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PRIME MINISTER NARENDRA MODI IS THE FIRST PRIME MINISTER OF INDIA WHO HAS TAKEN A SORTIE IN THE DOMESTICALLY DEVELOPED AND MANUFACTURED TEJAS, THE LIGHT COMBAT AIRCRAFT.

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COVER IMAGE

Prime Minister Narendra Modi's sortie on the LCA Tejas was a bold statement of proactive leadership and unwavering commitment to Indian Defence. This act instilled pride and confidence in both the Armed Forces and the Nation.

*(**Cover Photo**: PIB)*

COVER DESIGN BY: *SP's Team*

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NEXT ISSUE: *Wings India 2024 Special*

In a significant display of proactive leadership and commitment towards armed forces, security concerns and the associated industry, Prime Minister Narendra Modi's recent sortie on the LCA Tejas, conveyed a powerful message with far-reaching implications. This act transcends symbolism, carries profound meaning and has a deep impact, touching on several crucial aspects of the country.

ON NOVEMBER 25, 2023, PRIME MINISTER MODI'S HISTORIC sortie on the indigenously developed LCA Tejas showcased unwavering support for the Indian Armed Forces. This marked the first instance of an Indian Prime Minister flying a fighter aircraft sortie, and was a reflection of Modi pro-actively engaging with the defence forces and defence matters of the country in addition to reinforcing the government's commitment to military well-being and operational readiness. By entrusting himself to Indian Air Force pilots and the capabilities of an indigenously developed fighter, Modi instilled pride and confidence in both the armed forces and the nation. The Tejas sortie by the Prime Minister also brings about a set of responsibilities over the India's domestic aerospace players to inherit a pre-requisite culture of "zero compromise". The global impact of the Tejas sortie sent a clear message of India's growing military prowess and ambitions towards technological advancements, which will in turn serve as a deterrent to potential adversaries and highlighting India's rising stature globally.

Continuing with the military contents in this issue of *SP's Aviation*, Air Marshal Anil Chopra (Retd) analyses the shifts and challenges in military drone technology and explores evolving trends in military unmanned aerial systems. A special feature on Embraer Defense & Security pioneering innovative solutions for the defence and security challenges worldwide, done by Rohit Goel, is also a part of this issue.

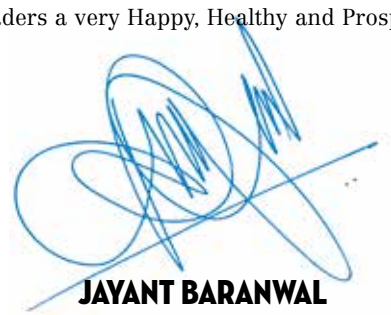
Year 2023 continued to see worldwide growth in civil aviation, witnessing a flurry of orders and deals at major global airshows and beyond them too. This has set an optimistic tone for the aviation industry, in the times to come. A report by Ayushee Chaudhary looks back at some of the key events and what faired among the fixed-wing players in the civil aviation industry.

One of the crucial concerns for the Airline Industry has been the pilot shortage. A report by Rohit Goel highlights that navigating pilot shortages in commercial and business aviation will require a collaborative approach by all stakeholders. In another report, he underlines the onset of online training programmes and how much they have emerged as a dynamic and accessible solution, offering cockpit crew a flexible and convenient avenue to hone their skills and stay current with industry standards, all from the comfort of their homes or offices.

One of the major airshows that happened this year was the Dubai Airshow which featured more than 1,400 exhibitors from over 95 countries and presented a spectacular display of 190+ aircraft and some of the biggest deals. The Dubai Airshow was a pivotal glimpse of the global aviation industry, especially the Middle East. The second and final part of the show report has been included in this edition.

Middle East has been the catalyst in the context of Business Aviation industry. The region has been witnessing significant growth, especially in business aviation driven by tourism and large-scale global events. The Middle East has clearly demonstrated the ways and approach enabling not only the sustenance but a consistent curve of growth of business aviation fraternity. Certain hubs like Dubai maintain robust activity, driven by a notable rise in high-net-worth tourists, escalating the demand for private aviation and propelling global business aircraft sales. A report by Ayushee Chaudhary highlights the growth of BizAv in the Middle East.

All this and more in this issue of *SP's Aviation*. We wish all our valuable readers a very Happy, Healthy and Prosperous Year 2024!



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LEADING FROM THE COCKPIT: PRIME MINISTER NARENDRA MODI FLIES A SORTIE ON IAF MULTIROLE FIGHTER JET TEJAS ON NOVEMBER 25, 2023

VISIONARY SUPPORT FOR DEFENCE

In a proactive approach to ensure 'Atmanirbharta' in Defence, Prime Minister Narendra Modi flew a sortie in LCA Tejas, a clear demonstration of his push for the use of indigenous products and technologies in Aerospace and Defence

By **SP'S SPECIAL CORRESPONDENT**

PHOTOGRAPHS: PIB

IN A HISTORIC MILESTONE, PRIME MINISTER NARENDRA MODI flew a sortie in the indigenously designed, developed and manufactured Tejas Twin Seat Light Combat Fighter aircraft at Bengaluru. The Sortie was carried out from the Aircraft Systems Testing Establishment, Bengaluru. During the 30-minute sortie, capabilities of fighter aircraft Tejas were demonstrated to the Prime Minister. This is the first time an Indian Prime Minister has flown a fighter aircraft sortie. Prime Minister Modi described his experience of flying the sortie as memorable.

Prime Minister Modi, who has given a strong impetus to

SP GUIDE PUBLICATIONS

GLIMPSES FROM PRIME MINISTER MODI'S SORTIE ON LCA TEJAS. THIS IS THE FIRST TIME AN INDIAN PRIME MINISTER HAS FLOWN A FIGHTER AIRCRAFT SORTIE.

Atmanirbharta in defence manufacturing applauded the scientists, engineers and flight test crew associated with the designing, development and production of the state of art fighter aircraft. He expressed pride in the capabilities of Indian engineers and scientists.

The LCA trainer is a light weight, all weather, multirole aircraft which can undertake all roles of a single seat Tejas fighter and can also be used as a fighter trainer. This is the first time ever that an indigenous twin seat fighter has been designed, developed and manufactured in India. With an amalgamation of contemporary concepts and technologies such as quadruplex fly-by-wire flight control, carefree manoeuvring, advanced glass cockpit, integrated digital avionics systems and advanced composite materials for the airframe, it is a state-of-the-art aircraft. The fighter aircraft has enhanced the defence capabilities and preparedness of the nation.

IAF test crew have been involved with the Tejas project right from conceptual stage till prototype testing. The first version of the aircraft was inducted into the IAF in 2016. Currently, two squadrons of IAF, 45 Squadron and 18 Squadron, are fully operational with LCA Tejas. An order worth ₹36,468 crore for delivery of 83 LCA Mk 1A aircraft has been placed with HAL and delivery is scheduled to begin by February 2024. HAL has current capacity to build eight LCA aircraft per year. This is being increased to 16 aircraft's every year by 2025 and further to 24 aircraft every year in the next three years.

