity. Sounds like we're whining but once the show began, it was just superb! All initial irritants were quickly forgotten.

Anyway, the five-day event concluded on 17 February; 13-15 February were business days while 16-17 February were public days to allow people to witness the show. The event comprised a Defence Ministers' Conclave; a CEOs Round Table; Manthan start-up event; Bandhan ceremony; great flying displays; a large exhibition; India Pavilion, media conferences and a trade fair of aerospace companies.

Organised at Air Force Station, Yelahanka in a total area of around 35,000 sqm, the event, the biggest-ever till date, witnessed the participation of 98 countries. The Defence Ministers of 32 countries, Air Chiefs of 29 countries and 73 CEOs of global and Indian OEMs attended the event. Eight hundred and nine (809) defence companies, including MSMEs and start-ups, as well as us, Vayu Aerospace and Defence Review participated.

Some major exhibitors included Airbus, Boeing, Dassault Aviation, Lockheed Martin, Israel Aerospace Industry, Rafael, Elbit, GE, MBDA, Safran, UAC and Rosoboronexport of Russia, BrahMos Aerospace, Army Aviation, SAAB, Safran, Rolls Royce, Thales, Larsen & Toubro, DRDO, Bharat Forge Limited, Hindustan Aeronautics



Surya Kirans and Sarang aerobatic teams performed daily at the event (Photos: VAYU/KSC)



Limited (HAL), Bharat Electronics Limited (BEL), Bharat Dynamics Limited (BDL) and BEML Limited amongst many others. About five lakh plus visitors attended the event physically and many millions more connected through television, social media and internet.

Aero India 2023 showcased design leadership, growth in UAV sector and Defence Space and futuristic technologies. The event aimed to promote export of indigenous air platforms like Light Combat Aircraft (LCA) Tejas, HTT-40, Dornier Light Utility Helicopter (LUH), Light Combat Helicopter (LCH) and Advanced Light Helicopter (ALH). It also integrated domestic MSMEs and start-ups in global supply chain and attract foreign investments including the partnerships for co-development and co-production.

One of our favourite halls, the 'India Pavilion', based on the 'Fixed Wing Platform' theme, showcased India's growth in the area, including the future prospects. There were a total of 115 companies displaying 227 products. It further showcased the growth of India in developing an ecosystem for Fixed Wing platform which included the demonstration of various structural modules, simulators, systems (LRUs) etc of LCA Tejas aircraft being produced by private partners. There was also a section for Defence space, New Technologies and a UAV section which gave an insight about the growth of India in each sector.

A full scale LCA Tejas aircraft in Full Operational Capability (FOC) configuration was at the centre stage of India Pavilion. LCA Tejas is a single engine, light







partnerships with foreign companies, in line with 'Make in India, Make for the World' vision for a secure and prosperous future".

Addressing the gathering, the Prime Minister stated, "Bengaluru sky is bearing testimony to the capabilities of New India. This new height is the reality of New India, today India is touching new heights and transcending them too. Aero India 2023 is a shining example of India's growing capabilities and the presence of around 100 nations at this event shows the trust that the entire world shows in India". He noted the participation of more than 800 exhibitors including Indian MSMEs and startups along with the well-renowned companies of the world. Throwing light on the theme of Aero India 2023 'The Runway to a Billion Opportunities', the Prime Minister expressed that the strength of Aatmanirbhar Bharat kept on growing with each passing day.

The Prime Minister said that India's successes were bearing witness to its capabilities. Tejas, INS Vikrant, advanced manufacturing facilities in Surat and Tumkur were the potential of Aatmanirbhar Bharat with which the world's new alternatives and opportunities were linked. "The new India of the 21st century will neither miss any opportunity nor will it lack any effort", the Prime Minister said as he noted the revolution brought in every sector with the help of reforms. He

weight, highly agile, multi-role supersonic fighter. It has quadruplex digital fly-bywire Flight Control System (FCS) with associated advanced flight control laws. The aircraft with delta wing is designed for 'air combat' and 'offensive air support' with 'reconnaissance' and 'anti-ship' as its secondary roles. Extensive use of advanced composites in the airframe gives a high strength to weight ratio, long fatigue life and low radar signatures.

Prime Minister Mr. Narendra Modi inaugurated the 14th edition of "Asia's biggest aero show Aero India 2023" at Air Force Station, Yelahanka in Bengaluru on 13 February 2023. A commemorative stamp was also released by the Prime Minister on the occasion. According to the organisers, "The five-day event, on the theme 'The runway to a billion opportunities', showcased India's growth in aerospace and defence capabilities. It displayed indigenous equipment/technologies and to forge







underlined that the nation which used to be the largest defence exporter for decades had now started exporting defence equipment to 75 countries in the world.

Referring to the transformation of the defence sector in the last 8-9 years, the Prime Minister said that the aim was to take defence exports from 1.5 billion to 5 billion by 2024-25. "From here India will take rapid strides to be included among the largest defence manufacturing countries and our private sector and investors will play a big role in that", the Prime Minister

stated. He called upon the private sector to invest in the defence sector which would create new opportunities for them in India and in many other countries. "The India of today thinks fast, thinks far and takes quick decisions", Mr. Modi said as he drew the analogy of India in Amrit Kaal to a fighter jet pilot. The Prime Minister said that India was a nation which was not afraid but excited to soar to new heights. India is always rooted however high it flies howsoever is its speed, the Prime Minister stressed.



Belly displays: Rafale, Tejas, Su-30MKI, F-35 and F-16 at Yelahanka (Photos: VAYU/KSC)

In his address, the Defence Minister Mr. Rajnath Singh lauded Prime Minister Narendra Modi for guiding India on the political and economic map of the world and made special mention of his unwavering commitment towards the industrial and economic growth of the country. He described Aero India as an expression of that resolve.

Mr. Rajnath Singh asserted that India had become a promising manufacturing destination due to its business-friendly environment and cost-competitiveness. "India has become the fifth largest economy in the world due to the vision and determination of our Prime Minister. It is well on course to become the third largest economy in the next 4-5 years. India's G-20 presidency this year is also a reflection of India's growing stature on the international platforms," he stated.

The Raksha Mantri also shed light on the growth story of the Indian defence sector, saying that it had come a long way in the last few years and was marching ahead on the path of empowering the nation with full zeal and dedication. He termed Aero India as one of the pillars which had strengthened the defence sector and has given it a new identity.

Mr. Rajnath Singh welcomed the Defence Ministers, Service Chiefs, CEOs, officials and delegates from many countries participating in this 14th edition of Aero India. He appreciated the fact that over 800 exhibitors from India and abroad showcased their products and technologies during the five-day event. He termed the huge participation as a testimony to a new confidence of the domestic and global business community in India's emerging business potential. He called upon the participants to become a part of India's journey towards becoming a defence manufacturing hub.



Assortment of combinations at the Show (Photos: VAYU/KSC)

Defence Ministers' Conclave

Raksha Mantri hosted the Defence Ministers' Conclave on 14 February. Defence Ministers of friendly foreign countries participated in the meeting, which had been organised on the theme 'Shared Prosperity through Enhanced Engagements in Defence (SPEED). The conclave addressed aspects related to deepen cooperation for capacity building (through investments, R&D, joint venture, co-development, co-production and provisioning of defence equipment), training, space, Artificial Intelligence (AI) and maritime security to grow together. The conclave was an opportunity for the defence ministers to engage with each other to carry forward the 'Make in India, Make for the World' vision.

Bilateral meetings

On the sidelines of Aero India 2023, a number of bilateral meetings were held at the levels of Raksha Mantri, Raksha Rajya Mantri, Chief of Defence Staff and Defence Secretary among others. The focus was on bolstering the defence and aerospace ties with friendly countries by exploring newer avenues to take the partnership to the next level.

CEOs Round Table

The 'CEOs Round Table', under the chairmanship of the Raksha Mantri, was held on 13 February on the theme 'Sky is not the limit: opportunities beyond boundaries'. It laid the foundation of a more robust interaction between the Industry Partners and Government with an eye on bolstering the 'Make in India' campaign. It is further expected to increase 'Ease of doing business' in India and provide a favourable platform to Original Equipment Manufacturers (OEMs) for manufacturing in India.

The Round Table witnessed participation from officials, delegates and global CEOs from 26 countries including global investors such as Boeing, Lockheed, Israel Aerospace Industries, General Atomics, Liebherr Group, Raytheon Technologies, Safran, General Authority of Military Industries (GAMI) etc. Domestic PSUs like HAL, BEL, BDL, BEML Limited and Mishra Dhatu Nigam Limited also participated. Premier private defence and aerospace manufacturing companies from India such as Larsen & Toubro, Bharat Forge, Tata's, Dynamatic Technologies, BrahMos Aerospace were also part of the event.

Bandhan ceremony

The Bandhan ceremony, which witnessed signing of Memoranda of Understanding (MoUs)/Agreements, Transfer of Technologies, Product Launches and other major announcements, was held on 15 February and the Raksha Mantri presided over the event. Two hundred and fifty one (251) MoUs, with an expected investment of Rs 80,000 crore, were signed for partnerships between various Indian/foreign defence companies and organisations.



It was hot. Any shade or spot one got was taken immediately (Photo: Vayu)

Manthan

The annual defence innovation event, Manthan, was the flagship technology showcase event that was held on 15 February. Organised by Innovations for Defence Excellence (iDEX), the Manthan platform brought the leading innovators, start-ups, MSMEs, incubators, academia and investors from defence and aerospace ecosystem under one roof. The Raksha Mantri presided over the event. Manthan had many firsts, including launch of challenges on Cyber Security, establishment of iDEX Investor Hub, MoUs with investors etc. Manthan 2023 provided an overview on the future vision/next initiatives of iDEX to galvanise the start-up ecosystem to foster innovation and technology development in the defence sector.



Seminars

A number of seminars were held during the five-day event. The themes included 'Harnessing Potential of Ex-servicemen for Indian Defence Industry; India's Defence Space Initiative: Opportunities for shaping Indian private space ecosystem; Indigenous development of futuristic aerospace technologies, including aero engines; Destination Karnataka: US-India defence cooperation innovation and Make in India; Advancement in maritime surveillance equipment and assets; sustenance in MRO and Obsolescence Mitigation and achieving excellence in defence grade drones and Aatmanirbharta in Aero Armament Sustenance.

All in all a very busy time for everyone connected with Aero India.



Record 75% of defence capital procurement budget for domestic industry in FY 2023-24

A record 75 per cent (approx. Rs one lakh crore) of the defence capital procurement budget has been earmarked for domestic industry in Financial Year (FY) 2023-24, up from 68 per cent in 2022-23. This was announced by Raksha Mantri Rajnath Singh during the Bandhan ceremony of Aero India in Bengaluru. In FY 2023-24, Ministry of Defence (MoD) has been allocated a total Budget of Rs 5.94 lakh crore, which is 13.18 per cent of the total budget (Rs 45.03 lakh crore). Capital outlay pertaining to modernisation and infrastructure development has been increased to Rs 1.63 lakh crore. Mr. Rajnath Singh termed the decision as an unprecedented step taken by the Government at the outset of 'Amrit Kaal' to further strengthen the defence sector and minimise import dependency. "If you take one step, the government promises to take ten steps forward. You spoke of land to run on the path of development. We are providing you full sky. Earmarking threefourth of the capital procurement budget for the local industry is a step in that direction," he stated.



IAF transports at Yelahanka: Il-76, An-32, C-130J and Avro HS-748 (Photos: VAYU/KSC)

Major agreements at Bandhan ceremony

- MoU between Hindustan Aeronautics Limited and Safran Helicopter Engines, France for work share for formation of joint venture for design, development, manufacture and life time support of helicopter engines.
- MoU between Bharat Electronics Ltd and Aeronautical Development Agency on IWBC and other LRUs for Advanced Medium Combat Aircraft (AMCA).
- Co-operation between BSS Material Limited and Pegasus Engineering, an ADUSEA Inc Division (USA) for

Logistic Drones for the Indian Army towards Last Mile Delivery for forward troops deployed along the border areas with capability of operation in wind/ gust condition, rain/snow etc.

- MoU between Gopalan Aerospace India Pvt Ltd and Omnipol, Czech Republic for manufacturing and assembling of 1st passenger aircraft (L 410 UVP-E20 version) by a private company in India.
- MoU on collaboration of Sagar Defence Engineering Private Limited (SDEPL) and Israel Aerospace Industries (IAI) for IDEX Challenge "Autonomous Weaponised Boat Swarm" for Indian Navy.
- MoU between Bharat Dynamics Limited and Bultexpro Ltd, Bulgaria for setting up the manufacturing facilities for 122mm GRAD BM ER and NONER rockets in India and fulfill the requirements (including ToT).
- MoU between GRSE and Rolls-Royce Solutions GmbH (MTU) for license production with localisation of the MTU 16V4000M73L engine to support the indigenous content for the Next Generation Fast Attack Craft vessel for Indian Navy.
- BEML's License Agreement for Transfer of Technology (ToT) with R&DEE, DRDO for development and supply

VAYU

of TRAWL Assembly for T-72/T-90 Tanks.

ToT of Shakti EW System from DLRL DRDO to BEL Hyderabad Unit for all system units, Bill of Material, test procedures, integration and offering methodology.

• MoU between Hindustan Aeronautics Limited and Elta Systems Limited, Israel for cooperation on future business in Maritime Patrol Radar (MPR) for Indian platforms.

Products

• Vertically Launch Short Range Surfaceto-Air Missile (Bharat Dynamics Limited): VLSRSAM is a nextgeneration, ship-based, all-weather, air defence weapon which can be used by Navy as a quick reaction point defence against supersonic sea skimming targets like aircraft and UAVs. The missile has a smokeless propulsion system with all-weather capability. It has a highly agile configuration with state-of-the-art Electronic Counter-Counter Measures features.

- SAL Seeker ATGM for BMP II (Bharat Dynamics Limited): Semi-Active Laser Seeker based Anti-Tank Guided Missile for BMP-II is a subsonic missile with a range of 4,000 metres and flight time of 25 seconds. The missile weighs 23 kgs with the launch tube and can be used in different kinds of terrains to incapacitate the moving and stationary targets such as tanks and Infantry Combat Vehicles.
- Jishnu (Bharat Dynamics Limited): Jishnu, a drone delivered missile, is light weight and miniaturised missile targeted for soft-skinned targets. It has a range of 1.5 km with a flight time of 9 seconds. The missile can be semi-automatic or completely autonomous based on the systems configurations.



Tejas and SKAT Hawks (Photos: MoD)

- Software defined NAVIC/GPS receiver module based on indigenouslydeveloped processors (Astra Microwave Products Limited).
- Indigenously-built 'Counter Drone Radar' based on technology from DRDO (Astra Microwave Products Limited).
- 9 mm sub-sonic ammunition (Munitions India Limited).
- BFT on Ios (ideaForge Technology Limited): "BlueFire Touch our Ground Control Station (GCS) software, is built to plan and command both mapping and surveillance missions with the ability to pre-plan missions based on operational area and target locations via waypoint-based navigation".
- HF SDR Radio (Bharat Electronics Limited): It is an advanced software defined radio. The radio is lightweight 20 W transmit capable radio. It provides a complete solution to the short-range communication requirements in the crowded HF band and long-range communications beyond line of sight.
- Goniometer (Bharat Electronics Limited): It is part of any integrated observation and fire control monitoring system for day time or night time use by artillery.

Mr. Rajnath Singh stated that the MoUs and ToTs completed during Bandhan would pave the way for enhanced FDI in defence and take the manufacturing in the sector to greater heights. He defined Bandhan as not just an agreement between two sides limited to economic benefit, but a new resolution to bolster the nation in the defence domain. He also emphasised that the partnerships forged with friendly countries would take their bilateral collaboration with India to the next level.

The Raksha Mantri stated that Aero India showcased to the world the 'New Defence Sector' of 'New India', which had not only grown in the last few years, but was now fully ready to walk alongside the defence sectors of leading countries. He expressed satisfaction that the event paved the new way to strengthen the Indian defence industry, terming it as the beginning of a new era of 'Aatmanirbharta'. He exuded confidence that the sector would move forward strongly on the path of progress with new energy and determination.

> Article by The Vayu Team with additional inputs from MoD

OINDIA SECTION

American commitment to Indian trade relations strengthens partnership at Aero India 2023



A merican aerospace and defence suppliers presented a broad range of the nation's "most innovative and reliable aerospace and defence solutions", with the intent of gaining a stronger foothold across the region's growing aerospace market at Aero India 2023 in Bengaluru.

As reported by the International Trade Administration (ITA), India's aviation sector holds great potential for US companies. By 2024, the domestic aviation market in India is expected to grow to \$30 billion, making it the third largest globally. In addition to this, India has the third largest armed forces in the world, and are amongst the largest military spenders (\$76.6 billion) with plans to spend billions of dollars on defence articles over the next several years.

Fourteen of America's leading manufacturers and suppliers, many with proven operating partnerships already in-country, exhibited within the USA Partnership Pavilion, the centerpiece of the national effort, organised by Kallman Worldwide, Inc, in coordination with numerous government agencies, including the departments of Commerce, Defence, and State. Entering its 60th year in 2023, Kallman Worldwide represented the North American presence at the show as returning advocates for global trade. With over 30 years of experience in the aerospace industry, their industry and show knowledge far exceed that of any other American pavilion organisers.

The group included three companies, Astronautics Corporation of America, Jonal Laboratories, Inc and United Performance Metals, who were new to show and Jonal Laboratories, Inc, completely new to market. Along with representation from nine states – California, Illinois, Virginia, Connecticut, Florida, New Jersey, Ohio, Texas and Wisconsin, the capabilities of these exhibitors ranged from airframes and engines to materials and components. The USA Partnership Pavilion presented a wellestablished destination for buyers looking for an efficient way to meet a critical mass of leading suppliers, an on-site business centre for US exhibitors looking to maximise their exposure and impact at the event, and a networking forum for all to share ideas and insights.

A comprehensive list of US Exhibitors, their capabilities, products, and services can be found at Sourcehere.com – the Official Digital Directory of the USA Partnership Pavilion and number one online platform for aerospace companies and professionals. "Six decades of experience has taught us that global trade is a year-long conversation punctuated by events. For Kallman Worldwide, the yearlong conversations take place on www.sourcehere.com where international buyers and suppliers come together on an online marketplace designed



to facilitate connections and sales 365/24/7. It's the perfect tool for sourcing products, companies, agents, and services and will power onsite connections in the USA Partnership Pavilion at Aero India 2023."

US global leader, Lockheed Martin, featured heavily at this year's show, presenting

amongst the most innovative capabilities on offer to the Indian Armed Forces including the F-21 fighter aircraft, C-130J transport aircraft, MH-60R "Romeo" multi-mission helicopter, Javelin Weapon System and S-92 multirole helicopter. "We are excited to participate at Aero India 2023 to showcase



William (Bill) Blair, chief executive, Lockheed Martin India Pvt Ltd



our advanced capabilities and address our customers' biggest challenges for the 21st Century. Our participation will be focused on engaging with our customers while creating opportunities for the local industry to feed into the global supply chain and manufacture in India, for India and for the world," stated William (Bill) Blair, chief executive, Lockheed Martin India Private Limited. "We continue to strengthen and grow our presence and partnerships in India for strategic security and greater self-reliance in the defence sector. We have a high degree of confidence in the manufacturing and technical capabilities of the Indian industry which is reflected through our two joint ventures and multiple associations with public and private companies of all sizes including MSMEs."

The prime attraction at the Lockheed Martin booth was the F-21 fighter aircraft cockpit demonstrator that was available for defence and aerospace customers and partners to "fly" the jet for themselves. The F-21 fighter aircraft, which is on offer to the Indian Air Force (IAF) for the Multi-Role Fighter Aircraft competition, is configured with the latest sensors and mission avionic systems that couple onboard and off-board data information into an effective, easy to manage combat situation display.

The return of B-1B Lancer

On 14 February, the United States Air Force (USAF) expanded its lineup for Aero India 2023 with the arrival of two B-1B Lancers after a journey to India from their temporary duty location at Andersen Air Force Base, Guam.



The B-1B Lancer, a supersonic heavy bomber, is capable of carrying out missions worldwide from its bases in the United States, as well as from forward commanders. Greater integration with our Allies and partners throughout the region is a positive step towards greater interoperability."



Rear Admiral Michael Baker, Senior Defence Official and Defence Attaché at the US Embassy in New Delhi, stated, "We are happy to have the B1 in India for the second time. These bombers made the journey from South Dakota to Guam and then to India just to add another exciting dimension to Aero India 2023. It's a long mission to travel from the continental US to the Indian Ocean; but it was worth it to be part of the biggest air show in the region hosted by our Major Defence Partner, India. The US and India continue to deepen defence cooperation. We have two great militaries that are even better when we work together."

deployed locations. It carries the largest conventional payload of both guided and unguided weapons in the US Air Force and is considered the backbone of America's long-range bomber force.

In a historic moment for US and Indian aviation enthusiasts, on 3 February 2021, the B-1B landed in India for the first time and conducted a fly-by on the inaugural day of Aero India 2021, escorted by an Indian Air Force Tejas fighter. Commonly called the "Bone" (for "B-one"), the return of the longrange, supersonic, heavy bomber to India to participate in Aero India 2023 underscores the importance the United States places on the growing strategic partnership with India. Major General Julian C. Cheater, Assistant Deputy Under Secretary of the Air Force, International Affairs, stated, "The B-1 offers flexible options to senior leaders and combatant







The array of US aircraft participating at Aero India 2023 showed US support for Aero India 2023 and the strength of the US-India partnership. In addition to the B-1s, the US lineup included the US Air Force's newest fifth-generation fighters – the stealthy, supersonic, multirole F-35A Lightning II and F-35A Joint Strike Fighter. Throughout the week, an F-16 Fighting Falcon duo conducted daily aerial demonstrations, showcasing the capability of one of the USAF's leading fighter jets. The US Navy F/A-18E and F/A-18F Super Hornet multirole fighters were also on static display at Yelahanka Air Force Base in Bengaluru.