Prime Minister Modi described his experience as memorable and expressed pride in the capabilities of Indian Scientists & Engineers

More than ₹9,000 crore have been sanctioned for the development of LCA Mk 2, an updated and more lethal version of LCA Tejas. To further promote indigenisation, including of the aircraft engine, Transfer of Technology for manufacturing of the GE engine in India has been negotiated with GE during Prime Minister's visit to the US in June 2023. In the coming years, Tejas would be the largest fleet of fighter aircraft to be operated by the Indian Air Force. Today's sortie by the Prime Minister will encourage the aeronautics ecosystem and give a big boost to Aatmanirbharta in defence sector. SP

BOEING MQ-28 WILL USE ARTIFICIAL INTELLIGENCE TO FLY INDEPENDENTLY OR IN SUPPORT OF CREWED AIRCRAFT TO SUPPORT INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE, TACTICAL EARLY WARNING MISSIONS AND MORE

UAV TRENDS

Analysing the shifts and challenges in Military Drone Technology and exploring Evolving Trends in Military Unmanned Aerial Systems

By AIR MARSHAL ANIL CHOPRA (RETD)

THE FUTURE OF AVIATION IS CLEARLY UNMANNED. WITH THE advent of aerial automation, and further augmented by artificial intelligence (AI), more and more military missions are today being assigned to unmanned aerial systems (UAS). All militaries are acquiring UAS and drones to undertake a variety of missions. Major Powers are having design and production set ups. Significant part of defence budgets arenow being earmarked for UAS.

Under the proposed $3.5 billion mega deal, India will acquire 31 General Atomics MQ-9B high altitude, long endurance drones, with 15 SeaGuardians for Indian Navy and eight SkyGuardians each for the Indian Army and the Indian Air Force (IAF). The Indian Navy had been operating two SeaGuardian drones (unarmed variants) on lease from the American Company since 2020. The long endurance drones supplemented the Boeing P8-I maritime patrol aircraft.

MILITARY USE OF DRONES

Militaries use drones mostly for dull, dirty, or dangerous missions. Dull being long endurance surveillance missions; dirty could be flying into a contaminated area; and dangerous would be in a highly contested threat area. Drones have been used in military operations for several decades. In the past, they were primarily used for surveillance. However, with advances in technology, drones have become more capable and versatile. They are now used for a wide range of military operations, including combat missions.

Important military mission are intelligence gathering, surveillance, and reconnaissance (ISR) that requires high-resolution cameras and sensors that allow to collect data and images from a distance. Drones support target acquisition, and thereafter targeting by ground based weapons or airborne platforms. They could also be used for laser lasing. Drones support battle damage assessment. Weapon carrying drones are used for precision strikes, including from stand-off ranges. They can provide offensive air support in ground battle against armour, gun-positions and troops. Drones can perform interdiction missions.

Modern drones also have air-to-air weapons that could be used both for defensive and offensive missions. Drones could fire missiles to neutralise incoming cruise missiles and other platforms. They can be used as an anti-UAS platform or even knockdown a combat helicopter.

Drones help create combat zone situational awareness, and in turn force protection. Drones are used for logistics and supply mis-

PHOTOGRAPH: BOEING

sions. They also act as airborne communications nodes to extend radio range. UAS greatly support search and rescue missions.

LARGE UAS ADVANTAGES AND CHALLENGES

Large UAS platforms have high endurance, and thus long loiter time, and are ideal for surveillance. They have greater weapon carriage capability. They can fly high above small arms and man-portable AD weapons. In uncontested areas they have been effectively used to destroy ground targets and also to target individual militant leaders as was done in Afghanistan and elsewhere in West Asia. AI is supporting autonomy. Large UAS are being used for flight refuelling roles. For better protection, future UAS would be stealth. Alternatively future combat aircraft will be optionally manned.

But large UAS are expensive. They can be taken down by long range SAMs and fighter aircraft. They were very effective in Iraq and Afghanistan because of uncontested environment. American large drones have been threatened by Russians in Syria and Black Sea despite deconfliction protocols being in place between the two super-powers. Yemen's Houthi rebels' air defences have successfully targeted them in West Asia.

With the major contest now developing between the US and China and Russia, the environment would not be benign. Similar will be the case between India and its neighbours China and Pakistan.

Yet large UAS continue to have role with stand-off weapons and for large area surveillance such as Oceans and Seas, and across mountains. Large loiter munitions like IAI Harop and Harpy can have significant endurance and then destroy a well-fortified concrete target.

SMALL DRONES – CHEAP AND EFFECTIVE

Small drones could be as little as a few grams to just a few kilograms. Small drones have many roles including operations in confined spaces. Weapon laden drones can be used for Kamikaze attack roles, as has been very effectively used in Armenia-Azerbaijan conflict and in the Ukraine-Russia war. These drones are usually as cheap as $3,000 and may go up to about $50,000. They can therefore be held in large numbers in unit inventory. Small drones also provide logistics support to the field commander in the mountains. They are good for across-the-obstacle surveillance. These have been seen to have game-changing role.

DRONE DETECTION

To neutralise a drone, it has first to be detected. Small size, low radar cross section (RCS), low noise, smoke, and infrared (IR) signature, make detection difficult. There are different types of drone monitoring equipment. These are radio frequency (RF) analysers, acoustic sensors (microphones), and optical sensors (cameras). Avian radars are being used at airports for checking bird activity. These have limited range and are expensive, so cannot be deployed across the entire border. The radar that detects drones may also detect birds and make it complicated. The radars are better than optical sensors, have longer range, and are more accurate, and can see more threats in day and night. Some Doppler radars are being designed to distinguish between drones and birds.

Optical sensors, visible and infrared, can detect drones by day and night. Modern optical sensors have improved resolution and processing power. Also, sets of microphone arrays can be used for detection and rough triangulation. They are passive and great gap fillers. But they do not work well in high ambient noise. Also, there range is limited to around 500 metres.

COUNTER DRONE TECHNOLOGIES

Drones can be neutralised by physical destruction, jamming it, or taking control of the drone. There are RF Jammers to mask the controller signal. But then some drones are programmed to return home automatically under such a scenario. A GPS spoofer could send a new signal to the target drone and replace the communication signal it uses to navigate to own 'safe zone'. Cyber takeover systems are a relatively new. They passively detect radio frequency transmissions to identify the drone's serial number and locate the pilot's position using AI, and then take-over the drone.

Kinetic solutions involve shooting the drone using a gun. High power microwave (HPM) devices can generate electromagnetic pulse (EMP) capable of disrupting drone electronic devices. But there is risk of unintentionally disrupting communications or destroying friendly electronic devices in the area. High-energy lasers defeat the drone by destroying the structure and/or the electronics. Laser could also cause collateral damage. Net guns can fire a net at a drone and entangle drone rotor blades to bring it down.

> Cost-effective and adaptable, these drones offer a dynamic and affordable solution to military needs and have emerged as game-changers in modern warfare

DRONE SWARMS AND COUNTERS

Better communications, high speed computation and AI have greatly supported drones flying in coordinated swarms. Drone swarms have great military applications. Drone swarms can be used as decoy formations. A drone swarm can saturate enemy radars and also air defence weapons. A typical drone swarm may have mix of surveillance, ELINT, electronic warfare and attack drones. Technology evolved for drone swarms is also been ported on to manned unmanned teaming (MUMT).

Drone swarms will have to be countered using standard anti-drone methods. Jamming intra-drone links could send them astray. A drone swarm could be used to intercept the adversary drone swarm. Satellites based directed energy weapons would be used to neutralise drone swarms in the future.

MANNED UNMANNED TEAMING

Aircraft automation and data-links have allowed manned unmanned teaming (MUMT). Such a team can use advantages of both, the less expensive drone, and much higher flexibility and fire-power of a manned platform, without exposing the more expensive manned aircraft and the airborne crew to high threat environment. The unmanned wingmen could perform ISR or tactical early warning missions, and Suppression of Enemy Air Defences (SEAD).

The drones could be launched from the ground or from airborne mother-ship. The package members are assigned separate roles and tasks. A few could act as decoys. Others could take on electronic warfare and SEAD roles. Significant mem-

bers could be carrying munitions. Some would have intelligence gathering roles and also for battle damage assessment.

MAJOR UAS MANUFACTURERS

Because of high demand of military drones, the market is growing most rapidly. Among the major large UAS manufacturers of the world are General Atomics Aeronautical Systems, Lockheed Martin, Raytheon, Northrop Grumman, BAE Systems, Elbit Systems, Israel Aerospace Industries (IAI), Turkish Aerospace Industries, and AeroVironment, among others. Both, China and Russia have significant UAS manufacturing capability. China's Wing Loong series are sophisticated and being sought by many countries. For long the Europeans were dependent on the US for UAS. Dassault Aviation, Leonardo, and Space SAU, are producing the future "Eurodrone" which will progressively replace the Reaper drones in France. Turkey's Bayraktar TB2 has had great success and many orders. Pakistan too manufactures UAS with technical support from China.

The small drone market has many players. The top small-drone manufacturers of 2023 were DJI, Yuneec International, and PowerVision, all from China. They control nearly 70 per cent of small civil drone market. The top American companies in this category were AeroVironment and Insitu. Parrot and Delairis are French. The British, German and Italian suppliers have developed different models of tactical drones. Poland's Warmate, Iran's Shahid drones have been used in many conflict zones. Low-cost "off the shelf" drones are being adapted for military use by non-state groups like Hezbollah.

REWORKING LARGE DRONE DESIGN OPERATIONAL ROLES

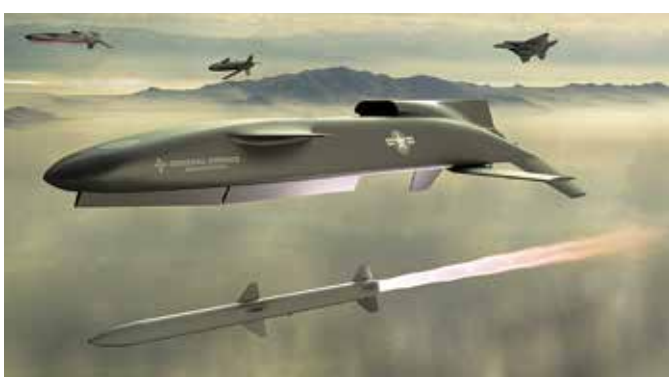
The Ukraine conflict has shown that significant operational battle-zone effects can be achieved by using low-tech cheaper kamikaze drones instead. These effects will multiply when a drone swarm is used. Large loitering drones such as IAI Harpy and Harop do have significant endurance and can make a kamikaze attack, but also cost a lot. There are some expensive drones that can be recovered back if not expended.

Large drones have proved very well for ISR. Both Russia and China continue to develop drones of the kind with the US. However, in contested domain they will have to stay far to be safe. There are plans to develop large drones for contested environment by increasing self-defence capability, and better manoeuvrability. This would mean airframe design changes and also compromises on endurance. With large number space based constellations coming up in low earth orbit, part of the ISR role can best be done from space.

There is clearly a need to re-design and produce more survivable large drones. They have to be stealthy like the proposed Indian "Ghatak" drone. Also, there is need to redefine the operational employability and roles of existing ones. More stand-off sensors and weapons perhaps. Improved AESA radar, self-defence electronic suite and air-to-air weapons. Survivability can be increased by using self-protection pods against infrared and radio frequency guided threats in contested environments. The large drones could also be converted in to mothership for smaller kamikaze drones. They could be adapted to carry air-to-air interceptors or directed energy weapons to counter air and missile threats to remote and forward bases including during out-of-area contingencies. The USAF is already working on a future Next-Generation Multi-Role Unmanned Aerial System Family-of-Systems.

LARGE DRONES IN INDIAN SUB-REGION

China already operates the Chengdu GJ series of drones, also called Wing Loong. These are in both Medium Altitude and High Altitude Long Endurance variants. China has their armed variant, and continues to develop more advanced ones. The Wing Loong II, with provision for up to twelve air-to-surface missiles entered PLA Air Force (PLAAF) service in 2018. As per media reports, a new generation of high-speed, long-endurance drones powered by low-cost jet engines has entered military service in China.



(LEFT) LONGSHOT UNMANNED AIRCRAFT SYSTEM, DROPPED FROM A BOMBER OR FIGHTER THAT CAN LAUNCH MISSILES OF ITS OWN; (RIGHT) X-61 GREMLINS IS A RECOVERABLE, LOW-COST UAV THAT COULD EMPLOY ISR AND OTHER MODULAR, NON-KINETIC PAYLOADS.

Pakistan acquired the CH-4 UCAVs from China. They have used them to conduct strikes in Balochistan. They have the maritime variants also. The indigenous Burraq UCAV has been jointly developed and built by the National Engineering and Scientific Commission (NESCOM) and the Pakistan Air Force (PAF). Shahpar-2 is another indigenous UAV. They also acquired significant numbers of the Turkish Bayraktar TB-2 UAVs. They have ordered the Bayraktar Akıncı HALE UCAV, deliveries for which have reportedly just begun.

Indian armed forces have depended on Israel for its UAS requirements with IAI Heron and Searcher. The Harpy and Harop were the large loiter munitions. India's DRDO remains the major player for large UAS in India with its Tapas-BH-201 and Ghatak UCAV still evolving. Adani-Elbit makes Hermes UAS in India. India has over 100 drone startups, and the market clearly has big future. Indian armed forces have placed

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PHOTOGRAPHS: GA-ASI, DARPA

HERON MK II: A GAME-CHANGER IN UNMANNED AERIAL SYSTEMS

REFLECTING THE LATEST UNMANNED AERIAL SYSTEMS (UAS) technology, the Heron MK II has recently joined IAI's Heron family of UAS, serving air forces, armies, and navies worldwide for over two decades. With a new airframe and wings tuned to maximize performance, advanced avionics, and a ground control system, the Heron MK II introduces new mission capabilities, efficiencies, and autonomy standards.

Equipped with a comprehensive payload suite, this Medium Altitude Long Endurance (MALE) UAS supports multiple payloads operating over a broad spectrum enable real-time collection of intelligence, surveillance, target acquisition and reconnaissance (ISTAR), covering large areas of interest. Dedicated sensors allow the system to perform standoff reconnaissance over long distances or persistent surveillance over a wide area. Additionally, the Heron MK II can carry maritime surveillance radar, synthetic aperture radar (SAR), electronic surveillance measures (ESM), and communications intelligence (COMINT). The Heron Mk II provides a complete, multi-modal intelligence-gathering capability on a single platform by operating up to six sensor payloads simultaneously.

HERON MK II PROVIDES A COMPLETE, MULTI-MODAL INTELLIGENCE-GATHERING CAPABILITY ON A SINGLE PLATFORM

The Heron Mk II also incorporates integral wideband satellite communication and fully digital line-of-sight datalinks, serving multiple payloads simultaneously and allowing the platform unrestricted operational envelope over long distances, sea, land, and mountainous terrain. Switching between the different datalinks can optimize the mission to become covert, secure, and resilient. In addition to streaming live sensor data to the ground, the Heron Mk II also has servers onboard, providing users access to large amounts of raw or processed sensor data collected throughout the mission and stored onboard.