USA headlines Yelahanka with largest-ever delegation

US Embassy Chargé d'Affaires Ambassador Elizabeth Jones led the largest-ever US delegation to Aero India in Bengaluru. "It is an honour to lead the largest-ever US delegation to Aero India to showcase the world-class equipment, training, capability and interoperability the US industry and military offer. As India modernises its defence capabilities, certainly we want to be the partner of choice. We are increasingly focused on mutually beneficial

Lightning at Yelahanka



The F-35A took Yelahanka by storm as the Lightning II flew at 'Aero India 2023' like a blue steak. This also marked the first flight of any fifth generation fighter jet in the Indian sky. Lockheed Martin reportedly brought two F-35s this Aero India; one for static display and



another for flying. The aerospace and defence company has already pitched F-21 for MRFA requirement for the IAF and leaving no stone unturned to win the contact. The astonishing flying display of F-35 raises the question if it will now be pitched. However, without any official statement one can just wonder.

(By Sankalan Chattopadhyay)

co-production and co-development partnerships. We see India as an indispensable partner for a safer, more prosperous, more open, and freer Indo-Pacific region," stated Ambassador Jones.



GE Aerospace at Aero India 2023 GE Aerospace selected by Air India

ir India, part of Tata Sons, signed a firm order for 40 GEnx-1B and 20 GE9X engines, plus a multi-year TrueChoice engine services agreement. The deal was signed in coordination with the airline's firm order for 20 Boeing 787 and 10 Boeing 777X aircraft. "All of us at Tata Group and Air India are forward to working together to introduce these engines into Air India's fleet and are committed to ensuring they deliver exceptional performance."

GE Aerospace has powered Air India since 1982, when the airline took delivery of its first CF6-powered Airbus A300. The airline currently operates a fleet of more "This order for GE Aerospace engines supports our Vihaan AI transformation plan, a key part of which is to dramatically expand our fleet and global network," stated Campbell Wilson, CEO & Managing Director of Air India. "We are confident that these engines will deliver the reliability and efficiency we need, and we are delighted



delighted to have this partnership with GE Aerospace, where we will build Air India to be a world class airline and one of the most technology-advanced airlines," stated Mr. N. Chandrasekaran, Chairman of Tata Sons and Air India.

"We are proud to continue our longstanding partnership with Tata Group and Air India," stated H. Lawrence Culp, Jr., Chairman and Chief Executive Officer of GE and CEO of GE Aerospace. "We look than 150 aircraft, including GE90-powered Boeing 777s and GEnx-powered Boeing 787s. Air India also announced a CFM order for more than 800 LEAP engines, the largest LEAP order ever, to power its entire narrowbody purchase of 210 Airbus A320/ A321neo aircraft and 190 Boeing 737 MAXfamily aircraft. The announcement includes a multi-year CFM services agreement. CFM is a 50/50 joint business between GE and Safran Aircraft Engines.



to continue our longstanding relationship with GE."

"Over the last decade, we have introduced a new portfolio of commercial engines that are significantly more fuel efficient, quieter, and emit less CO₂," stated Russell Stokes, President and CEO, Commercial Engines and Services for GE Aerospace. "This record order reflects our strong product renewal and our customer's continued confidence in our engines."

Like all GE and CFM engines, the GEnx, GE9X and LEAP are compatible with all approved Sustainable Aviation Fuel (SAF) blends.

GE Aerospace also provides multiple systems for the Boeing 777X. This includes the Enhanced Airborne Flight Recorder (EAFR), the Electrical Load Management



System (ELMS) and the Backup Generator, Backup Converter (BUG/BUC) and the Common Core System (CCS). The CCS is often referred to as the "central nervous system and brain" of the airplane and hosts the aircraft's avionics and utilities functions, eliminating several boxes and reducing hundreds of pounds of wire. GE Aerospace also supplies the CCS and EAFR for the Boeing 787.

GE Aerospace has been operating in India for over four decades with wide engagement in the industry including engines, avionics, services, engineering, manufacturing, and local sourcing.

Engineers at the John F. Welch Technology Centre (JFWTC) in Bangalore, India, GE's research and development centre, have played a key role in the technology development of the GE9X, GEnx, and CFM LEAP engines by providing analysis and test validation support. The centre has close to 1,000 engineers working to support next-gen technologies to reduce CO_2 emissions.

GE Marine and HAL in MoU

GE Marine and Hindustan Aeronautics Limited signed a Memorandum of Understanding to explore the expansion of HAL's manufacturing capabilities to include assembly, inspection, and testing (AIT) of the LM500 marine gas turbine. Since 1986, HAL's IMGT Division has been providing AIT of GE's LM2500 marine gas turbine, which is installed aboard Indian Navy's P-17, P-17A, and IAC-1 vessels. The LM2500 is a marine gas turbine and is derived from GE's TF39 and CF6-6 aircraft engines. As on date, HAL has delivered 22 LM2500 gas turbines for 11 Indian naval vessels.

"Based on HAL's outstanding performance of LM2500 AIT, coupled with GE Marine's continued commitment to the Indian Navy and Make-In-India initiatives, the MoU will explore allowing HAL to perform AIT for GE's LM500 marine gas turbine for use in an indigenous 4 megawatt gas turbine generator for possible installation aboard future Indian naval vessels. The LM500 is derived from GE's CF34 aircraft engine and is installed globally in naval applications for both mechanical propulsion and power generation", stated company officials.

"GE has been our valued partner for more than three decades working together supporting Indian Navy fleets including India's first Indigenous Aircraft Carrier by delivering LM2500 Gas Turbines. We are happy to see that the partnership is now at the inflection point of growth, with LM500 Gas Turbine in 4 MW category. Further, HAL and GE are working to enhance the indigenous content in both the LM2500 and LM500 projects in line with the Government's policy of 'Make in India'



and "Atmanirbhar Bharat'," stated Mr. C B Anathakrishnan, CMD HAL.

"GE Marine is pleased to have HAL as a trusted partner in India. For over 35 years, GE and HAL have worked together to support the Indian Navy, and this MOU is the next step in demonstrating our commitment. As we look ahead at the Navy's future surface combatants, the LM500 is extremely well suited to provide the power generation needed for the next generation of Indian surface combatants," stated Mark Musheno, Vice President, Sales and Marketing, GE Marine.

The MoU was exchanged between Mr. Youngje Kim, Vice President – Indo Pacific GE Aviation Military Systems, and Mr. B. Krishna Kumar, Executive Director (Engines & IMGT), HAL in the presence of Mr. Mihir Kanti Mishra, CEO (Bangalore Complex) HAL.

GE digital solutions for LM2500 gas turbines for IN's new IAC-1

GE's local subsidiary in India is under contract with Cochin Shipyard Limited to provide a comprehensive digital solutions package to enhance the capabilities of the LM2500 marine gas turbines that power the Indian Navy's IAC-1 Vikrant, which was commissioned in August 2022.

Included in this digital solutions suite is GE's SmartSignal solution, which will provide the Navy with early indications of equipment conditions that could cause engine damage and lead to unplanned losses. These early indications can help the Navy be more effective while reducing operational risk. With GE's proprietary predictive analytics technology that is built into the shore-based "digital twin" of the Vikrant's gas turbine engine, the Navy will be able to move toward a truly predictive mode of operation as it relates to its gas turbine propulsion.

With a GE gas turbine, navies have worldwide support whether onshore or at sea, and interoperability benefits with other allied ships. GE has delivered gas turbines onboard 633 naval ships worldwide and provides 95% of the commissioned propulsion gas turbines in the United States Navy fleet. With GE's split casing compressor and power turbine design, insitu maintenance is allowed, often making a gas turbine removal unnecessary; navies save millions of dollars a year and weeks/ months of ship unavailability.

Boeing at Yelahanka

Boeing commits to growing local industry at Aero India



oeing focused its presence at Aero India 2023 on investments in growing local services and capabilities, workforce development and partnerships in support India's Aatmanirbhar Bharat vision. A key strategic goal for Boeing in India is to strengthen and leverage local talent and its growing network of more than 300 supplier partners. "The Indian aerospace and defence industry is poised for growth and offers significant opportunities for Boeing with our proven portfolio of products and services," stated Salil Gupte, President, Boeing India. "Boeing is committed to supporting and enabling this progress with a vision to bring the best of Boeing to India and take the best of India to the world."

Boeing's exhibit at Hall A, USA Pavilion was built around the theme of "The Runway to a Billion Opportunities," highlighting local partnerships and investments in India. The exhibit also featured a range of advanced products including the F/A-18 Super Hornet, P-8I, CH-47 Chinook, 737, 787 Dreamliner and 777X. Visitors were able to experience the AH-64 Apache simulator and learn more the combat helicopter's capabilities and a wide range of missions.



During the show Boeing met with customers and industry partners to discuss India's future aviation, defence, and security requirements, focusing on in-country manufacturing, leveraging engineering and research talent, and strengthening local partnerships, technologies, services, worldclass sustainment, and training capabilities. The joint venture between Boeing and Tata Advanced Systems Limited (TASL), Tata Boeing Aerospace Limited (TBAL) recently delivered the first fuselage for six AH-64 Apache attack helicopters ordered by the Indian Army from its state-ofthe-art facility in Hyderabad. TBAL has produced and supplied Boeing's Apache final assembly plant in Mesa, Arizona with over 190 fuselages.

Boeing is expanding its support for local customers in India by establishing an ecosystem of comprehensive support packages and indigenous maintenance, repair and overhaul (MRO) capabilities with partners through the Boeing India Repair Development and Sustainment (BIRDS) programme. This all forms part of Boeing's commitment to Make in India and Aatmanirbhar Bharat.

India presently operates 11 C-17s, 22 AH-64 Apaches (with six more on order), 15 CH-47 Chinooks, 12 P-8Is, three VVIP aircraft, and two Head of State aircraft. In



addition, more than 150 Boeing airplanes, including the Next-Generation 737, 737 MAX, 757, 777, and 787 Dreamliner, are operated by India's leading commercial airlines.

TBAL ships first vertical fin structure for Boeing 737

Tata Boeing Aerospace Limited (TBAL) shipped the first vertical fin structure for the Boeing 737 aircraft from its facility in Hyderabad. The vertical fin will be delivered to the Boeing manufacturing facility in Renton, WA, for integration into the final Boeing 737 aircraft. In 2021, TBAL added a new production line to manufacture complex vertical fin structures for the 737 family of airplanes. The expansion marked a significant milestone for the joint venture. It also created additional employment opportunities while enabling skill development.

"Tata Boeing Aerospace Limited is an example of Boeing's commitment towards co-development of integrated systems in aerospace and defence in India for the world, and a reflection of the country's Aatmanirbhar Bharat capabilities. The speed and quality with which the first vertical fin has been manufactured is a testament to TBAL's skilled workforce, engineering talent, and world-class manufacturing prowess." stated Salil Gupte, President, Boeing India.

A vertical fin is a vertical stabilising surface mounted on the tail of an aircraft, providing stability and control in yaw, or the movement of the aircraft from side to side, preventing side-slip, and maintaining a straight and level flight. The new production line utilises cutting-edge robotics, automation, and advanced aerospace concepts like full scale determinant assembly in its manufacturing processes. Spread over 14,000 square meters, the joint venture between Boeing and Tata Advanced systems Limited (TASL) employs over 900 engineers and technicians.

Air India selects up to 290 Boeing jets

Boeing and Air India announced the carrier had selected Boeing's family of airplanes to expand its future fleet with plans to invest in 190 737 MAX, 20 787 Dreamliner and 10 777X airplanes. Along with a comprehensive set of aviation services, Air India is advancing its fleet strategy to sustainably address South Asia's rapidly growing market for domestic and international air travel.

The agreement between Boeing and Air India includes options for 50 additional the strength of the domestic market, which has recovered to 98% of pre-pandemic levels, India's traffic has transitioned from recovery to growth. As a result, Indian airlines will add 7% more supply in the first half of 2023, compared to 2019. Due to the rapid growth of its domestic traffic, Boeing forecasts that 90% of new airplane deliveries to India will be for single-aisle airplanes like the 737 MAX over the next 20 years. India will require approximately 2,210 new airplanes over the next two decades of which 1,983 units will be for single-aisle jets, while



737 MAXs and 20 787-9s. When finalised, this will be the largest Boeing order in South Asia and a historic milestone in the aerospace company's nearly 90-year partnership with the carrier.

Boeing: India passenger traffic transitions to growth

Boeing unveiled its Commercial Market Outlook (CMO) for India, forecasting longterm passenger growth rate of nearly 7% annually through 2041. Largely driven by 227 units or 10% of new airplane deliveries will be for widebody airplanes.

In addition, the India cargo market will also continue to expand over the next two decades to meet demand. The cargo fleet will grow from about 15 airplanes today to about 80 airplanes by 2041. These will predominantly be the converted narrowbody sized aircraft to support domestic and regional growth, as well as a number of production and conversion widebody freighters to support global operations.



BrahMos at Aero India 2023



A high-level delegation from Saudi Arabia headed by Major General Pilot Abdulla I Al-Ghamdi visited BrahMos pavilion on Day 1 of Aero India 2023. Mr. Atul D Rane, DG, BrahMos, DRDO and CEO & MD of BrahMos Aerospace apprised the Saudi Arabia delegation about the Brahmos Weapon System.



Mr. Boris Obnosov, Director General of Tactical Missiles Corporation, Russia was apprised about the Brahmos missile system by Mr. Alexander Maksichev, JMD of BrahMos Aerospace on the inaugural day of Aero India 2023 at the BrahMos pavillion.



Mr. Rajnath Singh, Defence Minister of India on 13 February 2023 released the 12th edition of global military compendium 'Brahmand World Defence Update 2023' at BrahMos Aerospace pavilion during the inaugural day of Aero India 2023 in Bengaluru, Karnataka. The yearbook was released in the presence of Mr. Atul Dinkar Rane, OS & DG (BrahMos), DRDO and CEO & MD of BrahMos Aerospace, Dr. Sanjeev Kumar Joshi, Dy CEO of BrahMos Aerospace and Praveen Pathak, Director (Mkt. Prom & Export).



Mr. Vladimir Drozhov, Deputy Director, Federal Service for Military-Technical Cooperation (FSMTC), Russia, visited BrahMos pavilion during the 2nd day of Aero India 2023. Mr. Drozhov interacted with Mr. Atul D Rane, CEO & MD of BrahMos Aerospace and discussed the latest progress made by the India-Russia JV entity.



Dr G. Satheesh Reddy, Scientific Advisor to Raksha Mantri, (SA to RM), visited BrahMos Aerospace pavilion during the 2nd day of Aero India 2023 and interacted with Mr. Atul D Rane, CEO & MD of BrahMos, Dr. Sanjeev Kumar Joshi, Dy CEO of BrahMos and other senior officials. Dr. Reddy also released the 'Silver Jubilee' edition of Brahmastra in-house BAPL magazine which highlights BrahMos JV's 25 years of illustrious journey.



BrahMos Aerospace showcased the Brahmos missile in various configurations, including the land-based weapon complex, ship-based weapon complex, underwater version and air-version with Su-30MKI aircraft along with the Brahmos airborne launcher and equipment including systems and sub-systems manufactured by various industries associated with BrahMos.



HMO

A high-level delegation from Kazakhstan, including Col. Talgat Syzdykov, Deputy Commander of the Air Defence Forces of Kazakhstan, interacted with Mr. Atul Dinkar Rane, CEO & MD of BrahMos at BrahMos pavilion on the inaugural day of Aero India 2023.



General Anil Chauhan, Chief of Defence Staff (CDS) of the Indian Armed Forces, was briefed by CEO & MD of BrahMos Aerospace and Dr. Sanjeev Kumar Joshi, Dy CEO of BrahMos about the recent accomplishments of the successful BrahMos Joint Venture and the "invincible prowess" of the Brahmos weapon system which has strengthened the firepower of the Indian Armed Forces.



Deputy Chief of the Air Staff, Air Marshal Narmadeshwar Tiwari visited the BrahMos Aerospace pavilion during Aero India airshow in Bengaluru on 15th Feb 2023. CEO and MD, BrahMos Aerospace, briefed the DCOAS, IAF about the Brahmos weapon system and its achievements.



Raksha Rajya Mantri, Mr. Ajay Bhatt visited the BrahMos pavilion. He was briefed by Mr. Atul Dinkar Rane, OS & DG (BrahMos), DRDO and CEO & MD of BrahMos Aerospace about the latest advancements achieved by Brahmos missile system.





Raksha Rajya Mantri, Mr. Ajay Bhatt visited the BrahMos pavilion. He was briefed by Mr. Atul Dinkar Rane, OS & DG (BrahMos), DRDO and CEO & MD of BrahMos Aerospace about the latest advancements achieved by Brahmos missile system.



Major General (Retd.) Tarique Ahmed Siddique, Security Advisor to the Prime Minister of Bangladesh in conversation with Mr. Atul Dinkar Rane, CEO & MD of BrahMos and Dr. Sanjeev Kumar Joshi, Dy CEO of BrahMos Aerospace.



Lt. Gen. JB Chaudhari, Deputy Chief of Army Staff, Indian Army visited BrahMos pavilion on the inaugural day of Aero India 2023.



General Manoj Pande, Chief of the Army Staff of the Indian Army visited the BrahMos pavilion during 2nd day of Aero India 2023 and interacted with Mr. Atul Dinkar Rane, OS & DG (BrahMos), DRDO and CEO & MD of BrahMos Aerospace, Dr. Sanjeev Kumar Joshi, Dy CEO of BrahMos Aerospace and Praveen Pathak, Director (Mkt. Prom & Export) about the latest developments incorporated in the Brahmos supersonic cruise missile system.

Safran and HAL partnership for the IMRH helicopter engine



■afran Helicopter Engines and Hindustan Aeronautics Limited (HAL) signed a workshare agreement for the joint development of the engine intended for the future 13-ton IMRH (Indian Multi-Role Helicopter) and its naval version DBMRH (Deck Based Multi-Role Helicopter). This agreement follows the MoU (Memorandum of Understanding) signed on 8 July 2022 and stipulates the sharing of activities within the joint venture where both parties have agreed on an equivalent repartition. In particular, HAL will take part in the design, development, and production of some of the core engine components, which is a breakthrough achievement in terms of expertise and knowhow in the country.

This workshare agreement was signed by Mr. Florent Chauvancy, Safran Helicopter Engines EVP Sales and Marketing, and Mr. K Ramesh, General Manager, HAL Aero Engine Research and Design Centre, in presence of Mr. C. B. Ananthakrishnan, CMD, HAL and Mr. Franck Saudo, CEO, Safran Helicopter Engines.

The development of the IMRH helicopter continues, and a 1/3 scale model was displayed by HAL at Aero India 2023. Discussions are also continuing with the



Indian Armed Forces on the operational requirements for this new helicopter. Availability of an indigenous engine will enhance the self-reliance content on the platform and demonstrates the commitment of both Safran Helicopter Engines and HAL to the Indian Government's vision of "Atmanirbhar Bharat", or achieving selfreliance particularly in defence technologies.

Mr. C. B. Ananthakrishnan, stated, "The joint development of high power engine is a new milestone in HALs evergrowing capabilities in the sector with a competent partner like Safran Helicopter Engines. We are confident of making the engine meet the highly stringent and demanding requirements of Indian defence customers".

Mr. Franck Saudo, commented, "We are very proud to be associated with such an important programme of the Indian MoD and very happy to once again support HAL, our partner for decades. While this programme will bring many advanced technologies to the Indian aerospace ecosystem and to HAL, it will also provide the Indian Armed Forces with state-of- theart solutions".

Safran and HAL will continue to work on the development of this joint venture in the coming months, which is intended not only to develop an engine for the IMRH,





but also for other helicopters. Both partners also agreed on the condition for the transfer right to HAL for manufacturing of seven critical forging and casting raw parts, for further enhancement of indigenous content in Shakti engine of Dhruv and Light Combat Helicopter (LCH) programmes.

Air India orders 800+ CFM (GE/ Safran) LEAP engines

Air India and CFM International signed an agreement for the largest ever CFM LEAP engine order. CFM will exclusively power the airline's newly announced fleet of 210



Airbus A320/A321neo and 190 Boeing 737 MAX family aircraft. Air India's firm order for 800 LEAP engines includes 420 LEAP-1A, 380 LEAP-1B, plus spares. Air India also signed a CFM services contract.

"CFM has been a longstanding partner of Air India, and we are delighted to take it to a higher level with this significant order for new engines. They will help power a key part of Vihaan.AI, Air India's



comprehensive transformation plan, by dramatically expanding our fleet and global network," stated Campbell Wilson, CEO and MD of Air India.

Air India has been a CFM customer since 2002, when the airline began operating Airbus A320ceo aircraft powered by CFM56-5B engines. In 2017, Air India began operating A320neos, becoming the first LEAP-1A powered operator in India.

"We are very honoured by Air India's renewed trust in CFM," stated Olivier Andriès, chief executive officer of CFM parent company Safran. "This historic order is enabling Air India to sustain continued growth and play an important role in the economic development of India. Through our current and future facilities as well as local partnerships, we are fully committed to supporting production and aftermarket activities of the LEAP engine in India."