Supporting flexible payload integration with a wide range of Heron family payloads and customer-furnished systems and applications, the HERON MKII conforms to open architecture with separate flight control and mission management systems. This enables the manufacturer and users to maintain optimal upgrading cycles and avionics flexibility throughout the UAS life cycle.

MISSION OPTIMIZED PLATFORM

The dimensions of the Heron Mk II have been increased over its predecessor, extending the fuselage to 9.7 meters and the almost 17 meters wingspan, providing a larger space for internal and external payloads, including underwing stores, without degrading performance. The system is certifiable by design for international and military airworthiness standards.

The new powerplant uses an aviation-certified engine that delivers 160 hp, specifically tuned to have a high climb rate and efficient operation at low and high altitudes up to 35,000 ft. The powerful motor also provides sustained power for a maximum airspeed of 145 knots and a faster ascent, improving the drone's rate of climb by more than 50 percent over legacy systems. The maximum takeoff weight (MTOW) has increased to 1,430 kg, including a useful payload of 490 kg. Heron Mk II has a mission endurance of up to 45 hours.

Another forte is its ability to endure adverse weather, with deicing systems enabling the aircraft to cross stormy weather it may encounter on its flight over mountains and sea. Special attention is given to protecting the communications, navigation, and flight systems from jamming and spoofing, safeguarding the GPS and datalinks against interference and cyber-attacks. The platform maintains self-awareness throughout the flight, preventing location deception, unauthorized intervention, or hostile takeover of the autonomous platform.

ADVANCED GROUND SEGMENT

The crew uses the Unified Control System (UCS) to control the mission, leveraging the highly automated and intuitive user interface to reduce crew workload and focus on the task rather than fly the platform. This modern mission control center comprises multiple displays, 'hands-on stick and throttle' (HOTAS) like controls, and a tablet with a touch screen. Autonomous taxi, takeoff and landing and multiple redundancies for flight and mission-critical systems are fully supported based on proven and robust automation, multiple sensors, and systems.

Since its introduction in 1994, the Heron family has been operational with over 22 customers worldwide, accumulating well over 500,000 flight hours. HERON MKII takes the system to new mission capabilities and performance levels, setting a new benchmark for advanced MALE UAS. SP

PHOTOGRAPH: IAI

significant orders for small drones. ideaForge and NewSpace Research & Technologies have got significant orders from Indian Army. Veda Defence Systems has order from the Indian Air Force. Many more orders will get placed regularly.

The IAF could use the UAS to not only look across the mountain in Himalayas for surveillance, and attack ground targets, but also use them to intercept cruise missiles. A few large drones can create an airborne radar chain for sectorial radar cover. IAF could use these drones for ELINT, SAR, and electronic warfare roles.

The large drones will continue to have significant role in maritime surveillance. They are much cheaper to operate than the P-8I Poseidon aircraft, and can supplement the air effort. They could also support creating extended air picture and situational awareness in India's Bay of Bengal and Arabian Sea. Lastly the large drones can greatly support the civil administration for emergency response to detect and mitigate the effects of natural disasters.

For some time to come, large drones will continue to play a significant role in Indian sub-continent. India must accelerate the development and production of indigenous systems. There is a need to work more aggressively on MUMT.

wireless communications are being considered and will offer advantages such as improved coverage, increased mobility, and access to remote or inaccessible areas. Tilt rotor designs are also evolving for seamless transition from vertical take-off and landing (VTOL) to higher speed forward flight.

Further research is on for energy-efficient flight. This will be done through aerodynamic design optimisation, lighter materials, and alternative energy sources as solar and electric-hybrid. Integration of UAVs with Internet of Things (IoT) has opened up new possibilities for data collection, analysis, and communication in various fields. Actions are at hand to develop systems for detecting and avoiding collisions with manned aircraft in shared airspace.

Intuitive and efficient human-UAV interaction systems are evolving. So are better AI algorithms for swarm behaviour. ChatGPT is proposed to be used for more accurate control of drones. Improving beyond visual line-of-sight (BVLOS) capabilities is being worked on. Future UAS will be more easily transformed from one role to other. Having foldable wings would reduce storage space, and make easy to transport.

The drone market is growing rapidly due to the high demand from militaries. More than 80 countries now have

(LEFT) SKYBORG CONCEPTUAL DESIGN FOR A LOW COST ATTRITABLE UNMANNED COMBAT AERIAL VEHICLE; (RIGHT) A MODEL OF HAL CATS WARRIOR.

FUTURE TRENDS

DARPA had funded development of Skyborg, a software and hardware package designed to allow a variety of low-cost, loyal wingman UAVs to fly and carry out missions autonomously. The Skyborg project is a USAF Vanguard programme developing unmanned combat aerial vehicles (UCAV) intended to accompany a manned fighter aircraft. Contracts have been awarded to Boeing, General Atomics, Kratos Unmanned Aerial Systems and Northrop Grumman. A Skyborg-equipped UAS conducted its maiden flight in April 2021. Two General Atomics MQ-20 Avenger UAVs demonstrated in-flight communication between each other and "responded to navigational commands, stayed within specified geo-fences, and maintained flight envelopes," while monitored from the ground command and control station.

Northrop Grumman Corp's Model 437 stealthy fighter jet with a 4,500 km range will involve flying alongside the F-35 jet fighter. USAF plans to build an airborne, autonomous 'best of breed' system of systems. The UAVs would be paired with USAF's Next-Generation Air Dominance (NGAD) fighter.

Miniaturisation of antennas is being studied to develop smaller and more agile UAVs with enhanced capabilities. Novel materials and manufacturing techniques such as 3D printing are evolving. Drones based flying ad-hoc networks (FANETs) for military drones for surveillance and munition roles. The rising civil market is adapting to meet the military demands. As per Statista analysis, the global drone market was 26.3 billion US dollars in 2021 and will reach 54.6 billion US dollars by 2030 at a CAGR of 13.58 per cent. The growth is significantly due to sharp increase in demand from security forces and agencies. With drone proliferation, countering unmanned aerial systems (CUAS) has also become a big market.

The increased demand is also bringing greater investments in technologies related to photonics, optronics, AI, image analysis, and sensors of all kinds. Also, in transport autonomy and cyber-security. Advance in AI will continue to play a critical role in UAS for both design wand mission accomplishment. Actions are on to increase survivability in contested environment.

India's initial MUMT experimentation is being led by HAL with the proposed LCA based CATS in collaboration with a Bengaluru based start-up, NewSpace Research & Technologies. It will involve a recoverable wingman till the combat radius of 350 km. The range would increase to 800 km for a kamikaze attack on target. India has an ambitious drone development programme. There are a large number of startups. The plan is being driven at the highest levels of the government. Future is unmanned, and India must succeed. SP

PHOTOGRAPHS: AIR FORCE RESEARCH LABORATORY, WIKIPEDIA / GAGAN

SP GUIDE PUBLICATIONS

DRONE REVOLUTION IN THE ISRAEL DEFENCE FORCES (IDF)

THE ISRAEL DEFENCE FORCES (IDF) are recognised as one of the most prolific users of Unmanned Aerial Systems (UAS), commonly known as Drones, for military purposes. Their extensive fleet of drones, coupled with innovative operational strategies, has transformed their approach to warfare. These Unmanned Aerial Vehicles are no longer mere reconnaissance tools; they are transforming battlefield tactics, offering unparalleled opportunities while simultaneously presenting unique challenges.