The LEAP engine family has achieved one of the fastest accumulations of flight hours in commercial aviation history, amassing more than 27 million engine flight hours and 11 million flight cycles. LEAP operators are reporting more than 15 percent improvement in fuel efficiency and CO2 emissions compared to the latest production of CFM56 engines, resulting in an average of more than 17 million tons of CO2 emissions reductions. CFM is supporting industry initiatives to approve and adopt 100% Sustainable Aviation Fuel (SAF). LEAP engines are compatible with currently approved 50% SAF blends and have successfully flown multiple demonstration flights with 100% SAF.

HAL and Aero India

HAL displays unique Aatmanirbhar formation, showcases HLFT-42

As part of Aero India 2023, HAL displayed a unique 'Aatmanirbhar Formation' flight of 15 helicopters consisting of all variants of Advanced Light Helicopter (ALH), 'Prachand' Light Combat Helicopter, and Light Utility Helicopter (LUH). The fixed wing front witnessed LCA twin seater







variant, Hawk-i, Intermediate Jet Trainer (IJT) and Hindustan Turbo Trainer (HTT)-40 aircraft.

HAL also showcased its full spectrum training capabilities and display for the first time, the scale model of Hindustan Lead in Fighter Trainer (HLFT)-42. HLFT-42 is the 'Next Gen Supersonic Trainer' that will play a critical role in modern combat aircraft training with state-of-the-art avionics like Active Electronically Scanned Array (AESA), Electronic Warfare (EW) Suite, Infrared Search and Track (IRST) with Fly by Wire control (FBW) system.



HAL's major attraction at its indoor pavilion was the scale model of Indian Multi Role Helicopter (IMRH), Next generation HLFT-42 and models of LCA Mk 2, Hindustan Turbo-shaft Engine-1200, RUAV, LCA Trainer, Hindustan-228 etc. The outdoor display adjacent to HAL stall featured Rotary wing products LUH and ALH Medical Intensive Care Unit (MICU) variant.

The ALH, Dornier, Hawk-i, HTT-40 were also on static display. In addition, civil certified Do-228 was showcased for utilisation in commercial flying sector.

The central theme of the India Pavilion was Fixed Wing platform. An actual LCA-Tejas in FOC configuration was the centre piece along with various associated structural modules, simulators, systems (LRUs) etc. being produced by private partners. There were also sections for Def space, new technologies and UAVs which gave an insight about the growth in each sector.

HAL promoted indigenously-built platforms to visiting defence delegations and held business meetings with OEMs and customers besides signing agreements

VAYU



and contracts with its business partners for various projects. Customer demonstration flights were also organised on various platforms.

HAL hands over ALH to Mauritius

HAL handed over an Advanced Light Helicopter (ALH) to the Government of Mauritius at Helicopter Division. Mr Nikhil Dwivedi, General Manager, Helicopter Division handed over the Certificate to Mr A K Dip, Commissioner of Police, Mauritius Police Force (MPF) in the presence of Mr E P Jayadeva, Director (Operations), HAL, Mr S Anbuvelan, CEO (HC) and others. Speaking on the occasion, Mr. Jayadeva stated, "HAL has handed over the helicopter way ahead of schedule. This order is in line with the Govt of India's vision to boost defence exports to Friendly Foreign Countries. The handing over of export helicopter has further bolstered the ties between both countries. The ALH Mk III helicopter will meet the operational requirements of Mauritius Police Force. The helicopter with its state of the art equipment will further enhance the operational requirements of MPF".

HAL had signed a contract with Govt of Republic of Mauritius in January 2022 for export of one ALH Mk III to Mauritius Police Force. ALH Mk III is a multi-role,



multi-mission versatile helicopter in 5.5 tonne category. It has proven its mettle in various utility roles, including numerous lifesaving missions during natural calamities in India and abroad. More than 335 ALH have been produced till date logging a cumulative of more than 3,75,000 flying hours.

Big milestone for HAL and Safran HE

HAL handed over the 500th indigenously manufactured Shakti engine to the Indian Army on 1 February 2023. The Shakti 1H1 engine was co-developed by Safran HE, France and HAL and has been designed to provide additional thrust to the Advanced Light Helicopter to enhance the operational envelope from 3 km to 5 km altitude. A de-rated version of Shakti1H1 engine (Shakti1U engine) will power the Light Utility Helicopter.







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HAL and Safran partnership for the IMRH engine



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HAL's MRO support for MQ-9B RPA

Hindustan Aeronautics Limited (HAL) and General Atomics Aeronautical Systems Incorporated (GA-ASI) jointly announced that turbo-propeller engines which power the MQ-9B Guardian High Altitude Long Endurance (HALE) Remotely Piloted Aircraft System (RPAS) will be supported by the HAL Engine Division at Bengaluru for the Indian market.

"HAL has been manufacturing and providing MRO support for TPE 331-5 engines for the last 40 years. We are also establishing facilities for manufacturing TPE 331-12B engines for HTT-40 project. The engine used on the MQ-9B RPAS belongs to the same family of engines with upgraded configuration to adapt to the RPAS technology. I am glad, that HAL Engine Division, Bangalore would be providing MRO support to



the engine for MQ-9B RPAS, one of the most sophisticated equipment in the world" stated Mr. C.B. Ananthakrishnan, Chairman and Managing Director, HAL.

"GA-ASI is proud to collaborate with HAL on this prestigious project", stated Dr. Vivek Lall, Chief Executive, General Atomics Global Corporation. "HAL is the foremost Indian public sector Aerospace and Defence agency, and its vast experience in the domain of aero-engine technology makes it our natural partner in India." Though the turboprop engine fitted onboard the MQ-9B HALE RPAS looks similar to other commercial engines in its category, it is unique in its configuration and operation, requiring special training and equipment to maintain, repair and overhaul.

HAL MoU with Response Plus Holding PJSC

HAL signed a Memorandum of Understanding (MOU) with Response Plus Holding PJSC (RPM), a leading healthcare provider of emergency medical services, remote healthcare services and occupational health solutions in the United





Arab Emirates. According to the terms of the agreement, RPM and HAL will explore new opportunities for cooperation in the areas of Emergency Medical Services, Medical Evacuation, Helicopter Emergency Medical Services and other mutually-beneficial fields in India, the Gulf region and the MENA Region. The Response Plus Holding PJSC is of the largest integrated private health care service providers in the Middle East and beyond, with a leading presence in the UAE, India, Oman, Saudi Arabia, Egypt, Nigeria and other GCC countries.

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HAL ITSO for indigenous CVR and FDR



HAL received ITSO authorisation from Directorate General of Civil Aviation (DGCA) for its indigenously developed Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR) during Aero India 2023. The Indian Technical Standard Order (ITSO) is a minimum performance standard for specified materials, parts, processes, and appliances used on civil aircraft. The Cockpit Voice Recorder (CVR) and the Flight Data Recorder (FDR) are popularly known as 'black boxes', however these recorders are painted in orange colour to help in their recovery following an aircraft accident. The CVR and FDR are used to record critical flight parameters and audio environment in a crash proof memory which is later used for investigation of aircraft incident or accident.

HAL and Argentinian Air Force sign contract



HAL signed a contract with Argentinian Air Force (AAF) for supply of spares and engine repair of legacy two tonne class helicopters. The contract was signed by Brigadier General Xavier Issac, Chief of Air Force, AAF and Mr C B Ananthakrishnan, CMD, HAL.

Brigadier General Xavier Issac said the contract for support service was a stepping stone for the future engagements and defence co-operation between India and Argentina. Mr Ananthakrishnan said this contract would further pave the way for giving new impetus for defence exports in the Latin American region. HAL has been supporting the Indian Defence Services and will extend all the support to the AAF too.

HAL and IN release photo essay on RD-33MK ROH

Admiral R Harikumar, Chief of Naval Staff and Mr C B Ananthakrishnan, CMD, HAL released a Photo Essay, compiled by HAL, on RD 33MK ROH project without ToT during Aero India 2023. The Indian Navy is operating MiG-29K aircraft which is powered by Russian origin RD-33MK aero engines. Presently, the country does not have Transfer of Technology (ToT) for Repair and Overhaul (ROH) of engines and hence maintaining serviceability of aircraft is a challenging task.

Genesys Aerosystems cockpit upgrade certified for HAL H-228

Genesys Aerosystems, a Moog Inc. company, announced that it has completed





certification of its Genesys Avionics Suite cockpit upgrade for the Hindustan-228 aircraft. The 19 seat HAL Hindustan-228 aircraft is a versatile multi-purpose light transport aircraft. It has been developed specifically to meet the requirements of utility and commuter transport, third level services, air-taxi operations, plus coast guard and maritime surveillance missions. With the cockpit upgrade completion, aircraft operators will immediately benefit from improvements in mission capabilities and reliability. The cockpit upgrade also provides for improved long-term product support for the aircraft fleet. The Genesys Avionics Suite provides renewed operational life to aircraft through a complete, comprehensive, and affordable cockpit system upgrade to existing fixedwing and helicopter aircraft.

DGCA approves modification for H-228 with 19 passengers

A new variant of HAL aircraft 'Hindustan 228-201 LW' has been approved by the DGCA. This variant has maximum takeoff weight of 5695 kgs with 19 passenger capability. With this modification, the aircraft would fall in the Sub 5700 kg aircraft category. This variant provides several operational benefits for operators such as reduced pilot qualification requirement enabling pilots with Commercial Pilot License to fly the aircraft, enhanced availability of pilot pool for the aircraft and reduced operational cost. In addition, the new variant will result in reduced training requirement for flying and ground crew including aircraft maintenance engineers. HAL also has approval for 6200 kgs AUW with 19 passenger capability.



The world of HAL helicopters



ALH Dhruv - Indian Air Force



ALH Dhruw - Indian Navy





ALH Dhruv - Indian Coast Guard





Photos by Abhishek Singh Chauhan

HAL's current and future projects













Photos by Abhishek Singh Chauhan

KSSL/Bharat Forge at Aero India KSSL/Bharat Forge MoU with Rolls-Royce Marine



alyani Strategic Systems Limited (KSSL), a 100% subsidiary of Bharat Forge, signed a Memorandum of Understanding (MOU) with Rolls-Royce Marine North America for the development of naval propulsion systems for the Indian market. Under the agreement, KSSL will collaborate with Rolls-Royce for the design and development, licensed manufacturing, pre-sales and sales support, installation, commissioning, testing, and aftermarket services and support of the propulsion systems. This would facilitate the creation of a local supply chain ecosystem in India for Controllable Pitch Propellers and Shafting systems as required by the Indian Navy.

Speaking on the occasion, Mr. Baba Kalyani, Chairman and Managing Director of Bharat Forge stated, "In line with the AatmaNirbhar Bharat mission, the Indian Defence Industry is at the cusp of a major transformation. We at Bharat Forge Ltd, are taking significant strides to indigenise critical systems and sub-systems for the Armed Forces. This strategic collaboration with Rolls Royce, a legacy player in the naval ecosystem having a strong portfolio of technologically advanced products and offerings, is aimed at indigenously developing niche naval propulsion technologies and products for the Indian Navy".

Commenting on the partnership, Mr.Kishore Jayaraman, President India and South Asia, Rolls-Royce stated, "Rolls-Royce is committed to serving the evolving needs of the Indian armed forces, and wellpositioned to offer advanced technology solutions to support India's naval modernisation vision. We are delighted to partner with Kalyani Strategic Systems Limited/ Bharat Forge, to further strengthen our defence ecosystem in India. We believe this will build on our long history of making in India, for India, and for the world".

Bharat Forge and Paramount MoU



Bharat Forge Ltd and global aerospace and technology company, Paramount Group signed a Memorandum of Understanding (MoU) for the development and production of Composite Rotor Blades, Mission Systems and Stores Management systems for Medium Lift Helicopters at Aero India.

HAL and BFL MoU

Hindustan Aeronautics Limited (HAL), Foundry & Forge Division, Saarloha Advanced Materials Pvt Ltd (Saarloha) and Bharat Forge Limited (BFL), signed an MoU for collaboration in development and production of aerospace grade steel alloys. This MoU also accentuates development, certification and prove out and application of new material for use in production of aircrafts, engines, and accessories. The MoU was signed by Mr. M S Venkatesh (Executive Director, F&F, HAL) Mr. Guru Biswal (CEO – BFL Aerospace division), and Mr. R K Goyal (Director - Saarloha), and in the presence of Senior officials from HAL, Saarloha & BFL.



The usage of such specialty alloys in aerospace is going to increase multifold, especially in fighter aircraft/helicopters. This indigenisation initiative could also pave the way for the increased utilisation of 'Make in India' steels in other related sector such as space and defence.
Garuda Aerospace at Yelahanka



rone manufacturer Garuda Aerospace created history by raising \$22 million, the largest ever Series A funding in the drone sector. The round was led by Venture Capital firm SphitiCap which invested \$12 million along with participation from other global investors, angel investors and HNIs at \$5 million.

While Garuda Aerospace continues to strengthen its existing offering, the acquired funds will be utilised to scale up and expand the company's operation. A part of the funds will be used for R&D thus accelerating the development of building advanced drone solutions for the armed forces in collaboration with global companies for the defence and aerospace sector. The funds will also be used for the skilling and training of drone pilots and help create employment with deepening its footprints in Tier II and III cities.

Speaking on the funding Agnishwar Jayaprakash, Founder and CEO, Garuda Aerospace stated, "Garuda Aerospace is on the path to becoming the first ever Drone Unicorn Startup in India with receiving great validation from the Venture Capital firms and Investment communities. Garuda Aerospace aims to sell 25,000 drones in the next 18 months and is looking forward to exporting 10,000 drones to about 100 countries in the next 15 months. After my experience at Davos 2023, it was clear that Garuda Aerospace has the potential to scale globally, by manufacturing more Make in India drones and will help India to become the drone hub of the world by 2030."

Solar powered drone SURAJ unveiled

Garuda Aerospace unveiled its SURAJ, a solar-powered unmanned reconnaissance

aerial J-Glider at the Aero India 2023. Dr. Satheesh Reddy, former DRDO Chairman and current Principal Scientific Advisor to the Defence Minister unveiled the drone.

SURAJ is an ISR high-altitude drone designed specifically for surveillance operations, providing real-time information to the high command and protecting jawans on the ground. The drone's unique J-shaped wings are equipped with solar-powered cells that serve as its primary fuel source, while an auxiliary battery provides additional propulsion or decreased speed as required. The drone will carry a versatile payload of high-resolution zoom cameras with thermal imagery and foliage-penetrating lidar sensors with a maximum capacity of 10 kg. This cutting-edge technology will capture, process, and transmit photos and videos in real-time, ensuring that the headquarters and base have access to vital information before planning strategic operations and terms. It has an endurance of 12 hours and can fly at an altitude of 3000 ft. The drone is all set to support the Indian Army, Navy, Air Force, BSF, CRPF, CISF, ITBP, DRDO, MoD and MHA.



Chennai-based Garuda Aerospace, which unveiled its flying wing concept last year has shared details regarding the current state of the Vajra project. A wind-tunnel model is already undergoing various simulation trials and the company expects to conduct the first flight of a battery-operated prototype in August-September 2023. However, the later prototypes and the production model will feature a powerplant currently being developed by HAL. Garuda Aerospace has stated that the primary purpose of this Unmanned Aerial Vehicle (UAV) will be surveillance, however, an internal weapon bay can be featured in case the user demands a combat-spec variant. Lockheed Martin will be providing support for setting Ground Control System (GCS), and Sony is reportedly in consideration for supplying EO sensors. However, major other critical systems are already being developed in-house.

(Reporting by Rishav)

DRDO showcases over 330 technologies and systems



ith an endeavour to integrate various stakeholders of defence R&D ecosystem in the country, Defence Research & Development Organisation (DRDO) planned an enriching experience of indigenous defence technologies and systems. DRDO displayed a wide range of indigenously-developed products and technologies. It provided numerous exhibits, flight displays and seminars, besides displaying its flagship products at the India Pavilion. This included display of products on Aeronautical Systems, Missiles, Armaments, Electronics, Micro Electronic Devices and Computational Systems, Soldier Support Technologies, Life-sciences, Naval & Material Science amongst others. The display showcased the recent advancements made by DRDO in furthering Prime Minister Mr. Narendra Modi's vision of 'Aatmanirbhar Bharat'.

The DRDO Pavilion showcased over 330 products categorised into 12 zones namely Combat Aircraft and UAVs, Missiles and Strategic Systems, Engine and Propulsion Systems, Airborne Surveillance Systems, Sensors Electronic Warfare & Communication Systems, Parachute & Drop Systems, Artificial Intelligence Machine Learning & Cyber Systems, Materials, Land Systems & Munitions, Life Support Services, and Industry & Academia Outreach.

The flagship products in each of 12 Zones were: AMCA, LCA Tejas Mk2, TEDBF, ARCHER, TAPAS UAV, Abhyas, Autonomous Stealth Wing Flying Test Bed from the Combat Aircraft & UAVs Zone; Akash, Astra, QRSAM, Helina, Nag, Pralay from the Missiles & Strategic Systems Zone; FACECU, Gearbox module, Kaveri Dry Engine Prototype, Small Turbo Fan Engine from the Engine & Propulsion Zone; AEW&C-NETRA, AEW&C- MkII, MMMA Aircraft, IFF, AAAU Model from the Airborne Surveillance Systems Zone; TWIR, BFSR-SR, Bharani, Ashlesha, AATRU, ASPJ Pod, LEOP from the Sensors Electronic Warfare & Communications Systems Zone; Military Combat Parachute System, Brake Parachute, P-16 Heavy Drop System from the Parachute & Drop Systems Zone; Airborne Sonar with Helicopter Model, Air launched Directional Sonobuoy from the Naval Systems Zone; DDCA, INDIGIS, Air Warfare Simulation System, QRNG from Artificial Intelligence Machine Learning & Cyber Systems Zone; FSAPDS, Titanium Alloys from the Materials zone; ASREM, Surveillance ROV, SUMITRA from Land Systems & Munitions Zone; Integrated Life Support System, Helicopter





Primary radar PR AEW&C Mk. II

Oxygen System from the Life Support Services Zone and Wankel Rotary Engine, Jet Fuel Starter, Radio Altimeter from the Industry & Academia Outreach Zone. The India Pavilion will exhibit five DRDO products. The exhibits are AEWC&C Mk-II, AMCA, LCA Tejas Mk2, TEDBF and Archer (Image intelligence with Weapon Payloads).

The DRDO's participation in the mega show was marked by the flight displays of LCA Tejas, LCA Tejas PV6, NETRA AEW&C and TAPAS UAV. The static display also included LCA Tejas NP1/NP5 and NETRA AEW&C. The participation was marked by the flying debut of indigenous Medium Altitude Long Endurance class UAV TAPAS-BH (Tactical Aerial Platform for Advanced Surveillance - Beyond Horizon). The TAPAS-BH showcased its capabilities and covered the static as well aerial displays on the business days and the aerial video was live streamed throughout the venue. TAPAS is DRDO's solution to the tri services ISTAR requirements. The UAV is capable of operating at altitudes up to 28000 feet, with an endurance of 18 plus hours.

DRDO organised two seminars during the event. The 14th Biennial edition of Aero India International Seminar on the theme 'Aerospace and Defence Technologies - Way Forward' was organised by CABS, DRDO in association with the Aeronautical Society of India on 12 February. This seminar is a flagship event which is organised as a prequel to Aero India. Many eminent keynote speakers from DRDO, Indian Air Force, Hindustan Aeronautics Limited, International Organisations and premier academic institutions participated to provide insights about cutting edge technologies and advancement in Aerospace and Defence. DRDO also felicitated the Indian Women Professionals in Aviation and Aerospace (IWPA) during the seminar.

A host of activities were held during the seminar on 14 February. Health Usage and Monitoring System for MiG-29K, which has been developed through Technology Development Fund (TDF) was Handed Over to the Vice Chief of Naval Staff. Other activities were namely handing over of CEMILAC Certificate for CVRDE developed Aircraft Bearings for AMAGB of Tejas; launch of a web portal for System for Advance Manufacturing Assessment and Rating; release of DRDO Export Compendium, DRDO Monograph 'Non Destructive Evaluation of Solid Rockets and Missile Systems, Aeronautics Research and Development Board's Magazine 'PUSHPAK2022' and DRDO Export Compendium. The DRDO also handed over 16 Licensing Agreements for Transfer of Technology (LAToT) for 11 DRDO developed technologies to 15 industries during the seminar. 🥁

DRDO's new 125mm round on the horizon



DRDO is developing a new generation 125mm Armour-piercing fin-stabilised discarding sabot (APFSDS) with a long rod kintetic energy (KE) penetrator for T-90 Bhisma tank of the Indian Army. As the Bhisma itself is going through extensive modernisation to meet future threats, it's necessary to enhance the firepower, protection, mobility and situational awareness. In accordance with the modernisation, DRDO has initiated two simultaneous projects to develop newer APFSDS. According to the DRDO official present at Aero India 2023, the future KE round will have a penetrator of 750mm. However, first a round with a 600mm long penetrator will be developed to validate all necessary newer technology before moving to a much ambitious one. Along with a new gun will come the new KE round to defeat future threats.

(By Sankalan Chattopadhyay)

Mission Mode (MM) projects of DRDO





The Government has worked out the Mission Mode (MM) projects of the Defence Research and Development Organisation (DRDO). As on date, DRDO is working on 55 MM Projects for a total sanctioned cost of Rs 73,942.82 crore. These are in the area of Decoys, Nuclear Defence Technologies, Air Independent Propulsion (AIP), Combat Suite, Propulsion System, Air Droppable Container, Torpedo, Fighter Aircraft, Cruise



Missile, Unmanned Aerial Vehicle, AEW&C Aircraft System, Gas Turbine Engine, Assault Rifle, Warhead, Light Machine Gun, Rocket, Advanced Towed Artillery Gun System (ATAGS), Infantry Combat Vehicle Command, Ordnance Disposal System, Tactical Radios, EW Systems, Radars, Life Support System, Geographical Information System, Surface to Air Missile, Anti-ship Missile, anti-Airfield Weapon, Glide Bomb, Simulator etc.





BEL showcases its capabilities at Yelahanka



Mr Bhanu Prakash Srivastava, CMD, BEL

t Aero India 2023, Bharat Electronics Limited (BEL) showcased stateof-the-art products and systems spanning every domain of its business.

The products and systems on display during Aero India 2023 were clustered as 'Air Defence & Surveillance', 'C4I Systems', 'Artificial Intelligence-based Products', 'Non-Defence & Diversification Products', 'Radar Systems', 'Communication Systems', 'Airborne Products & Systems', 'Homeland Security and Cyber Security', 'Futuristic Technologies', 'Missile Systems', 'EO & Laser-based Products', and 'Outdoor Display Products'. In addition, BEL showcased its R&D capabilities by launching/demonstrating some of its new products and technologies.



BEL's display in the area of 'Air Defence & Surveillance' included Hexacopter, Tethered UAV, Swarm of UAVs, Robotic Surveillance, Shallow Water Remotely Operated Vehicle (ROV) and D4 Antidrone Systems. The display in the area of 'C4I Systems' included C4I technologies, Combat Management Systems and Navigational Consoles and that in the area of 'Artificial Intelligence-based Products' included AI-based activity interference of air targets for situation awareness.



Also on show was the complete range of products and systems for 'Non-Defence & Diversification', including High Level Network Management in Advance Net Centric Operation, Virtual Reality for Rolling Stock Driver Training System, Air Traffic Management System for Civilian Airport, Advanced Surface Movement Guidance Control System, Super SCADA for Delhi Metro Rail Corporation, Virtual Reality-based Training Simulator, X-ray Baggage Inspection System, Explosive Detector, Automatic Chemical Agent Detector and Alarm, Fuel Cell, Electric Vehicle Batteries for two wheelers and three wheelers.



BEL showcased its 'Radar Systems' comprising Combined Interrogator and Transponder System, Battle Field Short Range Active Electronically Scanned Array (BFSR-AESA) Radar, Frequencymodulated Continuous-wave based Drone Detection Radar, Air Defence Fire Control Radar, Close-in Weapon System, Mountain Fire Control Radar, Weapon Locating Radar, BFSR-XR, X-Band Multi-Function Radar, Battery Surveillance Radar, AESA Radar, and models of 3D Low Level Light Weight Surveillance Radar and 4D Phased Array Medium Power Radar.

BEL's display in the area of 'Communication Systems' included Tactical Data Link, 0.76M Ku Band Manpack Terminal (manual assisted), Instant Fire Detection and Suppression System, Rugged Switches, Rugged Routers, Mine Field Recording System, Network Hardware Security Modules, Data Link Receiver Unit, High Capacity Radio Relay, Manpack High Frequency Software Defined Radio (SDR), Pointto-Multi-Point Radio, DSSS Networking Radio, SDR Airborne version, SDR Hand Held Naval version, SDR Manpack Naval version, SDR Naval Combat, SDR Tactical, Encryptor, Multi Capacity Encryption Unit, Data Multiplexercum-Encryption Unit, Configurable Live Mk-II , BEL Tactical Computer Mk-VI, Hardware Security Module, Rugged Tablet, Network Time Server and Data Diode.

BEL's 'Airborne Products & Systems' on display included Ultra Violet Missile Approach Warning System, Self-Protection Suite for Helicopters, Hand Held Field Signal Generator, HD Airborne Spread Spectrum Modem, HD Ground Spread Spectrum Modem, Directed Infrared Counter Measure System, Tarang II Radar Warning Receiver and Display Unit Indigenous.



Other 'Futuristic Technologies' on display included Automatic Dependent Surveillance-Broadcast System, Position Indicator – G3I, Hand-Held Indian Regional Navigation Satellite System, Extended C-Band Block Up-Converter, Monolithic Microwave Integrated Circuit, C Band Phase Locked Oscillator, Router with Call Manager, Voice Gateway Unit, MIL-GRADE TAB, Signal Processing Unit for Flight Level Radar, UHF RFID Reader, 3 ATI Display, Torpbuster CPU Board and Smart Energy Meter.

The 'Homeland Security and Cyber Security' cluster included display of Smart City solutions, Homeland Security solutions, Comprehensive Integrated Border Management System, Naval Airfield Integrated Security System, and Integrated



Perimeter Surveillance System, while the 'Missile Systems' display included Air Defence Weapon System.

'EO & Laser-based Products' included Panoramic Night Vision Goggle, Twin Tube Goggle, Laser Dazzler, Corner Shot Weapon System, Multipurpose Reflex Weapon Sight, Mini Eye-safe LRF Module, FO Gyro-based Sensor Packaged Unit, Laser Fence System, Electronic Artillery Fuzes and Aerial Fuze. The highlight of BEL's outdoor display was the GIMBAL for Tethered UAV, Tethered UAV, Shallow Water ROV, Hexacopter and Ultra-Light Weight Enclosure with platform.



BEL signs MoU with ADA, DRDO for AMCA

Bharat Electronics Ltd (BEL) signed an MoU with Aeronautical Development Agency (ADA), DRDO, for the Advanced Medium Combat Aircraft (AMCA) programme. The MoU was announced on the sidelines of the "Bandhan" event held at Aero India 2023. The Advanced Medium Combat Aircraft is a 5th Generation, multi-role, all-weather fighter aircraft designed with high survivability and stealth capability. The MoU aims at leveraging the complementary strengths and capabilities





of BEL and ADA, wherein both the parties will co-operate for the design, development, qualification, production and supply of Internal Weapon Bay Computer and other LRUs for AMCA and provide lifetime product support to the Indian Air Force.

BEL, GSL in MoU for naval platforms

Bharat Electronics Ltd signed an MoU with Goa Shipyard Limited (GSL) for co-operation in addressing global market opportunities for supply for state-of-the-art products such as Autonomous Boats, and other systems/solutions based on Artifical Intellegence for Naval platfroms.



Mr Bhanu Prakash Srivastava, CMD, BEL, and Mr Brajesh Kumar Upadhyay, CMD, GSL, exchanged the MoU documents at Aero India in the presence of Mr Vinay Kumar Katyal, Director (Bangalore Complex), Mr Manoj Jain, Director (R&D), Mr Damodar Bhattad, Director (Finance), and other senior officers of BEL and GSL.

BEL MoU with IAI for LORA Weapon System

At Aero India 2023, BEL signed an MoU with Israel Aerospace Industries (IAI) for



domestic manufacture and supply of its LORA Weapon System for the Indian Tri-services. The state-of-the-art strategic weapon system weapon will be manufactured by BEL, as the prime contractor, based on the workshare arrangement with IAI. The MoU is an outcome of the growing partnership between India and Israel in the field of high technology strategic defence systems, and is in line with the Government of India's Make in India initiative for major weapon systems.

Developed by IAI, LORA is a seato-ground and ground-to-ground system which comprises a long-range ballistic missile, a unique launcher, a command and control system, and a ground/marine support system. The LORA system provides ballistic assault capabilities for multiple ranges with a precision level of 10 meters CEP.



Astra Microwave Products Ltd (AMPL) marches ahead



ver the course of 30 years, we have contributed to indigenously developing Transmit Receive Modules for Phased array radars in all major frequency bands - V/UHF, S, L, C, X and Ku bands. We have qualified our products for ground, naval and airborne requirements and have been certified by quality agencies like CEMILAC, RNQA, DGAQA etc. One of the most important strategic areas for any country is Electronic Warfare. Simply put, in todays digital era, the edge for countries is clearly using the electronic intelligence of the enemy systems that helps device our strategies to counter them effectively and to gain a significant battlefield advantage. We are among the only few companies in India who have worked on Ultra Wide band products for COMINT and SIGINT requirements. The challenge of working in wide band RF systems is quite high and requires a very good understanding of all the RF and Microwave challenges. We have successfully delivered several products for India's naval and airborne EW needs, the latest being the very important system that will be used in the EW pod that will go on the LCA Tejas. In parallel, we have delivered several space qualified products to ISRO for their ground and satellite needs. In fact we are proud to have been associated with every major Satellite Programme of

ISRO on many occassions – sometimes to screen components to space grade for Chandrayan mission to building about 80% of all electronics on board the Synthetic Aperture Radar Payload for the RISAT programme", stated the company.

Aero India: product launches and MoUs



Product Launch with 'Drishti' Counter Drone Radar: Astra Microwave has manufactured 'Drishti' Counter Drone Radar with ToT from DRDO. It is the first private industry to manufacture and launch the radar. This radar has a range of 4 km for 0.001 sq.m target like micro drones. It can track atleast 100 drones simultaneously. Drishti Radar has an azimuth coverage of 360 deg and elevation coverage of 50 deg.

MoUs: Astra Microwave and Eldis Pardubice (Czech Republic) signed an MoU for exclusive manufacturing, assembly integration, testing, installation and commissioning of the Primary Surveillance Radar and Monopulse Secondary Surveillance Radar for opportunities in India.

Astra Microwave and Eldis Pardubice (Czech Republic) signed an MoU for exclusive manufacturing, assembly integration, testing, installation and commissioning of the Precision Approach Radars for all the opportunities in India.

Astra Microwave and Raytheon Technologies Corporation signed an MoU for jointly pursuing opportunities of all Raytheon's Hughes Integrated Synthetic Aperture Radar variants including manufacturing of critical radar subsystems and modules for these airborne radars at Astra.

Maini Materials Movement (P) Ltd: Electric GSE for military aviation

ith the Government's thrust to work towards "Net Zero Emission" the Indian Defence too are focussing to achieve 100% sustainable airports. Maini group is proud to be part of this Green Initiative in the aviation space. Over the last 6 years, MMM has designed and developed electric tugs for military and civil aviation. These are truly "Made in India" product designed keeping in mind the Indian operating conditions.

We are proud to have our tugs operating on board INS Vikrant for towing of the fighter aircraft and helicopters. The tug is built to MIL specifications and robust to take care of the movements of the ship during the different sea state levels. Powerful and silent, the tug can tow 35 tons.

Presently more than 200 electric tugs are in operation for both defence and civil applications.

The tug is also used for various other applications in aviation. The handling capacity ranges from 2000 kg to 35,000 kg. The applications include aircraft tow, hauling of GSE, MRO, baggage tow at airports etc. Ergonomically designed and with minimum moving parts, the tugs are a boon for both operations and the maintenance teams.

Maini Materials Movement (P) Ltd (MMM), a Maini group company is the forerunner in the field of harnessing electric technology for automotive and industrial applications for over three decades. MMM has designed and manufactured electrical Material Handling Equipments and in-campus passenger transportation buggies for various applications for sectors ranging from automobile manufacturing to pharmaceutical and food industry.

Alfa-S is more than just for swarm



The 'Air Launched Flexible Asset Swarm' or better known as ALFA-S is a long range loitering munition developed by 'NewSpace Research & Technologies' as a part of HAL Combat Air Teaming System (CATS). The main objective behind the development is not just to enhance India's swarm striking capability but to defeat robust air defence or counter drone system of the enemy as well. All these small drones are actually carried by CATS ALFA which reaching upto a desired range releases the swarm. But the capability of such drones can be increased to the next level by sending each individual Alfa-S for individual target! Thus an enhanced means to defeat enemy counter drone can be found by the indigenous product.

(By Sankalan Chattopadhyay)

The ePlane Company: Democratise Flying in India



mong the several engrossing **A**visions being brought to major trade shows like that of Aero India, one such in this edition is the concept of "Flying Taxi" by IIT Madras based The ePlane Company. Founded in 2019, the company has unveiled its e200 flying taxi concept which aims to be cheaper than standard taxi services in India while also being a trustworthy solution for timely intra-city travel with 160 kmph of cruise speed. According to Vishnu Ramakrishnan, from the founder's office of the ePlane Company, he has confirmed that a sub-scale prototype is undergoing testing with positive results so far and they are looking to conduct the maiden flight test of the 1:1 prototype likely by the end of 2023. The production variant will be fully electric and feature a two-seat configuration, accommodating one passenger and a pilot.

(By Rishav)

IAI showcases latest defence solutions at Aero India



srael Aerospace Industries (IAI) showcased its advanced technologies at Aero India 2023. IAI is leading a strategic transformation to provide fast direct access to IAI's solutions in full support of India's Atmanirbhar Bharat vision of a self-reliant country. IAI signed several Memorandums of Understanding





(MoUs) and joint venture agreements during the exhibition as it deepens its ties with the local defence sector.

For the past 30 years, IAI has built close partnerships in India developing and providing various strategic platforms to India, among them air and missile defence systems, unmanned aerial systems (UAS), satellites, radars, training platforms and others. IAI's state-of-the-art systems and technologies have been in operational use in India's three military arms and other government agencies. Additionally, IAI works closely with the Indian Armed Forces to develop and produce advanced technologies in the air, land and naval arenas.

Boaz Levy, IAI President and CEO stated, "We are very excited to be back in India for Aero India, which brings together some of our leading partners in the defence sector. We have been working closely with the Indian defence industry for more than 30 years and we look forward to further collaboration following the exhibition. We look forward to meeting our friends and partners while exhibiting our cuttingedge technologies to the Indian, Asian and global markets during this distinguished exhibition."

IAI showcased a wide array of aerial systems including its Medium Altitude Long Endurance (MALE) strategic Unmanned Aerial Systems (UAS) Heron TP. IAI displayed its advanced tactical loitering-munitions which are designed for both ground and naval units, the Mini Harpy and the Rotem. In addition, IAI exhibited an advanced GEO Mini Communication Satellite, whose development is based on IAI's long heritage and the Dror 1, Israel's National Communication Satellite. Also presented was IAI's Rampage, a supersonic, longrange accurate air-ground assault rocket for the annihilation of high-quality targets; the Scorpius G (ground) ground-based EW system designed to detect and disrupt ground and airborne threats; aerial refueling tanker for the supply of aerial refueling and strategic transport aircraft and IAI's HAROP was on display in Adani's booth and the LORA and MRSAM on display in the BEL booth.

IAI and BEL in JV

Israel Aerospace Industries (IAI) and Bharat Electronics Limited (BEL), the leading manufacturer of defence electronic products and systems for India's defence sector, concluded agreements to form a joint venture that will extend product support services for India's Defence Forces. The partnership is another significant step in the relationship between the two companies that have a long history of association and the two companies are engaging in several joint programmes that will be delivered to Indian Defence Forces. The new joint venture is being established for providing life cycle support services for MRSAM air defence systems in the country. The new venture will have its headquarters in New Delhi, India and will provide the required technical and maintenance support to Indian Armed Forces, including the Air Force, Navy and Army.



RO NDI SECTION

Rafael India showcases its systems



"Rafael is proud to have local partners and subsidiaries, such as its partnered Indian based companies Kalyani-Rafael (KRAS) and Astra-Rafael (ARC) with whom Rafael has joint ventures, presenting a selection of innovative defence solutions at the Aero India. Through our partners, state-of-the-art systems can be produced in India independently by KRAS and ARC, allowing for the transfer of technology, know-how, and active support of the local industry, and Indian economy. After decades in India, Rafael continues its long-term effort to invest in the supply of advanced defence systems to the Indian market. Rafael's





heritage in innovation through significant investment in R&D ensures that our technology and our customers are using the most effective means to defend their most valued assets and support the local industry. We are constantly seeking to improve these technologies and strengthen our systems showcased at conference which include I-Derby Missiles, RecceLite Reconnaissance Pods, Litening Advanced Targeting Pods, the SPICE Family of Air-to-Surface Missiles, the SPIKE Missile Family, and the BNET Tactical Communications system. Likewise, advanced versions of both Litening and RecceLite pods are also being presented together with our local partners", stated Rafael officials.

"I would like to say with great pride that Rafael has a rich legacy here - with 25 years of work in India. Throughout that time we have successfully delivered a variety of advanced systems and solutions in several different spheres and services. Systems that are combat proven on a wide variety of platforms. We are proud to see some of these systems still in active, operational use even 20 years later. This serves as a clear example of not only our history in India and alongside our Indian counterparts; It also conveys the deep and firm commitment to maintain this longstanding association and partnership", stated Maj. Gen. (Ret.) Yoav Har-Even, President & CEO of Rafael. 🥁

VAYU

Dassault Aviation at Yelahanka



assault had a big range of products on display. "In the defence sector, the Indian Air Force (IAF) is our longest standing export customer and has been flying Dassault aircraft since 1953. The acquisition contract for 36 Rafale, signed in 2016, and the modernisation of the Mirage 2000 I/TI are a continuation of this historic partnership. In the business aviation field, more than twenty Falcon aircraft are in service in India and growth prospects are promising. Following the Rafale contract, Dassault Aviation and its partners are also contributing to the "Make in India" policy, through a vast procurement, training and industrial subcontracting network involving dozens of companies, in accordance with our offset obligations", stated company officials.

Dassault Aviation presented the following at Aero India:

- A Rafale C mock-up in Indian Air Force colors and a Rafale Marine mock-up. The Rafale Marine is a candidate for the renewal of the Indian Navy's carrierborne fighter fleet, under a tender issued by the Indian Government.
- A Falcon 2000 front section built by the Franco-Indian plant in Nagpur, under agreements signed subsequent to the Rafale contract.
- A Falcon 8X. With its range of nearly 12,000 km and its extreme versatility, this trijet which enjoys a reputation for robustness and reliability is particularly well-suited to the needs of Indian companies and to local operating conditions (high temperatures and altitudes).

"Dassault Aviation's participation in the Aero India show is just the latest step in our 70-year partnership with India. It has always been our ambition and a source of pride to provide the Indian armed forces and Indian companies with the best equipment. We will do everything in our power to develop our industrial presence in this great country and meet its military and business aircraft needs, both today and for the future", stated Eric Trappier, Chairman and CEO of Dassault Aviation.



Thales and 'Make in India' strategy



Thales was present in full strength at the 14th edition of Aero India 2023 showcasing its cutting-edge technologies across Defence, Aerospace and Space, bringing a special focus on its progress towards 'Make in India for India and for the world'. Celebrating its 70th anniversary in the country, Thales is moving forward on its Make in India roadmap as part of the Indian government's Aatmanirbhar Bharat vision. At Aero India 2023, Thales exhibited its air defence capacities from sensors to effectors. As a systems integrator, the Group showcased its full range of radars as well as leading very short range air defence systems including Laser Beam Riding MANPAD, among others. The company also showcased the best of its airborne optronics capability: the 2-in-1 targetting and reconnaissance pod TALIOS (Targeting Long-range Identification Optronic System). On the connectivity side, Thales included SYNAPS A, the airborne member of the SYNAPS software-defined radio family designed to support battlespace digitisation and also Identification Friend of Foe (IFF).

Thales and BDL for 70mm laser guided rockets

Thales and Bharat Dynamics Limited (BDL) signed an MoU for setting up manufacturing facilities in India for precision-strike 70mm laser guided rockets (FZ275 LGR). Through the agreement, BDL will become a part of the FZ275 LGR global supply chain, providing the opportunity for export of Indian manufactured components to existing and future 70mm laser guided Thales is the original equipment manufacturer of FZ275 LGR, the lightest, shortest and most versatile 70mm laser guided rocket on the market with high level of accuracy. It can be deployed in day and night operations at ranges between 1.5m up to 7km (on helicopter).

Mr. Ashish Saraf, VP and Country Director, India - Thales stated, "We are proud to strengthen our partnership with Bharat Dynamics Limited. In support of the Aatmanirbhar Bharat vision, this collaboration seeks to further develop incountry capability of producing advanced weapon systems such as 70mm laser guided rockets to cater to export markets besides assisting the Indian Armed Forces in their mission to effectively safeguard the nation."

Thales opens its 1st Design Centre

Thales, celebrating its 70th anniversary in India this year, has opened its first Design Centre at its Engineering Competence Centre in Noida. The opening of this cutting-edge facility, the 13th of its kind worldwide by Thales, is part of the organisation's expansion plans in India.



"The inauguration of the 1st Thales Design Centre in India is a reflection of our commitment to invest in the country's talent, technology prowess and innovations. It fits perfectly with the Government of India mission to make India a world centre of research and innovation. This Centre is a step further in our innovation approach as it will enable co-innovation together with our customers, partners and academic institutions, utilising the perfect combination of a team of experts, cuttingedge tools, and a state-of-the-art space designed to foster creativity," stated Ashish Saraf, Vice President and Country Director for India, Thales. 🗡





rockets customers. This agreement will also provide the opportunity for BDL to offer a 'Make in India' 70mm laser guided rocket solution for existing helicopter fleet of Advanced Light Helicopters (WSI) and Light Combat Helicopters of the Indian Government.

Rolls-Royce in biggest ever order of Trent XWB-97 for Air India



Rolls-Royce announced it has received an order from Air India for 68 Trent XWB-97 engines, plus options for 20 more. This is the biggest ever order for the Trent XWB-97, which exclusively powers the Airbus A350-1000. Air India has also ordered 12 Trent XWB-84, engines, the sole engine option for the Airbus A350-900. This is the first time that an Indian airline has ordered the Trent XWB and the deal will make Air India the largest operator of the Trent XWB-97 in the world. Financial details of the order are not being disclosed.