One of the most significant opportunities drones offer is enhanced effectiveness. Their ability to operate for extended periods, tirelessly covering vast areas, provides invaluable real-time intelligence and situational awareness. These keen eyes in the sky allow IDF Commanders to make informed decisions, anticipate enemy movements, and orchestrate targeted strikes with pinpoint accuracy, minimising collateral damage and reduced risk to personnel. By taking the human element out of harm's way, particularly in urban environments or against heavily fortified positions, drones safeguard lives while enabling the IDF to achieve operational objectives. This shift not only protects soldiers but also fosters a more sustainable and efficient military strategy.

(TOP TO BOTTOM) IAI HERON TP-XP; IAI SEARCHER MK III; ELBIT HERMES 900.

Economically, drones offer a cost-effective solution. Their operational costs are significantly lower compared to traditional manned aircraft, making them a fiscally responsible choice for a wide range of missions. This allows the IDF to allocate resources more efficiently, maximising its capabilities while maintaining fiscal responsibility. Also, Drones are highly mobile, capable of rapid deployment to any location, regardless of terrain or accessibility. This adaptability allows the IDF to respond quickly to evolving situations and engage targets with minimal delay, effectively adapting to the ever-changing battlefield landscape.

The foundation of this unparalleled success in the use of Drones by the IDF lies in Israeli companies like IAI and Elbit's unwavering commitment to innovation. These companies have played a pivotal role in developing the Israel Defence Forces' UAS force, supplying them with the most advanced and reliable systems available.

For decades, IAI has been recognised as a global pioneer and leader in the field of Unmanned Aerial Systems (UAS). With a relentless focus on innovation, IAI continues to develop cutting-edge UAS models that push the boundaries of technology. Nevertheless, IAI remains firmly committed to providing unwavering support for its legacy systems, many of which continue to deliver exceptional service around the world.

IAI's Medium Altitude Long Endurance (MALE) systems are paragons of robustness and combat-proven capability. Boasting hundreds of thousands of operational flight hours across diverse terrains and weather conditions, these systems offer unmatched intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) capabilities. When medium-range surveillance is required for diverse missions like situation awareness, protection, reconnaissance, target acquisition, or damage assessment, only an IAI tactical UAS system can deliver the necessary flexibility, ruggedness, and endurance.

IAI's Mission Operation and Intelligence Centre (MOIC) and Unified Control Station (UCS) innovative ground control solutions represent the cutting edge of technology, effortlessly processing vast amounts of data from various online and offline sensors, optimising mission flow and minimising resource expenditure. IAI's UAS Academy offers comprehensive training programmes, ranging from initial candidate screening and basic flight instruction to advanced team training and specialised UAS instructor courses.

Elbit Systems has also established itself as a dominant force in the world of Unmanned Aerial Systems (UAS). Boasting a portfolio unrivalled in its breadth and depth, Elbit offers a comprehensive range of UAS solutions, catering to diverse operational needs and budgets. The pinnacle of Elbit's UAS portfolio is the next-generation Hermes 900 medium altitude long endurance (MALE) UAS. This state-of-the-art system represents the culmination of decades of operational experience and cutting-edge technological innovation. Capable of persistent surveillance, intelligence gathering, and even aerial refuelling, the Hermes 900 offers unmatched performance and operational effectiveness, making it the crown jewel of Elbit's UAS fleet. Elbit's extensive expertise and holistic approach ensures that every Elbit UAS solution is truly turnkey, offering unmatched performance, cost-effectiveness, and operational readiness.

IDF continues to harness the power of Unmanned Aerial Systems. It has invested heavily in developing new technologies like advanced sensors and countermeasures, constantly refining its tactics and techniques to unlock the full potential of Drone warfare. Additionally, the IDF is actively integrating drones with other military systems like air defence and artillery, creating a seamless and coordinated network for optimal operational efficiency.

The future of warfare is undoubtedly intertwined with the ascendancy of Unmanned Aerial Systems. The IDF stands at the forefront of this revolution, embracing the opportunities offered by Unmanned Systems. By harnessing technological advancements, IDF is effectively leveraging the power of Drones to ensure Israel's security and maintain its strategic edge. SP

PHOTOGRAPHS: IAI, ELBIT SYSTEMS

CZECH REPUBLIC HAS ANNOUNCED THE POTENTIAL ACQUISITION OF TWO NEW-GENERATION MULTI-MISSION EMBRAER C-390 MILLENNIUM

WINGS OF INNOVATION AND EXCELLENCE

Soaring beyond borders with elevated standards of excellence, Embraer Defense & Security is pioneering innovative solutions for the defence and security challenges worldwide

By **ROHIT GOEL**

EMBRAER DEFENSE & SECURITY (EDS) IS PART OF EMBRAER, one of the world's largest aerospace and defence conglomerates. Every 10 seconds, an aircraft manufactured by the company takes off globally, carrying over 145 million passengers annually. Since its inception in 1969, Embraer has been an innovator, leading in Commercial Aviation, Executive Aviation, Defense & Security, and Services & Support markets. With a history of manufacturing over 8,000 aircraft, Embraer's workforce at the end of 2022 comprised 18,872 collaborators, with 14,960 in Brazil and 3,912 abroad.

Embraer Defense & Security (EDS) stands out as a key player in the aerospace and defence industry. The portfolio includes the A-29 Super Tucano, C-390 Millennium military airlift, and various integrated solutions like Command and Control Center (C4I), radar systems, Intelligence, Surveillance & Reconnaissance (ISR), and space capabilities. The company also offers expertise in specialised aircraft for VIP transportation and unique mission requirements. With an expanding global presence, the products and solutions from Embraer Defense & Security are currently deployed in over 60 countries.

According to Bosco da Costa Júnior, President & CEO, "Embraer Defense & Security has products and solutions in more than 60 countries and is known worldwide for the quality and excellence of its aircraft and solutions. Beyond that, the company has invested a lot in diversifying its product portfolio, currently offering comprehensive solutions that include systems for air, land, maritime, space, and cyber domains. We also export radars. Embraer has shown its ability to adapt and inno-

PHOTOGRAPHS: EMBRAER

"Embraer develops high technologies that are used throughout its portfolio and bring benefits to all stakeholders. Our jets are designed for high reliability, high speed, long missions, and aggressive performance, with the highest technology, offering unbeatable cost-effectiveness."
— Bosco da Costa Júnior, President & CEO, Embraer Defense & Security

vate in the face of changing scenarios in the defence arena and deliver top-notch products and solutions."

PRODUCT RANGE

C-390 Millennium. The Embraer C-390 Millennium, and its air-to-air refuelling (AAR) variant, the KC-390 Millennium, is proving itself to be a force multiplier for military forces around the world. Military customers and those that have been involved in missions involving the C-390 Millennium have been impressed by how the aircraft's performance and reliability surpasses their expectations.

Since its entry into service to the Brazilian Air Force in 2019, the C-390 Millennium has proven its capability, reliability, and performance across a variety of challenges. The C-390 Millennium has demonstrated that it can aid air forces to swiftly respond to an array of real situations such as military operations, emergencies like evacuation of people from conflict zones, and humanitarian relief missions triggered by floods, forest fires, earthquakes, or COVID-like situations.

The Brazilian Air Force currently operate five KC-390s and more deliveries are underway. The fleet has already accrued more than 7,500 flying hours and recent numbers from the Brazilian Air Force's KC-390 Millennium fleet have shown a mission completion rate of 99 per cent, demonstrating outstanding productivity in its category. The key strengths of the C-390 are its robust design, dual certification approach (civil and military), greater flexibility, proven state-of-the-art technology and ease of maintenance. The C-390 Millennium flies faster (470 kts) and further on a standard crew duty day. It also carries more cargo (26 tonnes) compared to other medium sized military cargo aircraft.