Tufan Erginbilgic, CEO, Rolls-Royce plc, stated, "Today's announcement marks an exciting and truly remarkable occasion for Tata Group and Air India; the size and magnitude of this order reflects the level of their ambition for the future. I congratulate them on taking this bold step towards becoming one of the world's greatest airlines and I would like to thank them for putting their trust in Rolls-Royce to power them on this journey. Air India is the first Indian airline to order the Trent XWB and the size of the commitment, including options, will make them the biggest operator of the Trent XWB-97 in the world. With a dynamic and growing aviation industry, India is a strategically important market for us and we look forward to working with Air India as

they connect their passengers across global communities and cultures."

"The Trent XWB will support Tata Group and Air India's ambitious growth plans for the airline, providing reliability, flexibility and efficiency to its fleet as it takes on ultra-long-range routes between India and the US. The choice of the latest generation of Rolls-Royce engines also reflects Tata Group's vision for Air India to become the world's most technologically advanced airline, with a focus on service, competing on the world stage to deliver best-in-class customer experience. As the world's most efficient aero engine in service, the Trent XWB will also allow Air India passengers to travel in the knowledge they have chosen the most sustainable long-haul aviation option available. With a 15% fuel consumption advantage over the first generation of Trent engine, the Trent XWB goes further on less fuel, and offers leading performance and noise levels. It is also ready to operate on a 50% Sustainable Aviation Fuel blend" stated R-R officals at the show.

Rolls-Royce already has long-standing partnerships with the Tata Group. These include a strong supply chain commitment with Tata Advanced Systems Limited (TASL) for the manufacture of a significant number of parts for the Trent XWB engine in India, as well as several high-precision components for other Rolls-Royce civil aerospace engines. In addition, Tata Consultancy Services (TCS) provides engineering services, particularly to support our digital engineering and data innovation teams in India.

Rolls-Royce has a rich history of partnership with India, spanning 90 years, starting with power for the first commercial aircraft of Tata Aviation in 1932. Today over 750 engines provide Mission Critical Power to the Indian Armed Forces. The company continues to develop its ecosystem of strategic partners, suppliers, diverse talent, digital solutions and service capabilities in India. The new order from Air India will further build on Rolls-Royce's presence in the country, extending our partnership for decades to come.

Rolls-Royce Marine MoU with Bharat Forge for Naval Marine Propulsors

Rolls-Royce Marine North America Inc and Kalyani Strategic Service Limited (KSSL), a 100% subsidiary of Bharat Forge, signed a Memorandum of Understanding (MoU) to explore the opportunity for KSSL to become an in-country provider for propulsor sales within the Indian market. The MoU may include, but is not limited



Kishore Jayaraman, President – India and South Asia, Rolls-Royce

to, design and development; licensed manufacturing; pre-sales and sales support; installation, commissioning, testing; and aftermarket services and support. The new MoU is expected to enable the creation of a local supply chain ecosystem in India for Controllable Pitch propellers and Shafting. Rolls-Royce's propulsion systems are designed to be used in all modern warships and the company is one of the key suppliers to the US Navy.

Kishore Jayaraman, President – India and South Asia, Rolls-Royce, stated, "Rolls-Royce is committed to serving the evolving needs of the Indian armed forces, and well-positioned to offer advanced technology solutions to support India's naval modernisation vision. We are delighted to partner with Kalyani Strategic Service Ltd. and Bharat Forge to further strengthen our defence ecosystem in India. We believe this will build on our long history of making in India, for India, and for the world."

Baba Kalyani, Chairman, Kalyani Group, stated, "In line with the AatmaNirbhar Bharat mission, the Indian Defence Industry is at the cusp of a major transformation. We at Bharat Forge Ltd., are taking significant strides to indigenise critical systems and sub-systems for the Armed Forces. This strategic collaboration with Rolls Royce, a legacy player in the naval ecosystem having a strong portfolio of technologically advanced products and offerings, is aimed at indigenously developing niche naval propulsion technologies and products for the Indian Navy."

Rolls-Royce has over 50 years of expertise in designing and developing propellers around a large range of requirements. Successful and well-proven across the globe, its propellers are designed for robustness, reliability and efficiency, ensuring excellent cavitation performance as well as low vibration, noise levels and excellent fuel efficiency. The Controllable Pitch, Fixed Pitch and Fixed Bolted Pitch options ensure excellent hydrodynamic efficiency, supporting overall vessel performance and stealth characteristics for naval operations.

Rolls-Royce agreement with Aaran 1 Engineering

Rolls-Royce announced that it has signed an agreement with Aaran 1 Engineering Pvt. Ltd. to manufacture Adour engine components in India with a view to support Rolls-Royce's global defence customer base. This partnership with Aaran 1 Engineering, an MSME (Micro, Small and Medium Enterprise) is part of the company's focus on expanding the Adour supply chain, in partnership with Indian players.

Abhishek Singh, Senior Vice President – Defence, India and South East Asia, Rolls-Royce, stated, "We have long-standing partnerships in India, particularly for our Adour engines, that have been powering Indian military aircraft for several decades. This new partnership with Aaran 1 is a







recognition of the growing potential of MSMEs in India to contribute to the global defence supply chain. We look forward to building on these capabilities and expanding our defence sourcing footprint in India."

Adour engines power several platforms including the Hawk and Jaguar, that are in service with different military forces across the world. Rolls-Royce's supply chain for Adour engines in India supports global markets, while also serving the missionreadiness of the defence forces in the country.



Saab showcases "Power of game changing Gripen E"

"S aab is demonstrating the cutting edge technologies that make Gripen E the world's most modern multi-role fighter aircraft. Along with the Carl-Gustaf, AT4 and IDAS, which are in service with the Indian armed forces in cutting edge roles, Saab is presenting a wide portfolio of products and systems from the air, land and sea domains. In addition, a full scale replica of Gripen E and a Gripen E cockpit simulator will bring alive the gamechanging capabilities of the aircraft", stated company officials.

Saab exhibited a range of products and solutions for a fast changing defence and security environment. In addition, Saab engaged with Indian industry to further its plans for building a strong defence industrial base in India, making products for India and the rest of the world. Saab demonstrated how its advanced technology and innovative thinking can deliver the best



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solutions for strong national defence and an industrial future based on the premise of Make in India.

"At Aero India 2023, we are showcasing our latest technologies which are changing defence and security planning, deployment and future force readiness. Our team from India, Sweden and other countries are there to share our wide range of products, solutions, plans, and our thoughts about how we best can collaborate with the Indian defence industry to build an Atmanirbhar Bharat," stated Mats Palmberg, Chairman and Managing Director, Saab India Technologies.

"Aero India 2023 comes at a crucial juncture of global developments, leading to a greater focus on developing selfreliance along with a need for robust, high technology. We are fully committed to enabling the Indian government's Atmanirbhar approach to defence capability. To that end, Saab is setting up a manufacturing facility for Carl-Gustaf in India, further strengthening production in the country. The facility will support the production of the Carl-Gustaf M4 for the Indian Armed Forces as well as components for users of the system around the world. Saab will also be partnering with Indian sub-suppliers and the systems manufactured in the facility will fully meet the requirements of Make in India," Palmberg added.

At Aero India Saab exhibited among others: Gripen E and weapon systems, Giraffe 1X compact lightweight highperformance 3D radar for fixed, mobile and deployable applications, Carl-Gustaf M4 man-portable multi-role weapon system, AT4CS AST lightweight, manportable, unguided and fully disposable weapon system, Next-Generation Light Anti-tank Weapon (NLAW) system, the AUV62 System latest generation of Saab modular AUV systems, the AUV62-MR for mine reconnaissance, the Double Eagle Sarov AUV, the Saab Lightweight Torpedo (SLWT) new anti-submarine warfare solution, Sea Wasp new generation of ROV based systems, IDAS radar warning (RWC), missile approach warning (MAWS) and laser warning sensors (LWS), Deployable hospital and DeployNet mission-ready, deployable, tactical, 5G/LTE infrastructure providing a wireless network with highcapacity bandwidth in a flexible end-to-end solution. 🥁

The Gripen E full scale replica and weapon systems outside the Saab stand



BAE Systems to collaborate with NewSpace R&T





AE Systems will work with Bangalore-based technology group NewSpace Research and Technologies to explore opportunities to collaborate in next generation uncrewed systems and associated technologies. Under a Memorandum of Understanding (MoU) announced at Aero India, the companies will bring their collective expertise in aerospace development and systems engineering to identify opportunities for the defence and commercial market. BAE Systems, which has a long heritage in India, is developing next generation autonomous platforms to give customers both an information advantage and the freedom to act.

NewSpace's team of more than 200 specialists has delivered more than 10 projects since its inception in 2018, demonstrating its expertise in industrial uncrewed air vehicles, collective robotics, AI modules and augmented and virtual reality simulations.

Ravi Nirgudkar, Managing Director, BAE Systems–India, Bangladesh, Sri Lanka, stated, "Bringing together NewSpace's expertise in uncrewed platforms of various dimensions and capabilities with our extensive design and development expertise, we're excited about the potential of this new collaboration to advance defence technologies in India. BAE Systems' presence in India spans over seven decades and we continue to explore collaboration opportunities to strengthen India's national defence and security."

Sameer Joshi, Chief Executive Officer, NewSpace stated, "NewSpace is working on the F.U.T.U.R.E (Fused Teaming with Uncrewed Rapid Effects) initiative using a variety of unmanned systems to generate mass over a region of interest. Here a dedicated collaboration with BAE Systems, who are a global leader in next generation multi-domain missions and technologies; will help both sides explore mutually beneficial engineering and product development opportunities, as well help NewSpace contribute towards the Atmanirbhar vision for India and the world."

The companies will explore opportunities to develop and enhance their skills across a range of potential capabilities, such as networking, software, hardware and piloting.

BAE Systems and FSTC to develop mission simulator training capabilities

BAE Systems and FSTC announced plans to design, build and supply simulators to train pilots of the Indian Armed Forces. Under a Memorandum of Understanding (MoU) announced at Aero India, the companies will work together to develop a Twin Dome Full Mission Simulator for BAE Systems' Hawk



Mk132 fast jet trainer aircraft, which will use a realistic synthetic environment to help pilots train at a higher standard than ever before. The Hawk Mk132 has supported the training of highly-trained pilots to the Indian Air Force for more than two decades, with many aircraft built in India by Hindustan Aeronautics Limited (HAL) under licence from BAE Systems.

There are now 650 Hawks operating worldwide and BAE Systems has decades of experience working with armed forces across the globe to deliver and evolve training to prepare pilots for life in fast jet cockpits. FSTC is India's leading flight simulation training company. It will integrate the cockpit, motion and visual display system, along with model designated military bases as part of the new agreement.

Rosoboronexport offers new joint projects in aviation



osoboronexport (a unit of Rostec State Corporation) was the organiser of Russia's collective display at the Aero India 2023. "Rosoboronexport is a permanent exhibitor at Aero India, one of the world's largest air shows, where the Russian display traditionally stands out for its scale and the range of exhibited products for the air and air defence forces. The exhibition gives us an excellent opportunity to showcase modern Russian-made weaponry and discuss the areas for further bilateral cooperation with India," stated Alexander A. Mikheev, Rosoboronexport Director General. "The military-technical cooperation between Russia and India is an example of industrial partnership with a number of completed and ongoing joint projects for all services of the armed forces. Today we are offering new points of cooperation within the joint development and production of high-tech products on the premises of Indian enterprises under the national Make in India programme in compliance with all localisation and technology transfer requirements." Rosoboronexport exhibited about

200 advanced Russian-made samples of armaments and military hardware, including the advanced Su-57E fifthgeneration multifunctional fighter, the Checkmate light tactical aircraft, the IL-76MD-90A(E) military transport aircraft,



the IL-78MK-90A tanker aircraft, the Su-35 and the Su30SME supermaneuverable fighters, and the MiG-35D multifunctional frontline fighter.

Rosoboronexport also presented the Ka-226T light utility helicopter, the production of which is suggested to be launched under the Make in India programme on the premises of Indo-Russian Helicopters Limited, a joint venture with the participation of Russian and Indian industrial companies. In addition, a wide range of various Russian military helicopters were demonstrated. Among them was the upgraded versions of the Ka-52E and Mi-28NE attack helicopters and the Mi-171Sh military transport helicopters, which are in strong demand on the world market and in the Asia-Pacific region today. Visitors to the

Rosoboronexport display were invited to see Russian unmanned aerial vehicles, including the Orion-E reconnaissance/ strike UAV, the Orlan-10E reconnaissance UAV and the Orlan-30, a new product launched in 2022. In the air defence segment, Rosoboronexport showcased the entire range of assets that can operate both independently and as part of an echeloned air defence system. Russia's collective display exhibited the S-350E Vityaz air defence missile system, the Viking, Tor-M2KM, Tor-M2E SAM systems, and the Pantsir-S1 self-propelled anti-aircraft gun/ missile (SPAAGM) system. In addition, the company is offering the Igla-S and Verba man-portable air defence systems. Russianmade anti-drone systems, including Repellent, RLK-MCE, RB-504P-E and RB504A-E, were also on display.

Embraer showcases the C-390 Millennium at Aero India 2023



B mbraer showcased the C-390 Millennium military multi-mission tactical air transport aircraft, which was be on static display at Aero India 2023. Complementing the C-390 Millennium's presence at the show was Embraer's booth (Hall B, B2.2 B) that offered visitors a closer look at Embraer Defense & Security's comprehensive portfolio and innovative solutions, which included the A-29 Super Tucano, the P600 AEW&C, and the radars and border surveillance solutions.

"We are proud to bring Embraer's iconic C-390 Millennium to India for our guests to experience the true capabilities of this 21st-century military multi-mission aircraft," said Bosco da Costa Junior, President & CEO, Embraer Defense & Security. "India is a key market for Embraer, and we are keen to establish partnerships in the country that can further boost India's defence industries and capabilities. We look forward to engaging with India's defence and aerospace ecosystem at this event."

Since it entered into service with the Brazilian Air Force (FAB) in 2019, the C-390 has proven its capability, reliability, and performance across a variety of missions. FAB's fleet of five aircraft, all refueling versions, designated KC-390, have already accrued more than 7,500 flying hours, and recent numbers have shown a mission completion rate of 99%, demonstrating outstanding productivity in its category. Embraer has orders for the C-390 Millennium from Portugal and Hungary, both NATO member nations. The Netherlands, also a NATO nation, selected the C-390 Millennium in 2022.

The C-390 Millennium can carry out a wide range of missions using the same platform, including Air-to-Air (inflight) Refueling (AAR) for fixed & rotary wing aircraft, airborne operations, troop and cargo transportation, humanitarian missions, medical evacuation, firefighting, and search & rescue, with simple and rapid reconfiguration between the different configurations using conversion kits and state-of-the-art built-in reconfigurable cargo floor systems. The aircraft was designed to operate on semi-prepared or damaged runways as well as in hostile environments, ranging from hot and humid to cold, dry conditions.

One of Embraer's defence products operating in the country is the Indian Air Force's Netra AEW&C. Built upon the ERJ 145 regional jet platform, the fleet of three Netras is the product of collaboration between Embraer and DRDO.





HLFT-42, The 'Marut' is reborn!

ero India 2023 witnessed the first arrival of any fifth generation fighter Liet on Indian soil as the Lockheed Martin F-35A stunned the audience by its jaw dropping maneuvers. If it was the best highlight of the grandeur, second best position definitely can be claimed by a newly unveiled single-engine trainer platform. Conceived by the state-owned Hindustan Aeronautics Limited (HAL), the Hindustan Lead in Fighter Trainer-42 (HLFT-42) proved to be a crowd puller at the stall. The scaled model can remind one of the HF-24 'Marut', the first fighter jet developed in India. Hence many exclaimed, if 'Marut' is reborn!

Claimed to be the next generation supersonic lead-in fighter trainer will be designed to train pilots for the ever evolving fifth generation combat environment! According to HAL, it incorporates an ultramodern training suite enabling hyperreal combat situations to train fighter pilots in a perfectly standardised safe and efficient flying environment. Thus it offers unique operational capabilities to meet unforeseen future threats. The HLFT-42 is a purely HAL product which is being designed and developed by their own without prior requirements from the Indian Air Force (IAF). Once fully developed, will open the doors to multiple opportunities not just at home but abroad as well.

The physical dimensions are not revealed yet. It will have an all up weight (AUW) of 16.5T and payload capacity of more than 4.5T! According to the representative it will be powered by a General Electric F414 engine! One can expect this will be the same F414-GE-INS6 variant which will be used to power LCA Mk-II, AMCA Mk-I and TEDBF as well. Though, alternatively GE F404 engine is offered as potential requirement by the customer. The ultramodern avionics will incorporate an Active Electronically Scanned Array (AESA) radar, an Infrared Search and Track (IRST), advanced Electronic Warfare (EW) suite and will feature Fly by Wire (FBW) control as well. It will carry ten beyond visual range air-to-air missile (BVRAAM) and two short range one. Thus for air-to-air operations it will have a solid punch.







One can wonder the necessity of investment by HAL in a totally new platform when the IAF already has advanced trainers. Infact India in past some years has successfully developed several new trainer platforms like HTT-40 turboprop basic trainer and HJT-36 subsonic intermediate jet trainer. While BAE Hawk 132 works as advanced jet trainer for the pilots, it can't provide the necessary training to witness combat environment for an advanced fourth generation fighter jet. This is why afterwards the pilots need to be trained on the trainer variant of the specific fighter jet. Meanwhile, HAL brought an internally funded programme 'Hawk-i' to provide an advanced jet trainer. The Hawk-i is being extensively used for certification of systems and indigenous weapons. Simultaneously the ongoing LCA SPORT (Supersonic Omni Role Training Aircraft) programme will be the LCA Mk-I twin seater trainer stripped of high end sensors and avionics

and will be used to train pilots, after AJT session, before induction to frontline platforms. But none of them can be true alternative to fighter jets for pilots. The HLFT-42 will address this issue, as it will simulate training specific environment for any fighter jet one pilot does need to be trained on. Besides, no other platform will provide the pilots the opportunity to explore fifth generation environment without being on a fifth generation fighter jet!

The HLFT-42 in several features will suppress several training platforms around the world. One can wonder why the platform is to be powered by such a powerful engine which is generally not necessary for a 'LIFT'. As for an example the Boeing-Saab T-7A Red Hawk, designed to replace current Northrop T-38 Talon, which will be the new advanced jet trainer of the United States Air Force (USAF) is powered by much less powerful General Electric F404-GE-103 engine. But HLFT-42 is being developed to be more than just a 'LIFT', while potentially it can play the role of future light attack platform. Besides, the superior kinetic performance will enable the pilots to train for a twin-engine platform. The long endurance will help in training for multiple combat situations and exercises. Similarly, the AESA radar and other advanced features will provide superior capability than (most of) the other training platforms.

But this is still just a concept and will take years for successful completion of the project. While the unique indigenous product might draw attention from the IAF in future, the success in the global market will depend on multiple factors. The potential competitors are also improving their own products. As for example, both the Korean FA-50 and the American T-7A are planned to be equipped with AESA! Incorporation of several new features will narrow the chance of a totally new product in the market. But keeping all these in mind, no stone will be unturned by HAL. HLFT-42 still will have such features (like IRST) which no other equivalent can provide! It must not be forgotten that while most of the other such products are designed to train pilot for a fourth generation platform, Indian one will provide unique opportunity to explore the fifth generation world!

The HF-24 'Marut' was a glorious success for India. But unfortunately, it couldn't be used at its full potential. It could be the first supersonic fighter for India, but the lack of adequate engine shunned the capability. Even later, several different projects had been envisioned based on the HF-24 which could alter Indian aviation history forever, unfortunately none was continued. The HLFT-42 brings uncanny similarity being the first in house designed supersonic trainer aircraft for IAF and featuring superior capabilities than the contemporaries. The HLFT-42 has the potential to be the origin of future advanced light jet variants. It will be a mistake to ignore an indigenous platform designed specifically for the fifth generation combat environment. HAL is highly optimistic of success and we are all waiting eagerly for the first flight of the 'Marut' of the new era. 🥁

Article and photos: Sankalan Chattopadhyay (Twitter @vinoddx9)

VAYU at Aero India 2023:



Arrival on 10 February on Indigo Airlines.



On arrival at Bangalore—lull before the storm!





The very busy Vayu Team!



Post briefing at start of Day 1 of the Show.



Our Show Dailies were well received by all and could be seen at every corner of Yelahanka.



The Distribution Team readying themselves for distribution of the Vayu Special Issue and Show Dailies.



General happy mood knowing that no more Show dailies needed to be produced.

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a brief photo story



15 February: Last day for us at the event on Day 3.



Vayu's Abhishek and Rishav happy to be in a vantage position for photography.



Some fooling around outside Saab's stand and display of a Gripen mockup outside Hall C.



Approximately 7:30am after reaching Yelahanka to begin a new day. A quick pose by Vayu's Abhishek, Rishav, Sankalan and Tejaswi. Happy on arrival and grumpy by the evening.



15 February: End of the Show for us and departure by Vistara Airlines to our various destinations.



Final gathering and recap before departure.



Dinners and pubbing obviously needed to be done for the full airshow experience.