Super Tucano. The A-29 Super Tucano is a light attack and advanced training aircraft, known for its cost-effectiveness and adaptability. The A-29 Super Tucano provides an optimised training solution, supporting light attack and air reconnaissance training. The aircraft also allows instantaneous reconfiguration from combat to training, and vice versa, enhancing the fleet productivity and delivering the best value and most comprehensive solution for the Air Force.

The P600 AEW&C. The P600 AEW&C combines the best in aircraft technology, best-in-class operational costs, with state-of-the-art sensor technology to create a modular and adaptable solution to meet individual customer requirements. With superior aircraft performance and an advanced mission system, the P600 AEW&C provides accurate and reliable surveillance in the aerial and maritime environments at a fraction of the cost of modern AEW&C systems. A complete communication suite ensures interoperability and joint operations with existing assets.

Other Integrated Systems and Solutions. Embraer Defense and Security provides a full line of integrated solutions and applications such as Command and Control Center (C4I), radars, ISR (Intelligence, Surveillance & Reconnaissance) and space. This also includes integrated systems for information, communications, border monitoring and surveillance as well as aircraft for authorities' transportation and special missions. With a growing presence on the global market, Embraer Defense & Security products and solutions are present in more than 60 countries.

INTERNATIONAL PRESENCE

Embraer Defense and Security has successfully expanded its footprint beyond Brazil, with a growing list of international customers. The company's aircraft are utilised by various armed forces globally, showcasing the global acceptance of their products.

Just a few days back, on December 4, 2023, South Korea's Defence Acquisition Program Administration (DAPA) announced Embraer's C-390 Millennium as the winner of the Large Transport Aircraft (LTA) II public tender to provide the Republic of Korea Air Force (ROKAF) with new military transport aircraft. South Korea is the C-390 Millennium's first customer in Asia. Embraer will provide an undisclosed number of C-390 Millennium aircraft specially configured to meet ROKAF's requirements, as well as services & support including training, ground support equipment and spare parts. "We welcome the Republic of Korea Air Force to the growing number of air forces operating the C-390 Millennium – the most modern military tactical transport aircraft. Day after day, the aircraft has proven its capability to complete a wide range of missions with great efficiency, serviceability and speed," said Bosco da Costa Jr, President and CEO, Embraer Defense & Security.

Embraer and the Netherlands Industries for Defence & Security (NIDV) signed a Memorandum of Understanding (MoU) covering ongoing initiatives associated with the C-390 Millennium and A-29 Super Tucano. The MoU between Embraer and NIDV adds to Embraer's existing partnerships and strategic relationships in the Netherlands while structuring a joint framework aimed at exploring additional opportunities aligned with the priorities of the Netherlands' Defence Industry Strategy. Contributions from the Dutch ecosystem to the supply chain of the Embraer C-390 programme for export markets will remain a central goal.

In June 2022, the Netherlands selected Embraer's C-390 airlifter, becoming the third European nation to opt for the Brazilian-built airlifter after Hungary and Portugal. The Netherlands decided to acquire five C-390s, with the first delivery scheduled for 2026.

Earlier this year, in October 2023, the first KC-390 Millennium of the Portuguese Air Force (FAP) entered into service with standard NATO (North Atlantic Treaty Organisation) equipment already integrated into the aircraft. In 2019, FAP ordered five KC-390 aircraft, a comprehensive services and support agreement and a flight simulator.

In November 2020, the Hungarian Government and Embraer signed a contract for the acquisition of two new gen-

eration multi-mission transport aircraft Embraer C-390 Millennium, in its air-to-air refuelling (AAR) configuration, designated KC-390 including pilots and technicians training as well as other services and support. Deliveries are expected to start in 2024.

In September 2023, Austrian Air Force announced that it will buy four Embraer C-390 Millennium aircraft in a deal expected to be worth more than €500 million ($532 million) and in October 2023, Czech Republic announced the start of negotiations on potential acquisition of two new-generation multi-mission Embraer C-390 Millennium, identified as the most suitable solution for meeting the requirements of the Army of the Czech Republic.

Also, in the first quarter of this year, Embraer reached a new agreement with the Philippine Air Force to provide support services for the fleet of six A-29 Super Tucano light attack advanced training aircraft delivered to the Philippine Air Force in 2020. Embraer's A-29 Super Tucano has been in operation with more than 15 Air Forces around the globe, accumulating about 5,00,000 flight hours through 260+ aircraft ordered.

in the area of border monitoring and protection of strategic structures. Bradar Indústria S/A is a technology based company, specialised in remote sensing, electronic equipment and radars for aerial and ground surveillance.

Visiona Space Technology is a joint venture between Embraer and Telebrás devoted to space systems integration. Combining Embraer's systems integration skills and INPE's accumulated satellite integration knowledge, Visiona has a key role in Brazilian space industry, coordinating the industry business actions to provide solutions to civil and military Brazilian satellite needs. The company is the prime contractor for SGDC (Geostationary Defence and Strategic Communications Satellite) programme, which offers broadband internet connectivity to Brazilian cities as part of the National Broadband Program and is also the strategic communications system backbone of the Brazilian military.

OGMA Indústria Aeronáutica is part of the Embraer Group, that offers a complete portfolio of services for Defence, Commercial and Executive aviation as well as for aircraft engines, components and engineering within the MRO market.

(LEFT) THE A-29 SUPER TUCANO IS A LIGHT ATTACK AND ADVANCED TRAINING AIRCRAFT, KNOWN FOR ITS COST-EFFECTIVENESS AND ADAPTABILITY; (RIGHT) EMBRAER'S P600 AEW&C PROVIDES ACCURATE AND RELIABLE SURVEILLANCE IN THE AERIAL AND MARITIME ENVIRONMENTS.

ACQUISITIONS AND PARTNERSHIPS

To consolidate its leading position in Latin America and offer comprehensive defence solutions that combine strategic knowledge and cutting-edge technology, Embraer Defense & Security holds the control of a set of companies with recognised expertise in critical areas of intelligence, monitoring and control:

Recognised as the "System House" of the Defence Industrial Base, Atech has a successful track record in delivering onboard and command and control systems for civil and military areas. Atech solutions assure safe and efficient systems designed within the aspects of each scenario. The Arkhe product family constitutes vital systems for several countries, contributing to mission planning, surveillance, cyber security and decision making, including training.

Embraer Defense & Security has invested into two cybersecurity companies, TEMPEST and KRYPTUS, as part of an effort to diversify its business. The company took a majority stake in Tempest Security Intelligence, a cybersecurity services firm and has also invested in Kryptus, a cybersecurity and cryptology firm. Kryptus also does encryption work for the Brazilian military, including the country's Air Force, Army and Navy.

SAVIS, a subsidiary company, is dedicated to developing, designing, integrating and implementing systems and services

SHAPING THE FUTURE

Embraer invests about 5 to 6 per cent of its net revenue in research and development (R&D). The company has five research centres in Brazil and one abroad (Netherlands). Embraer has more than four thousand employees committed to R&D, and are focused on adopting and adapting techniques, technology, and materials to deliver sustainable and affordable solutions to meet the world's aviation, defence, and security challenges. As Bosco da Costa Júnior, President & CEO, said, "Embraer develops high technologies that are used throughout its portfolio and bring benefits to all stakeholders. Our jets are designed for high reliability, high speed, long missions, and aggressive performance, with the highest technology, offering unbeatable cost-effectiveness. New requirements are continuously updated, and whatever the mission requirements, there will be an Embraer solution ready for it."