FLY NAWY, FLY A HISTORY OF INDIAN NAVAL AVIATION

SEALAND, FIREFLY SUPER CONSTELL 4iG-29K, P-8I, ALH, LCA NAVY, HAV SEALAND, FIR SUPER CON

LCA N SEALAN SUPEN 4iG-29N

SEALA SUPE MIG-29K LCA N SEALAND

SUPER CO IIG-29K, P-8I, LCA NAVY, I SEALAND, FIR SUPER CONS

SUPER CONSTELLATIO iG-29K, P-8I, ALH, SEA LCA NAVY, HAWK, SE SEALAND, FIREFLY.

JPER CONSTELLATIO

PUSHPINDAR SINGH ANGAD SINGH

नो चरुणः

, DO 228, SEARCHER II, 31, MQ-9B, DOVE, H-30(ANDER, HPT-32, MI-4 IRE, KIRAN, CHETAK, DO 228, SEARCHER II,



1st P-8A Poseidon for New Zealand



New Zealand has received the first of four Boeing P-8A Poseidon maritime patrol aircraft in a ceremony at the Museum of Flight. The milestone comes four years after the New Zealand Government entered into an agreement with the US Navy for the P-8A. New Zealand's three remaining P-8 aircraft are all in advanced stages of production and will be delivered later in 2023.

Korea for 18 CH-47F Chinooks

Lockheed Martin's 1st sea-based hypersonic strike capability



Lockheed Martin is partnering with the US Navy to integrate hypersonic strike capability onto surface ships. The US Navy awarded Lockheed Martin a contract worth more than \$2 billion, if all options are exercised, to integrate the Conventional Prompt Strike (CPS) weapon system onto ZUMWALT-class guided missile destroyers (DDGs).

LM and NGC LoI with Rheinmetall



The Republic of Korea (ROK) has requested to buy eighteen CH-47F helicopters; forty-two T55-GA-714A engines (36 installed, 6 spares); twenty-two Common Missile Warning Systems (CMWS) (18 installed, 4 spares); and forty-four secure radios, RT-1987 (36 installed, 8 spares), etc.



Lockheed Martin and Northrop Grumman have signed a letter fintent with Rheinmetall as a promising strategic source of supply for the F-35 centre fuselage. This potential partnership would establish a second F-35 center fuselage integrated assembly line (IAL) in Germany, expanding the significant role European industry plays in the F-35 programme.

AVIATION & DEFENCE

1st C-130J-30 for Indonesia

Lockheed Martin delivered the first of five C-130J-30 Super Hercules tactical airlifters to the Indonesian Air Force (IDAF) during a ceremony, commemorating a new era in Hercules operations for this longtime C-130 operator.



Saab receives NLAW order from Finland



Finland placed the order within a framework agreement between Saab and the Swedish Defence Materiel Administration. This agreement allows Finland to place orders for NLAW as well as Saab's Carl-Gustaf recoilless rifle, ammunition and the AT4 disposable weapon. NLAW is a shoulder-launched, anti-tank missile system that attacks the tank from above.

Saab responds to NATO RFI with GlobalEye

Saab has responded to a Request for Information (RFI) from NATO's Support and Procurement Agency regarding a new



generation of surveillance and control capabilities. Saab's response is based on GlobalEye. NATO will define its new generation capability within the Alliance Future Surveillance and Control (AFSC) project.

Norway for 54 New Leopard 2 A7 MBTs

The Norwegian military procurement authority NDMA has commissioned Krauss-Maffei Wegmann GmbH & Co. KG (KMW) with delivering 54 of the latest Leopard 2 main battle tanks (A7 NOR). The vehicles are scheduled for delivery from 2026 to 2028. It also includes the option of having an additional 18 Leopard 2 A7 NOR vehicles delivered.





Egypt for 12 Chinooks

The US Army has awarded Boeing a contract to produce 12 new CH-47F Chinooks for the Egyptian Air Force. With this \$426 million foreign military sale, Egypt will replace its fleet of CH-47D aircraft with the modern F model.



Austal USA delivers EPF-13



A ustal Limited (Austal) has delivered Expeditionary Fast Transport USNS Apalachicola (EPF 13) to the United States Navy; the largest surface ship in the fleet with autonomous capability. Building upon the highly automated hull, mechanical and electrical systems already installed on the Spearhead-class Expeditionary Fast Transport ships, designed by Austal Australia, the Austal USA team (in partnership with L3Harris and General Dynamics Mission Systems) added automated maintenance, health monitoring, and mission readiness to provide EPF 13 with the capability to conduct up to 30 days of operation without human intervention.

US Army to modernise Shadow TUAS

Textron Systems announced the US Army exercised an option valued at up to \$76.1 million to provide continued contractor logistics support; field service; maintenance including hardware,



spares and repairs; and engineering support for existing Shadow Tactical Unmanned Aircraft Systems (TUAS). Also scheduled are upgrades of Shadow systems to the significantly improved Block III configuration.

Boeing awarded NASA sustainable flight demonstrator contract



NASA has selected Boeing and its industry team to lead the development and flight testing of a full-scale Transonic Truss-Braced Wing (TTBW) demonstrator airplane. The technologies demonstrated and tested as part of the Sustainable Flight Demonstrator (SFD) programme will inform future designs and could lead to breakthrough aerodynamics and fuel efficiency gains.

USAF contract for 15 KC-46A tankers

The US Air Force has awarded Boeing a \$2.3 billion contract for the ninth production lot of 15 KC-46A Pegasus tanker aircraft. To date, 128 KC-46A Pegasus are on contract with the US Air Force, with 68 delivered and operationally deployed worldwide.



AVIATION & DEFENCE

New capability for the Black Eagle 50H

Steadicopter and BIRD Aerosystems have unveiled the BlackEagle 50H (BE50H) – an advanced hybrid unmanned helicopter, featuring a miniature airborne radar with advanced proprietary technology, for use in maritime intelligence missions.



EH216 AAV in Japan



E Hang Holdings Limited announced that its EH216 passengergrade AAV has completed its first passenger-carrying autonomous flight demonstration within Japan, which also marks the first passenger-carrying flight for an autonomous eVTOL aircraft in Japan.

Safran's Euroflir 610 for Eurodrone



Safran Electronics & Defense has signed a contract with Leonardo to develop and supply the Euroflir 610 high-performance airborne electro-optical (optronic) system for the Eurodrone programme. Derived from the Euroflir 410 architecture, the Euroflir 610 is a 25-inch airborne optronic system that is vital for the European MALE UAV's ISTAR missions (intelligence, surveillance, target acquisition and reconnaissance).

Safran's JIM for ADF

Safran Electronics & Defense Australasia Pty Ltd has signed a contract with NIOA for the supply of more than one hundred JIM Compact's for the LAND 159 Tranche 1 – ADF sniper system – to equip the Australian Defence Force. The Safran JIM Compact multispectral surveillance device, critical element of military operations and real-time tactical information, has been selected to improve sniper system surveillance, accuracy and performance in a wide range of environments.





BAE delivers 5th Astute to Royal Navy

HMS Anson, the fifth Astute class submarine, which BAE Systems has designed and built for the Royal Navy, has departed the Company's shipyard in Barrow-in-Furness, Cumbria, and headed out to open sea for the first time. She will undertake sea trials before joining HMS Astute, HMS Ambush, HMS Artful and HMS Audacious, in operational service with the Royal Navy.



Safran SBH support for Yellowhead Helicopters



Safran Helicopter Engines has signed a contract with Yellowhead Helicopters to support Arriel powering its AS350 and H125 fleets. This Support-By-the-Hour (SBH) contract formalises a long-term Maintenance, Repair and Overhaul (MRO) and services agreement supporting 21 engines.

Leonardo and Safran partner for AW09

Leonardo and Safran Helicopter Engines announced they have joined forces to further enhance the capabilities and



competitiveness of the next generation AW09 single-engine helicopter. The production aircraft will feature the 1,000 shp class of power Arriel 2K engine, the newest generation of the Arriel family.

Bell completes Bahrain AH-1Z POR

 $B^{\rm ell\ Textron\ Inc\ has\ completed\ the\ AH-1Z\ programme\ of\ record}_{\rm (POR)\ for\ the\ Kingdom\ of\ Bahrain.\ Bell\ delivered\ the\ final\ production\ aircraft\ to\ Naval\ Air\ Systems\ Command\ in\ December\ 2022.}$



Philippine and Rafael's integrated naval combat suite

 $R_{\rm SHALDAG\ MK5}$ vessels with a fully-integrated naval combat suite have been commissioned by the Philippine Navy. The two





vessels manufactured by Israel Shipyards Ltd., provided to the Philippine Navy, serve as the first fully-integrated vessels with the naval combat suite out of a total of 9 which the Philippine Navy will ultimately receive.

Leonardo and WZL1 and the Polish M-346 Bielik



Leonardo and Wojskowe Zaklady Lotnicze Nr 1 S.A. (WZL1), part of the PGZ Group, have signed a contract for the long-term support of the Polish Air Force M-346 Bielik fleet, improving the existing cooperation.

Rafael's Spyder and counter TBM capabilities

Refeated says its combat-proven Spyder air defence system is now enhanced with a sophisticated Counter-TBM (tactical ballistic missiles) capability. The introduction of this feature is the product of Rafael's Counter-TBM Spyder programme, which involved researching and analysing the lessons learned from recent and ongoing armed conflicts involving extensive use of tactical ballistic missiles.



US Army awards four prototyping contracts for CTT programme



The US Army is set to replace its heavy tactical truck designs from the 1980s with the new Combat Tactical Truck (CTT) programme. The CTT programme aligns with similar modern tactical truck acquisitions made by western armies including Germany, Australia, the UK, Norway, Sweden and other NATO countries. The US Army plans to evaluate CTT prototypes in early 2024 and make a decision in 2026 to move forward with a full and open competition Request for Proposal. The estimated value of the initial CTT production, covering approximately 5,700 vehicles, is estimated to be US\$5 billion.

The CTT family will be based on modified commercial offthe-shelf technology incorporating state-of-the-art capabilities not currently found in the US Army's legacy military trucks. The trucks will have inherent modularity to allow for easy component exchange or upgrades over their service life and will have maximum commonality with civilian base models for costeffective replacement and upgrades. The use of common chassis, powertrain, and transmission will simplify maintenance and the trucks will also incorporate commercial Advanced Driver Assist Systems for enhanced safety. The CTT must also be able to include armoured replaceable cabs, MRAP-level protective features, and be able to withstand chemical, biological, and radiation/nuclear decontamination.

Recently, the US Army on 27 January 2023 selected four companies to build prototypes for the CTT family. Navistar Defense, Mack Defense, Oshkosh Defense, and the team of GM Defense and American Rheinmetall Vehicles will deliver three prototypes for the three CTT variants, according to an army statement. The contracts, worth a total of US\$24.25 million, are for prototypes of the M915 Line Haul Tractor, M1088 Medium Tractor, Palletized Load System (PLS), and Heavy Expanded Mobility Tactical Truck (HEMTT). The prototypes and corresponding digital designs are to be delivered by the end of 2023, with evaluations starting at the beginning of the 2024 fiscal year. The Army Requirements Oversight Council will make a decision on final requirements in 2026, and the competition for a production contract will begin thereafter, based on updated requirements.

Courtesy: Tejaswi Singh

Rolls-Royce racing with NASA for Advanced Nuclear Propulsion Technology

B ritish aerospace firm Rolls-Royce has entered the race to develop a nuclear rocket engine following a partnership between NASA and the Defence Advanced Research Projects Agency (DARPA). The company, known for its work in military and civilian aircraft, submarines, and other machinery, has a space division and recently teased the development of a micro nuclear reactor. The nuclear propulsion industry is seeking to use High-Assay, Low-Enriched Uranium (HALEU) as fuel, which it is speculated that Rolls-Royce's engine will also use. The partnership between NASA and DARPA has determined a safe fuel for nuclear rocket engines, which have been used in military ships but pose complications for aerospace due to their high level of radioactivity.

Rolls-Royce has been working on its own small modular reactor (SMR) since 2015 and aims to bring it online by 2029 as part of the UK's plan to transition to low-carbon energy sources. The SMR, considered the most powerful currently in operation or under licensing by the International Atomic Energy Agency (IAEA), is expected to generate 470 megawatts of electricity with an initial cost of \$3 billion. The teaser released by Rolls-Royce appears to extend their SMR, the "Rolls-Royce Micro-Reactor," which is being considered as a potential power source for a human presence on the moon.

In addition to the Micro-Reactor, Rolls-Royce is developing a ramjet engine and a power plant that uses naturally decaying radioactive material. The company is working with the UK Space Agency to examine the role of nuclear power in space exploration and is currently testing ten heaters to assess the impact on engine temperature, voltage, power, and system load. There is a possibility that the company is using a Stirling engine in its power system, which was demonstrated by NASA and the Los Alamos National Laboratory in 2012.

While the concept of nuclear engines may seem cutting-edge, NASA conducted six successful tests in the 1960s as part of their exploration plans for Mars and the solar system. These tests utilised the Kiwi engine prototype under the Nuclear Engine Rocket Vehicle Application (NERVA) programme and achieved a specific impulse of 701 seconds, with theoretical vacuum



(Image Courtesy – Rolls-Royce)

impulse estimated to exceed 900 seconds. Specific impulse, a key metric in aerospace engineering that calculates efficiency by dividing thrust generated per unit of time by the mass used, makes the NERVA engine a benchmark for future engine design and performance. The NERVA engine's 701 second specific impulse is significantly higher than other well-known rocket engines, such as the RS-25 with 462 seconds and SpaceX's Raptor 2 which aims for 382 seconds.

Courtesy: Tejaswi Singh

Lufthansa orders 10 A350-1000 and 5 A350-900

Lufthansa Group has signed an agreement with Airbus to expand Lits fleet by 10 Airbus A350-1000s and 5 Airbus A350-900s. With this firm order for the latest generation widebody aircraft, the airline will continue its decarbonisation trajectory.



EGYPTAIR delivery of 1st A321neo



EGYPTAIR took delivery of its first A321neo from Airbus' Delivery Centre in Hamburg, making the airline the first African operator of the aircraft.



Embraer A-29 Super Tucano agreement with Philippine AF



E mbraer announced that it has signed a services agreement with Tucano aircraft. This agreement will provide support for more than 200-part numbers of the A-29 Super Tucano.

Belize MoD'ss 1st Cessna Grand Caravan EX



Textron Aviation Inc announced it had delivered a special mission Cessna Grand Caravan EX aircraft to the Belize Ministry of National Defence and Border Security. The Foreign Military Sale (FMS) contract was executed by the US Army Contracting Command, Redstone Arsenal, Huntsville, Alabama.

Australia for 63 AARGM-ERs

Australia has requested to buy up to sixty-three Advanced Anti-Radiation Guided Missiles-Extended Range (AARGM-ERs) and up to twenty AARGM-ER Captive Air Training Missiles (CATMs).



United Kingdom for 600 Javelin missiles

United Kingdom has requested to buy up to six hundred Javelin FGM-148F missiles (includes twelve fly-to-buy missiles). Also included is US Government technical assistance and other related elements of logistics and programme support. The total estimated cost is \$125 million.





Boeing, US Army Apaches achieve 5M FH



B oeing and the AH-64 team are observing a unique milestone as the US Army's AH-64 Apache attack helicopters have officially reached five million flight hours. The accomplishment is equivalent to flying nonstop for more than 208,333 days or 570 years and nine months. Additionally, 1.3 million of those five million flight hours were accomplished during combat.

Boeing receives USAF E-7 AEW&C contract



BAirborne Early Warning & Control (AEW&C) aircraft through a \$1.2 billion Undefinitized Contract Action. The E-7 provides a fully integrated, combat-proven, flexible command and control node that delivers multi-domain awareness in the most challenging operational environments.

GA-ASI selected for Japan's MALE RPAS project



General Atomics has been selected to support the Japan Maritime Self-Defense Force (JMSDF) Medium-Altitude, Long-Endurance (MALE) RPAS Trial Operation Project. The project will feature GA-ASI's MQ-9B SeaGuardian and will begin in April 2023.

Airbus achieves in-flight autonomous guidance of drone from MRTT

A irbus Defence and Space and the company's wholly-owned subsidiary, Airbus UpNext, have achieved in-flight autonomous guidance and control of a drone using an A310 MRTT. In a first step towards Autonomous Formation Flight and Autonomous Airto-Air refuelling (A4R), the technologies demonstrate a significant breakthrough for future aerial operations involving manned and unmanned assets.

Known as Auto'Mate, the technologies were integrated on an A310 MRTT flying testbed, which took off from Getafe, Spain, on 21 March, and on several DT-25 target drones, acting as receiver aircraft and flying from Arenosillo Test Centre (CEDEA) at Huelva, Spain.



Gulfstream G650ER in the Netherlands

The Gulfstream (G650ER) arrived on 15 March 2023, at Eindhoven Air Base (ICAO code EHEH). The aircraft will be in the Netherlands until the end of March/early April for training pilots and maintenance personnel. The aircraft has the tailcode V-117. Jet Aviation bought the aircraft last year on behalf of the Ministry of Defence. Subsequently, the company converted the newly used passenger aircraft to the required configuration. The conversion has now been completed and the aircraft has now been handed over to the Ministry of Defence.





The G650ER dates from 2015. The device has approximately 2,000 hours on the clock. The G650ER replaces the Gulfstream IV. It has been in use by the Air Force since 1996 and is now at the end of its service life.

V-IC

The new defence acquisition has yet to be fitted with a self-protection system. For this purpose, the G650ER will be flown to AMAC Aerospace in Basel, Switzerland. The device is expected to return in the second half of July. Then the Air Force will start using this VIP aircraft.

Photos: Joris van Boven and Alex van Noije Text: Ministry of Defence



way for the fast jet Stormo training: **61**

he Aeronautica Militare (AM-Italian Air Force) allocated considerable resources (in human, financial and material terms) in its Flying Schools to maintain its pilot training syllabus at the "state-of-the-art" in order to guarantee high training standards to its own pilots and for those sent by Allies and partner nations. Among the Flight Schools, a pivotal role is played by the 61° Stormo (61st Wing).

Since its establishment in September 1946, this prestigious unit is based at Lecce-Galatina Airbase, Puglia, in Southern Italy and nowadays, it is tasked for the fast jets training, in accordance with the characteristic "jet ab initio" training philosophy implemented decades ago which consist into train - after the basic training -all its pilots on jets instead using turboprops.

Due the effectiveness of its modular syllabus, the School gained a lot of interest from abroad, a fact confirmed by the growing number of foreign personnel posted in Galatina thanks to international training agreements between AM and other foreign air forces. Personnel from Argentina,

Austria, France, Germany, Greece, Japan, Kuwait, the Netherlands, Poland, Qatar, Saudi Arabia, Singapore and USA flown in the past or are actually flying within 61° Stormo, attending the flying courses or working as instructors.

The daily flight activity at Galatina is very intense, an average of 40/50 missions carried out every day by the 212° Gruppo (squadron) 213° Gruppo and 214° Gruppo each one with a specific task within the fast jet training programme.



Frontal view of MB-339CD, the upgraded version of MB-339A. Note the different nose and the in-flight refueling probe

214° Gruppo

"Once the cadets selected to become pilots after completing all courses and exams at the Air Force Academy, as well as the Basic Pilot Training (aka "Phase 1") at the 70° Stormo at Latina airbase (flying with the SIAI-Marchetti SF260EA piston engine trainer), they come here at 214° Gruppo in order to begin Phase 2 (Primary Pilot Training). Those who are selected to fly Phase 2 are expected to complete their training either in Greece (Kalamáta air base) or USA (joining for example, the ENJJPT - Euro-NATO Joint Jet Pilot Training programme at Sheppard AFB). We also train foreign pilots who do not necessarily carry out Phase 1 in Italy, mainly depending on their Air Forces requirements, therefore on the international agreements" explained the pilot instructor Major O.A.

"Here we do the so-called "track selection" deciding the most appropriate role for each of student pilots evaluating both the attitudes and trainees' performances. Once Phase 2 is successfully completed, they are screened and selected to fly either fighters, Unmanned Aerial Systems (UAS), transport aircraft or helicopters", he concluded.

The ground school lasts 25 days, while the flying syllabus consists of 37 sorties in 45 hours at the simulator and 75 flying sorties including 6 solo flights - for a minimum of 88 hours. Consisting of 4 steps, the 6-month programme allows students to become familiar with a wide range of aviation skills that will be useful for the upcoming years: mission planning (weather, NOTAMS, route and fuel), aircraft handling (from basic take-off and landing, to exploration of the flight envelope through aerobatics), radio communication procedures, emergency procedures management, instrument flights in adverse weather, mutual support in formation and the risks involved in low altitude and night flights.

Pilots flying with the MB339A/MLU the oldest version in service of the jet trainer, symbol and workhorse of the 61° Stormo since its introduction in 1982.

MB339 derived from the previous MB326, sharing most of its airframe except for the forward fuselage, which was redesigned with a raised rear seat allowing better visibility for the instructor, and retaining the Rolls-Royce Viper turbojet engine, although in an improved version. Over the years, the MB339A fleet received a Mid-Life Update (MLU), mainly concerning radio and navigation equipment, including GPS.

213° Gruppo

Those selected for fighter aircraft remain in Galatina, moving to 213° Gruppo for Phase 3 (Specialised Pilot Training), flying the MB339CD, the updated and improved version of the MB339A.

The main innovation is installed in the glass-cockpit with three colours screens Multifunction Display that replaced the analogic one of the MB339A and the Head



M-346 at landing. Although with no roundel this airframe is one of the six bought by Qatar Emiri Air Force. Note the Qatari flag on the IFTS badge on the tail.



One of the four M-346s belonging the IFTS taxiing out for the next sortie

Up Display for both pilots. Externally, the type features a new tail, a re-designed nose fitted with new avionics and in-flight refuelling probe.

"Flight performance is almost identical as the "Alpha" version, the aircraft handling is quite smooth for those coming from 214° Gruppo (a minimum of 90,5 hours in 78 flying sorties plus 40 hours in 30 missions at simulator is the standard syllabus required to complete Phase 2), while it takes a little longer for those who have attended Phase 2 abroad," stated Lt J.V., instructor pilot at the 213° Gruppo. "Having previously only flew turboprop, they need to master a jet trainer first. Going from being pulled by the propeller or pushed from behind with different engine response, different times to climb and gain speed etc gives you a very different feeling! In addition, they must
familiarise themselves with the procedures and working areas around Galatina. In their case, the ground school has a duration of 30 days instead of 15-20, followed by 118 hours in 92 sorties plus 48 hours in 38 missions at the simulator. The possibility of using the simulator is fundamental, because it allows to repeat the procedure many times at "zero" cost".

The syllabus goes on with the following steps called "Composite" (mixed flight VFR/IFR, aerobatic with G force increase, high angles of attack), "Formation" (basic, advanced and tactical formation flight), "Low Level" and then proceeding with advanced handling, starting BFM (Basic Fighter Maneuvers), air-to-ground activities at shooting range, in-flight refuelling and introduction to night flight (paying attention especially to visual illusions and spatial disorientation).

Having to prepare the trainees for the fighters, the instructors themselves are former fighter pilot with "combat ready" status.

212° Gruppo

After Phase 3 is completed with obtaining Brevetto Pilota Militare (BPM Military Pilot's License), pilots goes at 212° Gruppo, making their final step before being assigned to the frontline unit: Phase 4, or Lead In to Fighter Training (LIFT).

The rapidly changing technology, especially with the introduction in service of 4.5 and 5-generation fighter aircraft such as Eurofighter Typhoon and F-35 Lightning II has imposed a radical revolution in the implementation of LIFT.

To do this, the AM introduced, in 2015, the Integrated Training System (ITS) composed by Leonardo M346 Master advanced jet trainer, along with its associated Ground Based Training System (GBTS).



The M-346 can be fitted with the refueling probe. In flight refueling missions are part of LIFT syllabus





Major I.F. instructor at 212°Gruppo explained, "LIFT is done with 96 sorties (89,4 hours) at simulators and 79 flying the M346 (89 hours). We make great use of simulators, a total of 21 sorties on the various types are normally carried out every day. Everything that is done in flight is first tested on the simulator".

In fact, alongside, the ground school carried out training through a dedicated online platform with CBT (Computer

Based Training), the trainee learns basic aircraft systems and procedures through the basic simulator called SBT (Simulation Based Training). It consists of nine workstations interconnected, each one equipped with six displays and a perfect replica of ergonomics HOTAS (Hands On Throttle-And-Stick) and engine throttle that allow the familiarisation with airplane's basic settings, learning how to use the throttle, make the checklist, etc. The next level is the use of PTT (Partial Task Trainer) basic simulator, equipped with a full replica of the cockpit and a 180° visual screen. It is used to put into practice the acquired knowledge gained from CBT and SBT, to become fully familiar with instrumentation, to simulate basic flight, navigational flight and to deal with emergency situations.

The latest and most sophisticated simulator is the FMS (Full Mission Simulator) designed by CAE (Canadian Aviation Electronics) which consists of a faithful reproduction of the cockpit of T-346 and the dynamic G-seat, inserted inside a 360° spherical screen with 25 projectors providing images. FMS also has devices that are found in the aircraft during a real flight such as G-suit, oxygen system, HMD (helmet-mounted display) and NVG (night vision goggles).

Regarding the flying part, he stated, "We start with the initial handling, flight patterns, instrumental flights, formation flights. Then we have "advanced" training where missions focus on air-to-air, air-toground, aerial refuelling, range and night flight with NVG. The aircraft features an embedded simulation capability called





Embedded Tactical Training System (ETTS), which is able to simulate on-board sensors such as radar, ECM, targeting pods, weapons and can generate realistic Computer Generated Forces in a tactical scenario. This is loaded before take-off when the ETTS works in a standalone mode. Moreover, the flying aircraft can be linked together with PTT and/or FMS via data link when needed, working in a network that allows us to create what we call a Live Virtual Constructive environment: as in augmented reality the pilots who are flying on the airplane can interact with those who are at the simulator, working together and "seeing" the same things. Here on the ground through the real-time monitoring station, an instructor can interact with all the pilots connected together changing the tactical scene by generating hostile forces such as SAM sites, ships, enemy aircraft, ground target, to enable more complex activities. At the cost of one-hour flight, however, involving a larger number of planes. All the data recorded during the session can be extracted, reviewed and evaluated during post-mission briefing".

Future of 61° Stormo and the IFTS

Its effectiveness along with the growing demand for pre-operational fighter training has exponentially increased the interest from abroad towards the 61° Stormo. This has also favoured the creation of the International Flight Training School (IFTS), a partnership between AM and Leonardo company.

The first has a leading role, providing training expertise by establishing, supervising, evaluating and guaranteeing the quality standards and training the civilian instructors belonging to the IFTS and those destined to operate with simulators.

Leonardo provides, along with its own four M346s, civilian instructors and technical ground personnel for maintenance and logistical support of the fleet and simulators.

"The high number of pilots that the IFTS brought here to Galatina meant that the spaces, both inside the airport and in the neighbouring airspace, were no longer sufficient to handle this workload. To deal with this, it was decided to move the 212° Gruppo and the IFTS to Decimomannu Airbase, Sardinia, although they will continue to depend on the 61° Stormo. Actually, we have about 60 pilots in training but thanks to the large training areas, the possibility of using the new dedicated buildings, adding new simulators and the presence of shooting ranges, the forecast is to be able to double this number," concluded Major I.F.

A further step will be related to the MB-339's replacement within 213° Gruppo and 214° Gruppo. Even if the MB339 is still - after 40 years, over 400,000 flight hours achieved and more than 2,500 trained pilots - being recognised as a good trainer, robust, reliable and "easy" to fly, it is starting to become difficult to maintain. A withdrawal date has not been decided yet but its replacement will be the Leonardo M345.

Despite having the performance and effectiveness of a jet, the M345 has operational costs and simplified maintenance, comparable to those of a turboprop, borrowing the ITS concept from the M346.

Photos and text: Fabrizio Capenti and Simone Marcato

MMU IOC at Eindhoven AB



n 23 March 2023, at Eindhoven AB (ICAO code: EHEH), NATO Secretary General, Jens Stoltenberg, traveled to the passenger terminal of Eindhoven Air Base, to take part in the ceremony marking the Initial Operational Capability (IOC) of the new Multinational Multi-Role Tanker Transport aircraft fleet. The fleet, an important example of NATO-European Union cooperation, will perform key functions such as air-to-air refuelling, air transport and medical evacuation.

The event was hosted by Kajsa Ollongren, Minister of Defence of the Netherlands. Ministers and high-level officials from the countries participating in the MRTT project, as well as the European Commissioner for the Internal Market, Thierry Breton, and representatives of other organisations that are facilitating the project, also took part in the event.

Next to the IOC event, was there another event. The 10th Airbus A330 MRTT aircraft was officially ordered and the contract was signed by Ludivine Dedonder for Belgium, Siemtje Möller for Germany, François Bausch for Luxembourg, Kajsa Ollongren for the Netherlands and Anne Marie Aanerud for Norway. After the



signing of the contract, there were speeches by Jurgen van der Biezen, the commander of the Multinational MRTT Unit, Kajsa Ollongren, minister of Defence of the Netherlands, Thierry Breton, European Commissioner for the Internal Market and Jens Stoltenberg, NATO Secretary General.

Jurgen van der Biezen received from Kajsa Ollongren symbolically the IOC status, formed by a model tail of an A330.

On the Eindhoven AB tarmac, two A330 MRTT aircraft were located. One in the tanker configuration and one in the MEDEVAC configuration.

The MMF programme (Multinational MRTT Fleet) brings together six European countries:

Germany (5,500 flight hours), the Netherlands (2,000 flight hours),





Luxembourg (1,200 flight hours), Belgium (1,000 flight hours), Norway and the Czech Republic (100 flight hours each).

The acquisition of the ten A330 MRTTs was carried out by the Organisation for Joint Armament Cooperation (OCCAR), under the aegis of NATO. The logistics management of the fleet is provided by NSPA, NATO's support and procurement agency. With the 10th A330, the Belgian Air Force will get to 2000 flight hours.

Report by Joris van Boven and Alex van Noije Photos by Joris van Boven



Netherlands Detachment Tucson Arizona had five F-16AM's assigned. One of them being J-004/AZ which arrived at Sabca in December 2022

Draken International purchases European F-16's

Draken International is one of civilian companies in the USA contracted to provide adversary aircraft to US Department of Defence. Operating in the red air role, its aircraft provide realistic training to combat squadrons. Draken operates a fleet of A-4 Skyhawk, Cheetah, L-159, Mirage F.1 and MB-339 aircraft. In 2021, it was announced that the company bought F-16's from NATO members The Netherlands and Norway; following the move made by competitor Top Aces who had bought former Israeli Defence Force F-16's.

On 30 June 2021, the Netherlands MoD announced it sold 12 of its F-16's to Draken as part of its End Of Life Type (ELOT) programme. The contract with Draken contained an option for the delivery of another 28 F-16's. Except the Dutch fighters, Draken also purchased up to 12 F-16's from the Royal Norwegian Air Force, a contract announced by the Norwegians



The second flight arrived in Belgium on 23 January 2023

on 2 December 2021. Ten of the 12 Dutch F-16's were assigned to the Netherlands Detachment Tucson Arizona (NDTA). The other two withdrawn from use by 312 squadron based at Volkel.

RNLAF F-16's End Of Life Type (ELOT)

On 1 January 2019, the RNLAF had 68 F-16AM/BM fighters assigned to its squadrons. The number contained 61 operational and seven logistical reserve aircraft. These were operated by 322 squadron at Leeuwarden, 312 and 313 squadrons at Volkel and the NDTA. These F-16's are part of the End Of Life Type (ELOT) programme. From 2019 until the end of 2022, a total of 44 F-16's, including all dual seat F-16BM, were withdrawn from service. These contained the 10 Tucson based fighters. Within The Netherlands both 322 and 313 ceased F-16's operations and passed on their aircraft to 312 squadron based at Volkel. 312 squadron will continue to fly the aircraft until the end of 2024 when the last F-16's will cease operations. From 1 January 2023, the squadron had 24 F-16AM's assigned. Aircraft withdrawn from service are stored at the base and await their future. The Netherlands Defence Material Organisation (DMO) is responsible for the purchase of material for the armed forces



Back in April 2018 RNLAF F-16BM wore the NDTA, 148 FS markings. It's captured at its arrival at Leeuwarden AB to take part in exercise Frisian Flag

but also the sales of aircraft, vehicles and equipment withdrawn from use. ELOT aircraft are transferred to the DMO.

Netherlands Detachment Tucson Arizona (NDTA)

Training of RNLAF F-16 pilots took place in the United States. The Netherlands Ministry of Defence and the US Department of Defence have a long-standing relationship to train Dutch pilots and other personnel in the United States. F-16 training took place in Tucson, Arizona until mid-1995. The aircraft then returned to The Netherlands. In 2010, training was relocated to the USA again. This time, the Ohio Air National Guard's 162nd FS, 178th FW based at Springfield Beckley airport integrated their Dutch colleagues. As the wing transitioned to operation UAV's, the RNLAF relocated its training once again to Arizona. Organised with the 148th FS "Kickin' Ass", 162nd FW, AZ ANG the NDTA stood up. The 162nd FW operates from Morris ANGB, part of Tucson International Airport. NDTA had 10 F-16's assigned equally between the F-16AM and F-16BM. Its last class graduated on 29 July 2022, ending more than 25 years of training F-16 pilots in the United States. Pending their transfer to Draken International, the fighters were stored at Morris ANGB. On 12 October 2021, F-16BM J-882 was withdrawn form use by 312 squadron. The

aircraft was disassembled and transported by truck to the port of Antwerp, Belgium. From there, it was shipped to the USA and eventually turned up at Morris ANGB. It was recorded flying from the base by the local aviation enthusiasts. In the timeframe of August–December 2022, all 11 F-16's flew to Lakelinder International Airport, Florida. F-16Bm J-368, the twelfth F-16 destined for Draken, remained stored at Volkel.

Royal Netherlands Air Force relocates USA based F-16's to Belgium

On 13 December 2022, the Netherlands Ministry of Defence (MoD) issued a press release announcing it would fly the 11 US based F-16's to Belgian aviation company Sabca located at Charleroi. All were planned to arrive in Belgium on 15 December. However, it took until 30 January 2023 to get them all there. The official communication stated the transfer was needed as the transfer of aircraft to Draken was delayed and all fighters needed maintenance. Sabca is contracted to maintain Belgian and Dutch F-16's while the USAF also makes use of their services.

While the Netherlands is one of the members of the NATO Multinational MRTT Unit (MMU) based at Eindhoven, Netherlands and Cologne, Germany the MMU was not tasked to provide air refueling. MMU currently operates seven Airbus Defence A330MRTT's and utilises its annual flight hours for its members. The RNLAF annually has 2000 hours allocated to support its missions. Instead, the USAF provided its KC-10A and KC-135R/T tankers to fly the fighters over the Atlantic Ocean. The flight from Florida to Belgium was made in two legs. All tankers used a Reach 8x callsign, not a common callsign when dragging fighters over the pond.

The first leg was scheduled on 13 December 2022. Two cells (six and five aircraft each) would fly up the US eastern seaboard to the New York/Boston area. Their accompanying tankers departing Florida handed over the fighters to their colleagues for the flight to Lajes. Only the cell with six aircraft made the journey. Due to several reasons, the other five remained in the USA. Two days later, only four of the six F-16's managed to fly to Charleroi. The fleet of eleven aircraft now being scattered between the USA (5), Lajes (2) and Charleroi (4). This situation would last into the second half of January. On 21 January 2023, another attempt was made and the five F-16's joined their two sisters at Lajes. Two days later, two cells were planned to make the final hop consisting of four and three aircraft. Each to be accompanied by a KC-135. But the second cell cancelled. A week later, the 30th, they finally made their way Charleroi.

What will happen with the Dutch F-16s?

After the updated press release in 13 December 2022, no further communication was made by the Netherlands' MoD. Somewhere in the first quarter of 2023, the minister of defence will provide an update of the F-16 sales to Draken by the Dutch parliament defence committee. Perhaps, this will provide more information about the future of these Dutch F-16's as well as the 28 options in the Draken contract. are delivered. Both Belgium and Norway were contacted but both refused. The first needing the fighters until the F-35A has been received while the Norwegians sold their F-16's to Romania and 12 to Draken. The Netherlands MoD also rejected to supply the Bulgarians with the F-16AM/BM. Based on the contract with Draken that seemed a logical decision. Breaking down the 68 ELOT F-16's, 12 were sold to Draken with an option for another 28. Another 24 F-16AM will Meanwhile, in 2023 Ukraine also expressed its interest in acquiring F-16's as well as other fighter aircraft from NATO members. The Dutch government did not decline the request but as its Minister of Defence stated on several news outlets will review the request together with other NATO allies. The same as was done when Ukraine requested air defence missiles, tanks and other (heavy) army equipment.

What will be the future of the Dutch ELOT F-16's will most likely only be



After its participation at Frisian Flag 2018 J-882 received a tiger colour scheme to take part in NTM 2018 and then received its operational (312 squadron) colours and as such in Belgium on 23 January 2023

It is known that the Bulgarian Air Force (BulAF) requested to buy F-16's from their NATO colleagues. The Bulgarian MoD purchased eight brand new F-16V's from Lockheed Martin contracted by the US DoD on 2 April 2020. However, delivery of these F-16's is delayed. The MiG-29's operated by the BulAF are nearing the end of their career and are expected to be withdrawn from use by the end of 2023.

As interim measure secondhand F-16's would fill the gap until the F-16V's remain in the RNLAF inventory. Leaving just four aircraft. Of these, one was written off (J-001), one transferred to the Belgian Air Component (J-624 serving as instructional airframe), one transferred to the National Military Museum at Soesterberg (F-16BM J-066 known as Orange Jumper and former test aircraft). That leaves F-16AM J-063 which made history when shooting down a Serbian Air Force MiG-29 on 24 March 1999. It's currently stored at Volkel. known to a few people within the MoD and the RNLAF/DMO. When it turns out the contract with Draken is cancelled this would free up 40 F-16's. It is already strange to fly F-16's who received their maintenance in the USA back to Europe only to fly them back to the states. One can only wait until the defence committee has received the update of the Draken F-16 sale.

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



The operations with this new stealthy fighter carried out from Amendola Air Base show the airframe and working to the military professionals in the further integration of the airframe and working towards Full Operational Capability (FOC) status as we visit the Italian air base.

32 Stormo badge

Italy, as a major global player in the F-35 programme with a F-35 assembly/ production facility in its country, had its first "Lightning II" aircraft delivered in 2015. Together with 3 follow-on production aircraft, it was assigned for pilot training purposes in the USA and left Italy to make the trans-Atlantic crossing. By the end of 2016 another milestone was achieved when the first two F-35's were delivered to the 32 Stormo (wing) at Amendola Air base to become part of operational unit 13 Gruppo (squadron). Here we meet the 13 Gruppo Commander Lt.Col. Luca V. who has logged more than 2500 flight hours on aircraft types like MB-339, HAWK 115, AMX and of course the F-35. Before his current assignment as 13 Gruppo Commander, Lt.Col. Luca, with so-called combat name "Decker", was involved as Instructor Pilot in the US based F-35 pilot training for the Italian Air Force and tells us more about this programme.

13 Gruppo badge







US initial training

"For our F-35 training we entered the Pilot Training Centre (PTC) programme, where we conduct joined training together with the USAF and Norwegian Air Force within the 62nd Fighter Squadron of the 56th Fighter Wing", as Lt.Col. Luca explains. The PTC is based at Luke Air Force Base, Arizona USA, and is playing an important role in international F-35 pilot training which is displayed at best with Australia training within the based 61st FS, Danish and Dutch crews training in the 308th FS and the Republic of Korea in the 944th OG. Another nation to start training at Luke is the Belgian Air force, planned for this year (2023) when the first delivery is scheduled to take place. "For our Italian training we included a number of our own F-35's, together with the USAF 62nd FS and Norwegian aircraft. In our unit, our 3 nations share each other's aircraft and instructors for the joined training goal, resulting for example in an Italian pilot flying in a Norwegian F-35 guided by an American instructor", as Lt.Col. Luca continues. At Luke, the pilots receive their initial training which takes about 6 months.

Amendola

After that, the pilots return to Italy and join 13 Gruppo at Amendola. Here they will receive follow-on training, like flight- and formation lead qualifications and weapon training to become combat ready. During the training, the experience of a pilot is replicated in hypothetic scenarios. The pilots' performance is then evaluated if in accordance with certain levels of standard performance that must be achieved. When the performance is below the minimum standard level, the pilot must repeat that specific training as Lt.Col. Luca declares.

The F-35 training at Amendola is really complex and is composed out of synthetic (in a flight simulator) elements and live flying. Lt.Col. Luca "Decker" prefers to talk about synthetic training over F-35 flight simulator training, as it contains so much more these days. To achieve all annual requirements, one cannot rely on life flying only. The current synthetic training system is considered to be a key element in pilots training to become and remain qualified. It also provides much more trainings capacity, at lower operational costs.

The ongoing development of complex scenarios can only be trained in a synthetic

environment which the current system is providing. Training on flying skills only in a flight simulator does not provide the added value of a complete synthetic training. The advantage of synthetic training is that you can simulate very complex scenarios which are difficult to achieve in the normal daily flight activities, like flying in large formations or adding various threats in a hostile environment. "Although there are some large scale international exercises a year, we cannot join them all due to practical constraints like on personal, logistic and budget levels. Combining the synthetic and life flying training aspects, you shape the overall capabilities and skills of a pilot", Lt.Col. Luca explains and continues "that it is not only a combination of these types of training, but also the part of mission a pilot may do". When a pilot becomes combat ready it does not implicate that training is completed, new operational elements arise, of which a QRA sample is given by Lt.Col. Luca; "Our F-35's were involved in the NATO Air Policing mission and NATO QRA alert from Amendola, defending the south flank of the alliance".

QRA

For QRA it is important for a pilot to be ready, to be fast, jump into the jet and take off in accordance with the NATO standard procedures when the QRA order comes. One also has to be acquainted with the C2 (Command & Control) NATO policing structure. These are specific modular training aspects and when you reach that capability and can apply the knowledge in all procedures, you are ready to be employed in the mission. Besides the Air Policing, there is a large variety of mission possibilities for the F-35, so you can imagine our training remains complex, ongoing and wide".

The F-35's QRA duties are not limited to the NATO Air Policing missions, they can also be fulfilled in their home country on national level. Although the primary 24/7 QRA task is a responsibility of the Italian Eurofighter community divided over various bases, the F-35's contributes to carry out the Italian QRA, for definite periods, on specific assignment of the command staff of the Air Force.

"Although the F-35 deliveries to Amendola still continue, we already have more than a minimum number of aircraft to accomplish our missions" as Lt.Col.