Embraer Defense & Security (EDS) stands as a testament to Brazil's aerospace prowess and its commitment to providing innovative and cutting-edge solutions to the global defence and security community. With a rich history, a strong track record of success, and a relentless focus on innovation, EDS is poised to continue shaping the future of defence and security worldwide for years to come. SP

DURING 2023, AIR INDIA CONTINUED ITS MAKE OVER WITH ORDERS FOR FRESH PLANES AND A COMPLETELY MODERN NEW BRAND IDENTITY WITH NEW AIRCRAFT LIVERY THAT CAPTURE THE ESSENCE OF A BOLD NEW INDIA

A HIGH-FLYING YEAR

During 2023, the aviation industry continued to fly high despite challenges like shortage of skilled personnel, escalating fuel prices, regulatory constraints, and airport capacities

By AYUSHEE CHAUDHARY

THE YEAR 2023 TURNED OUT TO BE A LANDMARK YEAR FOR civil aviation, witnessing a flurry of orders and deals at major global airshows. These agreements have set an optimistic tone for the aviation industry, pointing towards a promising ascent in the times to come. With new airlines coming in; some old airlines' consolidating, turning towards refurbishing their fleet and regional aviation seeing a growth, India too had an interesting year. Expected to surpass previous records by the close of 2024, the Indian aviation sector foresees substantial growth, fueled by significant aircraft orders from major carriers such as Air India and IndiGo this year. While challenges like a shortage of skilled personnel, escalating fuel prices, regulatory constraints, and airport capacities persist, the industry sees vast opportunities.

Sustainability took center stage with a surge in commitments to sustainable aviation fuels (SAFs). Urban air mobility (UAM) progressed, witnessed in global cities with test flights of electric vertical takeoff and landing (eVTOL) aircraft. Despite pandemic challenges, airlines pursued ambitious fleet expansions and announced new routes, fostering recovery. Airports embraced digital transformation, introducing smart technologies for enhanced passenger experiences, while safety and security remained paramount.

AIRSHOW EXTRAVAGANZA

While many events happened across the globe in 2023, the Paris Air Show, Dubai Air Show and Aero India were among the top headline makers.

The International Paris Air Show marked its triumphant return for the 54th edition after a four-year hiatus due to the COVID-19 pandemic, attracting global aviation enthusiasts,

PHOTOGRAPH: AIR INDIA

industry leaders, and trade visitors. The show featured 2,500 companies from 46 countries, including 300 startups. A record-breaking 322 official delegations, ministers, and chiefs of staff attended, drawing 3,00,000 visitors and showcasing over $150 billion in contracts.

The Dubai Airshow's 18th edition brought together 1,400 exhibitors from 95 countries. With 350+ speakers, 80+ startups, and 190+ aircraft displays, the event highlighted innovations and deals, particularly in the Middle East.

Aero India 2023 hosted 98 countries with a focus on showcasing indigenous capabilities, demonstrating India's prowess in the aerospace sector and laid the groundwork for substantial collaborations and advancements.

DEALS THAT SEALED AMBITION, HOPE

Many large scale orders and deals were witnessed at these shows that gave a significant push to the civil aviation industry.

AZORRA EXERCISES PURCHASE RIGHTS FOR 15 EMBRAER E195-E2S

Some of the major fixed wings deals from this year have been highlighted here.

Airbus Soars into the Future

- In a sweeping move toward modernisation, Qantas finalised an order for nine A220-300s with Airbus, marking a strategic step in its comprehensive fleet replacement.
- Philippine Airlines strengthened its collaboration with Airbus, solidifying an MoU for the acquisition of nine A350-1000s. This decision sets the stage for the replacement of its existing 777-300ERs, earmarking these new aircraft for ultra-long-haul journeys.
- The Baltic skies are set to see significant transformation as Air Baltic committed to expanding its fleet with a firm order for 30 Airbus A220-300s, boosting its total order to an impressive 80 aircraft.
- Simultaneously, EgyptAir embraced the Airbus A350-900, securing 10 aircraft scheduled for delivery in 2025.
- Emirates took center stage with a remarkable expansion of its A350 fleet, adding 15 more A350-900s to reach a grand total of 65. Ethiopian Airlines contributed to the momentum with an order for 11 A350-900s, consolidating the A350 backlog at 33.
- Air Arabia, underscoring its commitment to operational prowess, made a substantial move by ordering 240 CFM Leap-1A engines. This strategic decision aligns with its Airbus A320neo family aircraft, shaping the future of its fleet.
- Air Cairo, in a bid for sustained service excellence, formalised a multi-year service agreement for 28 Leap engines, bolstering the operational backbone of its A320neo fleet.
- Air India emerged as a headline-maker at the airshow, signing a monumental contract for up to 250 Airbus aircraft. Driven by the imperative to replace aging planes and expand the fleet, the deal includes a mix of Airbus A320neo, A321neo, and A350-1000s.
- The largest single aircraft order placed by any airline with Airbus was made by the Indian low-cost carrier IndiGo, who ordered 500 members of the A320 family. Delivery will start in 2030 and last until 2035. The order includes a mix of twinjet models A320neo, A321neo, and A321XLR.
- In a parallel development, Pratt & Whitney secured a 10-year agreement with Emirates, solidifying its commitment to maintain and support the airline's 116 PW980 auxiliary power units (APUs) installed on its Airbus A380 fleet.

Boeing's Triumph and Collaborative Milestones

- China Airlines is set to elevate its fleet dynamics, exercising options to incorporate eight Boeing 787s, a strategic move embedded in a broader agreement inked last year.
- Aviation leasing giant Avolon rekindled its engagement with Boeing, ordering 40 of the fuel-efficient 737-8 model, aligning with its commitment to a more sustainable and economical portfolio. In tandem, Air Algérie bolsters its Boeing narrowbody family, confirming an order for eight 737-9 MAX jets, emphasising their increased capacity and extended range.
- Boeing, amassed orders, options, and purchase rights approaching an astounding $100 billion. Among the highlights were significant orders from Emirates Airline, securing ninety 777Xs and five 787 Dreamliner widebodies, and FlyDubai, adding thirty 787s to its fleet.
- Boeing's success reverberated with contracts from carriers including Scat Airlines, SunExpress Airlines, EgyptianAir, Royal Jordanian, and Royal Air Maroc.
- Air India took center stage by signing a monumental contract for up to 290 new Boeing jets. This comprehensive deal, driven by the imperative to replace aging planes and expand the fleet, includes a diverse mix of Boeing's 737 MAX, 787s, and 777Xs.
- Boeing and Akasa Air announced an order for four additional 737-8 jets. India's regional carrier, Star Air has leased four E175s in 2022 and two of them have started operations since May 2023.
- Emirates made a resounding entrance with a substantial $52 billion procurement of Boeing aircraft. Safran, in turn, secured contracts exceeding $1.2 billion from Emirates, encompassing seats for the new Airbus A350 and Boeing 777X-9 aircraft. This significant export order spans Business, Premium Economy, and Economy classes, underscoring the airline's commitment to passenger comfort and luxury.
- Oman Air ventured into dedicated cargo operations by welcoming its first 737-800 Boeing Converted Freighter, marking a strategic leap into the realm of cargo transport.
- In a collaborative thrust, CFM joined forces with Flydubai, cementing an agreement for 222 Leap-1B turbofans. This collaboration strategically supports Flydubai's Boeing 737

PHOTOGRAPH: AZORRA

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fleet, ensuring operational efficiency and technological advancement in the realm of aviation propulsion.