Luca explains. With the earlier obtained Initial Operational Capability, the unit started joining international missions like the before mentioned NATO Air Policing missions. For these missions 13 Gruppo has been deployed four times of which three times to Iceland in 2019, 2020 and 2022 and one time to Estonia in early 2021. Next to national exercises, the F-35's from Amendola had also began to participate in large scale international exercises, like the Tactical Leadership Programme (TLP) in 2018, the Greek held Iniochos exercise in spring 2019, the USAF Red Flag exercise in 2020 and the Israel organised Blue Flag exercise in 2019 and 2021. "We were very enthusiastic for participating in these exercises, as we were able to do real life training with a large variety of involved assets. With the sophisticated sensors of our F-35's we were able to support 3rd and 4th generation fighter aircraft and were effective in achieving the overall mission goals in these COMAO's (Combined Air Operations)", as Lt.Col. Luca explains.

Falcon Strike

While participating in these regular organised international exercises, the unit perceived also a gap towards a dedicated training opportunity designed specifically for 5th generation platforms that cannot be achieved without a specific and dedicated

Operational Training Infrastructure (OTI). "Each F-35 operating force has its 5th generation training need, which is likely to increase the partnership in training and therefore the way ahead", as Lt.Col. Luca declared. As a result the Amendola based unit prepared exercise "Falcon Strike", which was finally held at its base during June 2021. The first edition brought F-35's together from the Royal Air Force, the USAF and US Marines Corps, The Israel AF, next to the resident Italian F-35's of 13 Gruppo, to fly specific trainings missions but also exploiting forms of interoperability in the field of maintenance between some Nations. "This big net of F-35 flight is something which needs to be explored. In other exercises you find new things, new trainings, but usually not specific for 5th generation. So in Red or Blue Flag and similar exercises you have to compromise", as Lt.Col. Luca sets out.

Additionally, he mentions; "together with partners you can find communality to develop a required OTI and make this training structure available for everybody. Italy is committed to further develop and improve this OTI".

In November 2022 already the second Falcon Strike exercise was organised with F-35 participants from the USAFE's 495 FS based at RAF Lakenheath, UK and Dutch aircraft from Leeuwarden air base. For 2 weeks the visiting aircraft flew with the Amendola F-35's from 13 Gruppo. New in the Falcon Strike 2022 edition was that Italian F-35's were also included in the "red forces" aggressor role, as these days 5th generation aircraft are not solely available to western nations. Additional support for





the F-35 missions came from USAFE F-16's from Aviano AB, Italy as well as from a wide variety of Italian aerial assets. With a positive participant feedback and the continuous training demands of 13 Gruppo, a further Falcon Strike follow up seems inevitable. Therefore it was no surprise that during the November 2022 edition, it was announced to return the exercise as a biennale event with the next planned for 2024.

Deliveries and FOC

13 Gruppo operates A and B models of the F-35 and both are produced at the Final Assembly and Check Out (FACO) facility at Cameri, Italy, in partnership with Leonardo's Aircraft Division. The unit is not jet at full strength and therefore awaiting future deliveries before finally reaching Full Operational Capability (FOC) status. In 2022 the northern Italian located air force base of Ghedi, with resident unit 6 Stormo, also started to receive Lightning II's as a replacement for their Tornado fleet. Next to the air force, the Marina Militare (Italian Navy) is another receiver of the F-35B models out of the FACO plant, to replace the aging AV-8B+ Harriers from the "Wolves" squadron. The B variant of the F-35 is Short Take Off and Vertical Landing (STOVL) capable and when assigned for naval operations, they will be executed from Naval Air Station Grottaglie, or at sea when embarked at the aircraft carrier ITS Cavour. When the air force is performing dedicated missions with the F-35B, they will be operated under the 32 Stormo command from Amendola.

Considering the ongoing distribution choices of new F-35's by the Italian Defence Command, a final FOC planning of 13 Gruppo is therefore not completely clear at this stage.

Text and photos: Peter ten Berg



Rajnish Sharma says...

I learnt more than flying from them: Air Marshal (R) Harish Masand

The First Supersonics, celebrating their Diamond Jubilee in March 2023, I thought this was an appropriate time to pay tribute to a living legend who not only converted the Squadron

on MiG-29s but also set a new bar on aerobatics and air combat. I have known Air Marshal Harish Masand since 18 March 1989, then a Wing Commander. In fact, it was an enrapturing experience as I watched him flying with graceful



dexterity his MiG-29 over Tilpat Firing Range during Air Power Demonstration (APD). It was a solo aerobatic display. The way he flew enthralled me and all the spectators. I could see the excitement among the onlookers as they watched him flying over the range. The whole sequence of his aerobatic display is still vivid in my mind. 9 G turn and Hammer Stall were particularly breathtaking. The next day's Hindustan Times newspaper carried an article about APD and described Wing Commander Masand's aerobatic display that stole the show from Thunderbolts aerobatic Team (the erstwhile aerobatic team of IAF). A similar write-up is in the VAYU issue in 1989. These bear testimony to Air Marshal Masand's flying skills. Even a layman like me could understand that his aerobatic display was extraordinary. From that day onwards I started taking even a keener interest in military aviation and Air Marshal Masand.

I had a strong desire to meet Wing Commander Masand and the desire to meet him grew stronger with each passing day. Since I didn't know where he was posted at that time, I sent a New Year Greeting card addressed to Air Chief Marshal NC Suri in December 1992 and requested him to redirect an enclosed envelope addressed to Wing Commander Masand to wherever he was posted then. Thankfully, the Air Chief redirected that envelope to Wing Commander Masand. I express my gratitude to Air Chief Suri Sir if he is reading this article. Sometime in the middle of January 1993 I received a letter from Group Captain Masand (he was promoted to Group Captain soon after the APD). He was in the USA then, deputed by IAF for a course in Air War College, Montgomery, Albama. Group Captain Masand had topped in that course, thereby adding another feather in his cap.

Soon after his return from the USA sometime in 1993 he was appointed as Director of MiG upgrade. The redoubtable MiG-21s (I would rather prefer to call MiG-21 a formidable aircraft despite media recklessly stigmatising this aircraft over the past many decades because of number of freak accidents involving 21s) were upgraded to BIS standards under his aegis. MiG-21s proved their worth in 1971 Indo- Pak war, and it was the upgraded variant of the same MiG-21 (BIS) flown by Wing Commander Abhinandan Varthman, who shot down a far superior F-16 aircraft of the Pakistan Air Force (PAF) in an aerial dogfight on 27 February 2019. Lots of emphasis was given on minimising the cost of upgradation of MiG-21s without compromising on its effectiveness. All credit goes to Air Marshal Masand for achieving all the parameters laid down in upgradation programme of MiG-21s. Even though

must have kept him very busy, he took some time out to meet me on 16 August 1995 at my residence in Delhi. I got to know about his family, how he joined IAF, his experiences in the IAF etc. His father was called into MES in the East during the Second World War, his elder brother was a Transport Aircraft Pilot in the IAF and his younger brother was a Lieutenant in the Army. Three brothers fought 1971 war valiantly. This is truly rare, and yet a rarer honour was indeed bestowed upon Masands by the Almighty. He received Vir Chakra for shooting down PAF Sabre jet in the early days of 1971 war while, sadly, he lost his younger brother in the same war. His senior Officer, former Air Chief Marshal SK Kaul, who broke this sad news, advised

direct bearing on the outcome of 1971 war. He was the youngest pilot to have shot down an enemy's aircraft in a dogfight. The Officer had e very impressive career in the IAF that he joined in 1967. In 1974 he went for All Purpose Flying Instructor Course and stood first in all the disciplines. In 1975 he was posted to MiG-21 as an instructor and thereafter for the Photo Interpreter Course. Here too he stood first. In 1977 he stood first in Junior Commaders Course. In 1978 he was promoted to Squadron Leader. In 1979 he appeared for Defence Service Staff Selection Examination and stood first. In 1981 he was posted to Directorate of Air Staff Inspection as the youngest Inspector. In 1986 he was sent to erstwhile USSR as Commanding Officer of a Squadron to train



more than 2 decades had passed since this venerable aircraft was upgraded, yet it was potent enough to shoot down F-16 in February 2019. I am getting goosebumps as I am writing these lines.

I am grateful to Air Marshal Masand that despite his involvement as a Director in the MiG upgradation programme that him to take few days off. But, driven by his morals and ethics, he refused to go on leave and continued to discharge his military duties till the war ended. He was part of the Hunter Aircraft formation that had carried out an attack on Dacca Governor House on 14 December 1971 and made the Governor submit his resignation. This attack had a the first batch of pilots on the latest MiG-29s. In 1989 he was promoted as Group Captain and awarded the Vayu Sena Medal for distinguished service.

After the successful completion of MiG upgradation programme he was posted to Shillong in October 1996 as an Air Commodore. In late January 1997 I got



to know that he had taken over as an Air Officer Commanding (AOC) of Poona Air Force Base after a tragic crash of MiG-29 that killed the former AOC of Poona AFB, Air Commodore CD Chandrasekar. The young and rookie MiG-29 pilots who had witnessed the crash (AOC Chandrasekar's MiG crashed while landing) had lost faith in MiG-29. Group Captain Masand, whom Air HQ had sent to investigate the crash was asked to fill in the vacant post of AOC left by AOC Chandrasekar's untimely demise. The first responsibility he himself took soon after taking over as AOC of Poona AFB was to fly MiG -29 and also perform complex aerobatics in front of young pilots in order to boost their atrophied morale. This shows the stuff he is made of: a valiant fighter pilot who also possess excellent man management skills.

In December 1998 I went to Poona to meet him. I can never forget the hospitality extended to me by the AOC and his family during my stay in Poona. Su-30s were inducted during his tenure as an AOC of Poona Air Force Base. Please see the attached photo of AOC Masand Sir clicked by me during my visit to Poona. He is holding 1:42 scale mode of Rafale assembled and painted by me. In December 2001 he was promoted to Air Vice Marshal and was posted to Maintenance Command in Nagpur as Senior Air & Administration Staff Officer so I didn't see him for a few years till he came back to Delhi to fight his promotion case.



Despite his impeccable, difficult to match Service record, as we saw above, it is rather discouraging for any dedicated Military person like Masand Sir to move court for promotion to the higher rank. And unfortunately it happened with Masand Sir. Despite being number 1 in the merit, he was denied promotion to the rank of Air Marshal. The questionable discretionary power usurped by the Promotion Board drew flak from within the Military Service and civilians. Some "Letters to the Editor" published in the leading newspapers and magazines attached here testify to the fact that public opinion was overwhelmingly in favour of Air Marshal Masand who bore the brunt of faulty promotion policy. The landmark judgement by the Supreme Court to reinstate him in IAF with promotion and salary arrears forbids any future Promotion Board to usurp discretionary powers beyond prescribed limit. It is noteworthy that even the Russians recognised his talents and abilities and invited him to fly their brand new MiG-35 in Aero India 2009 in Bangalore. I understand that many of the upgrades in the MiG-35 were based on the inputs given by then Wing Commander Masand to the Chief Designer of Mikoyan, Mr RA Belyakov, during his visit to Poona in 1988-89. Unfortunately, however, IAF's senior leadership chose to overlook his impeccable service record.

I also remember an article written by Major General Ashok K Mehta soon after Air Marshal Masand was appointed as





Valid Verdict favour of Air Vice Marshal (AVM) Harish Masand and TS Chhatwal has reaffirmed the people's faith in the judiciary and boosted the morale of the armed forces Air Chief Marshal Krishnaswamy's 'deep selection' policy was nothing but an attempt to usurp discretionary power

I feel the defence minister could have been more assertive and vocal against the offenders and shown a little more sympathy towards the wronged officers. One only hopes that justice will be done despite attempts by the IAF to drag the case to the Supreme Court. Rajnish Sharma, New Delhi

10/11/04 **Clipped wings**

THE Delhi High Court verdict quashing the promotion of four senior Indian Air Force officers following a petition filed by two others is a searing indictment of the IAF's style of governance. (HC shoots down top Air Force promotions, November 9). The excessive discretionary powers earlier enjoyed by the officers constituting the promotion board shows their personal whims and fancies got undue weightage.

The stand taken by the officers who moved the court has been vindicated. But what about the harm done to the IAF because of the high position occupied by the promoted officers?

S.C. KAPOOR Noida

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FOR DECADES promotions. especially involving key positions in the government agencies and defence establishments, have had more to do with lobbying than merit. The two AVMs who dared to

challenge this are exceptions to the millions who prefer to quit the system.

It is high time defence establishments and other government bodies made drastic changes in the promotion process, laying due emphasis on merit.

NAVNEET DHAWAN Delhi

Flight control HT.

THE MINISTRY of defence needs to take the Supreme Court direction on reevaluating Indian Air Force promotions in the right spirit. This is to accept that injustice was done to two officers, a fact upheld by a division bench of the Delhi High Court, and set things right. Unfortunately, as a rule, ministry mandarins tend to take negative court decisions as a slight to their ego. In fact, in this case too, the ministry could have accepted the verdict of the high court, a senior enough judicial level, but it decided to appeal to the apex court. In fact, the things that the high court had to say about the IAF leadership should have alerted the ministry to the fact that it had not adequately exercised its supervisory functions and allowed the air force brass to act in an unjust manner.

In the past, several instances of injustice were deliberately dragged on till the officers in question retired. This time, fortunately, the courts are rightly refusing to provide the MoD much wriggle-

an Advisor of Aeronautical Development Agency (ADA) in 2004. Maj Gen Mehta wrote about Air Marshal Masand's flying skills and also hailed his appointment in Tejas Aircraft development programme. He emphatically wrote that Air Marshal Masand had the proficiency to accelerate the much delayed Tejas aircraft programme.

Air Marshal Masand's continuing series of articles in the Vayu Aerospace Review called "I learnt more than flying from them" gives insight into the leadership qualities of many IAF's legendry personalities. Through these articles, Air Marshal Masand has immortalised those personalities and at the same time expressed his gratitude to them for shaping his career. This series gave me the idea of writing something on him, based what I know of and about him.

It is not so easy, I think, to maintain the top position perpetually for decades in a highly competitive environment and mutating technologically with each passing day is tough, to say the least. It requires continuous efforts, drive, commitment, lots of self- motivation, lots of fire in the belly to keep oneself abreast of fast changing technology. Air Marshal Masand has kept himself up-to-minute for over 4 decades exhibiting his simmering passion and his patriotic fervour. Why he stands out taller than many of his ilk in his service to the nation emanates from his deep rooted

15/12/04 room; after all, it is their job to protect the rights of individuals. On issue has been the arbitrary manner in which the 5 per cent marks available to the selection board's discretion were enhanced to 20 per cent. Worse, there is evidence that a candidate's past appraisal was tampered with. Now that the apex court has spoken, it is still not too late for the ministry to make amends.

The episode has left serious questions about the IAF promotion processes and the quality of its leadership, since the injustice done to Air Vice Marshals Masand and Chatwal were perpetrated by the entire collegium of top air force officers, including its chief. Worse, there is suspicion that some scurrilous stories spread about the two candidates, even after the high court verdict, had their origin in the air headquarters. With the air force brass involved in such goings-on, it is little wonder that the morale and state of readiness of the IAF are so low.

feeling of patriotism and dedication for which, unfortunately, there has been little recognition. Let this be one such tribute to him while he is still there to bask in its warmth.



Article by Mr Rajnish Sharma (seen in photo above sitting in a MiG-29 cockpit)

Air Marshal (R) Harish Masand: "I have known Rajnish since 1992-93 when he first made contact with me. He works for a multi-national Shipping Company in Finance but is a keen military aviation and history buff who also does aero-modelling in his spare time. Military history is another area of interest to him".

From Vayu Aarospace Review Issue 11/1998

Years Back

The ALH Completes Cold-Weather, High Altitude Trials

The Army version (prototype No.3 or PT-A) of the Advanced Light Helicopter (ALH) successfully carried out cold weather and high altitude trials in the Ladakh area of N.E. Kashmir during the period 24 January - 4 February 1998. A total of 42 hours were flown by the pilots and test engineers of the Combined Task Force (including the ferry from Bangalore) over a period of 17 days. The return ferry was via Jammu, Chandigarh and Gwalior to Nagpur and then back to base, flying 6:30 hrs on a single day "without a snag".

National Security Council To Be Set Up

On 10 April 1998 ("Good Friday"), Prime Minister Atal Behari Vajpayee constituted a task force to work out the constitution, role and function of the intended National Security Council (NSC). According to a spokesman of the Prime Minister's Office (PMO) in New Delhi, "the task force will submit its report within the shortest possible time". Chaired by Mr. K. C. Pant, former Defence Minister, the task force will have Air Commodore Jasjit Singh, Director Institute of Defence Studies & Analyses as its convener and Mr. Jaswant Singh, Deputy Chairman of the Planning Commission, as member.

George Fernandes: New Defence Minister

Mr. George Fernandes took office as the country's Defence Minister on 20 March, the thirtieth Defence Minister of India. Born on 3 June 1930 in Mangalore (Karnataka), Mr. Fernandes has had a long innings in public life, stretching over four decades. He was elected to the Fourth Lok Sabha in 1967, was Member, Committee on Petitions in 1967-70, General Secretary, Samyukta Socialist Party in 1971-77 besides being the President of All India Railwaymen's Federation.

Jet Airways Expands Fleet

Between April and May 1998 Jet Airways will induct four additional aircraft enhancing its total fleet strength to 22 new generation Boeing 737 aircraft. With the induction of these additional aircraft, Jet Airways will connect four new stations and provide six new links on its network and also increase frequencies on some of its existing routes to meet traffic demands.

Delhi Airport Accepts Raytheon Equipment

On 26 March 1998, five years after the project was first conceived for Delhi's airport, the Airports Authority of India carried out formal acceptance of the equipment supplied by Raytheon. This ILS modernisation project, which was conceived in 1993, should have been completed in 30 months. However, as a direct consequence of various delays in the project, the cost has escalated by Rs. 72 crore (\$18 m), up from the Rs. 351 (\$92 m) crore as estimated in 1993.

WAC Conducts Exercise "Trishul"

"All time high" flying hours with more than five thousand sorties flown along with a record 96% serviceability of aircraft and 99% of other systems were the main highlights of the two week long operational exercise Trishul conducted by the Western Air Command.

Thais Cancel F/A-18 Order, To Upgrade F-5s

Devaluation of the Thai baht has dramatically affected future procurements and modernisation of the Royal Thai Air Force. The \$392 million order for eight Boeing F/A-18s stands cancelled and the US Government's decision to relieve Thailand of its Foreign Military Sales (FMS) obligations, will now give the RTAF greater flexibility to upgrade the 35 F-5E/ Fs in service.

Gripen Aimed At Philippine A.F.

In their proposal to meet the Phil AF's requirement for new generation fighters, BAe/Saab are offering the JAS-39 Gripen with major industrial offsets and flexible financing options. These include industrial development proposals with the Philippine Aerospace Development Corporation and a score more major companies.

Three More Dornier 328s For SATENA

In presence of the Defence Minister of Colombia, Dr.Gilberto Echeverri Mejfa the General Manager of Satena, Major General German Castro Prieto, took delivery of the carrier's fourth and fifth Dornier 328s on 13 March, while aircraft No. 6 will be delivered in early June.

T-6A Texan II For The US Air Force And Navy

The US Air Force and US Navy have exercised a \$ 60 million option for 22 production T-6A Texan II aircraft for the Joint Primary Aircraft Training System (JPATS) programme. The target quantity for the option was 18 aircraft.

RAAF Selects ASRAAM

In a major sales breakthrough, Matra BAe Dynamics have beaten strong competition from Rafael and Raytheon to have its Advanced Short Range Air-to-Air Missile (ASRAAM) selected by the Royal Australian Air Force (RAAF) as successor to the AIM-9 Sidewinder.

ANA Gets First A321

Japan's All Nippon Airways (ANA) took delivery of its first Airbus Industrie A321 on 28 March, in Hamburg, Germany. The aircraft is the first of seven A321s ordered by the carrier and will join an existing fleet of 17 A320s already operated on ANA's domestic route network.

Amazing feat by humankind!

It was only 66 years between the Wright Brothers first flight (17 Dec 1903) and the first moon landing (20 July 1969). WOW! What will we have achieved in the following 66? (Image Twitter)

ale



Happy 8!

Vistara marked its eighth anniversary on 9 January 2023 by operating a special Airbus 321 neo flight, UK08, that took off from Trivandrum (India) and drew the number '8' in the skies. This makes Vistara the first commercial airline to draw the figure '8' at 20,000 ft at 300 KIAS over 450 NM in oceanic airspace above the Arabian Sea. (Image: FlightRadar)



High altitude selfie



Mid-Feb'23, the Pentagon released a selfie taken by US pilot showing the Chinese spy balloon before it was shot down. The selfie was taken in the cockpit of a U-2 spy plane and shows the shadow of the aircraft on the balloon and a clear image of the balloon's payload.

Hand launched Tejas versions?



Models of the LCA Tejas Mk.1 and Mk.2 were seen installed at various points of the Aero India 2023 exhibition halls- from DRDO's pavilion, ADAs, HALs, India Pavillion to various suppliers' stands; all had different weapon payloads which made hunting for these models a treat!

Grandchild of the Marut?



At Aero India 2023, HAL revealed its future HLFT-42 with the title "The storm is coming". Much was discussed of its lineage from the HF-24 Marut. Will this new avatar be named "Maruti"? Also, initially the HLFT-42 had a stylized image of Lord Hanuman as its tail art but a controversy on that resulted in HAL removing the art—so the "storm" was definitely coming though unknowingly prophetic!



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