Embraer echoes growth too

- In a significant upswing for Embraer's aircraft portfolio, Azorra has placed an order for 15 E195-E2 single-aisle aircraft, contributing a substantial boost to Embraer's order backlog.
- Simultaneously, Avolon has engaged in a strategic sale and leaseback agreement with Porter Airlines, securing ten additional E195-E2 aircraft, further fortifying Embraer's standing in the aviation market.
- Embraer's success story continued with American Airlines making a pivotal addition. The airline has placed an order for seven E175 models, earmarked for its regional affiliate, Envoy Air. This strategic move aligns with American Airlines' commitment to expanding its regional fleet with Embraer's cutting-edge E175s. The collaborative momentum between Embraer and its partners underscores the aircraft manufacturer's prowess in meeting the evolving needs of the aviation industry.

MINISTRY OF CIVIL AVIATION IS DRIVING INITIATIVES TO ATTAIN CARBON NEUTRALITY AND NET-ZERO CARBON EMISSIONS AT INDIAN AIRPORTS

PHOTOGRAPH: PIB

ATR Secures Impressive Orders and Expands Partnerships

- ATR, a prominent turboprop manufacturer, placed a total of 22 firm orders and two additional options, encompassing both its ATR 72 and ATR 42 turboprop models.
- Taiwan's Mandarin Airlines took the lead with an order for six ATR 72-600s, while Berjaya Air opted for two ATR 72-600s configured entirely for business class.
- Brazil's Azul added to ATR's triumph by expressing intent to acquire three more ATR 72-600s, solidifying its commitment to the efficiency and reliability of ATR turboprops. ATR's accomplishments further extended to contracts with five undisclosed customers, resulting in orders for eight ATR 72-600s and three ATR 42s.
- In a separate development, Abelo made a significant commitment to enhance its fleet by securing up to 20 ATR 72-600 aircraft. The initial firm order for 10 aircraft, coupled with options for an additional 10, underscores Abelo's confidence in ATR's turboprop technology and sets the stage for expanded regional connectivity.

The aviation landscape of 2023, as reflected in these significant events, stands as a testament to the industry's resilience and innovation in the face of evolving challenges. These developments not only set the stage for technological advancements but also underline the collaborative spirit that drives the global aviation community toward new horizons.

INDIA'S REGIONAL ROUTE

The Regional Connectivity Scheme (RCS) - UDAN (Ude Desh Ka Aam Nagrik), a pivotal part of India's National Civil Aviation Policy, celebrated six years of operation. Launched by the Ministry of Civil Aviation (MoCA) in 2016, UDAN aims to enhance air connectivity, especially in remote areas. Over this period, it has facilitated travel for more than 130 lakh passengers. UDAN has evolved through versions like 1.0, 2.0, 3.0, and 4.0, and recently launched 5.0, 5.1, and 5.2, each enhancing connectivity and operational flexibility. The ongoing bidding for UDAN 5.2 aims to further boost connectivity in remote areas, fostering growth in the civil aviation industry. Notably, the scheme has spurred the emergence of four successful airlines in the last six years, creating a conducive ecosystem for the aviation business.

The RCS-UDAN initiative has significantly improved regional air connectivity, linking previously underserved airports in remote areas of India. Across five bidding rounds, 517 routes have commenced operations, connecting 76 airports, including 9 Heliports and 2 Water Aerodromes. This has created more than 130 city pairs, with 2.47 lakh flights transporting over 130 lakh passengers. The scheme provides concessions such as exemption from landing and parking charges, discounted Route Navigation and Facilitation Charges, and the freedom for airline operators to enter code-sharing arrangements. Additionally, state governments at RCS Airports are encouraged to reduce VAT on Aviation Turbine Fuel and provide various support services for the sustainable development of regional air connectivity.

SUSTAINABILITY

Sustainability has been a key area of discussion and showcase of technologies for it have been showcased in most of these global events and even in India.

MoCA is driving initiatives to attain carbon neutrality and net-zero carbon emissions at Indian airports. The focus involves standardising the carbon accounting and reporting framework for airports. Airport operators are advised to map carbon emissions and work toward carbon neutrality and net-zero emissions progressively. The directive extends to upcoming Greenfield Airports and state governments, urging them to achieve carbon neutrality and net-zero, emphasising the use of green energy. Notably, airports like Delhi, Mumbai, Hyderabad, and Bengaluru have achieved high-level Airports Council International (ACI) accreditation, reaching carbon neutrality. Moreover, 66 Indian airports operate on 100 per cent green energy.

As we bid farewell to 2023, the civil aviation landscape reflects a dynamic industry evolving with the times. From sustainability commitments to technological marvels, the year witnessed the aviation sector's resilience and determination to shape a future that is efficient, sustainable, and interconnectedness. With the above mentioned happening and more, these have set the stage for an exciting journey into the future of flight. SP

ONLINE TRAINING PROGRAMMES ARE A PIVOTAL FORCE IN THE AVIATION INDUSTRY, PROVIDING FLEXIBLE AND ACCESSIBLE SOLUTIONS TO TRAIN PILOTS AND ADDRESS THE SKILL GAP

SOARING HIGH WITH DIGITAL SKIES

Online training programmes have emerged as a dynamic and accessible solution, offering cockpit crew a flexible and convenient avenue to hone their skills and stay current with industry standards, all from the comfort of their homes or offices

By ROHIT GOEL

PHOTOGRAPH: FLIGHTSAFETY INTERNATIONAL

AS THE AVIATION INDUSTRY CONTINUES TO EVOLVE, SO TOO do the demands placed upon its workforce. Cockpit crew, the backbone of safe and efficient air travel, are now expected to possess a diverse range of skills and knowledge, encompassing technical expertise, procedural awareness, and exceptional interpersonal abilities. To meet this growing need, the training paradigm for cockpit crew is undergoing a revolutionary transformation and online training programmes have emerged as a dynamic and accessible solution, offering cockpit crew a flexible and convenient avenue to hone their skills and stay current with industry standards. Fuelled by technological advancements and an escalating demand for skilled pilots, online training courses have emerged as a pivotal force, providing a flexible and accessible alternative to traditional classroom-based programmes.

DRIVING GROWTH IN ONLINE TRAINING

The growth of online training in the aviation sector is driven by several key factors. Technological advancements, particularly the emergence of the internet and sophisticated online learning platforms, have revolutionised training delivery by enabling global outreach in a cost-effective manner, breaking down geographical barriers. The cost-effectiveness of online training courses is evident in the significant reduction of training costs compared to traditional programmes, eliminating the need for travel, accommodation, and physical facilities. This efficiency allows aviation organisations to allocate resources more effectively, thereby enhancing the accessibility of pilot training. The self-paced nature of online learning is a significant advantage for cockpit crew members with demanding schedules, offering the flexibility to tailor study hours around existing commitments. Additionally, in response to the global pilot shortage, online training provides a scalable and efficient solution to train a large number of pilots, contributing to industry efforts to address the skill gap. The variety of courses available in online training caters to diverse needs within the aviation sector, ranging from airline-specific programmes to type-rating training, recurrent training, and specialised safety courses. Furthermore, the evolution of resources goes beyond formal training programmes, allowing pilots to access a wealth of online materials such as e-books, webinars, podcasts, and online communities for continuous learning and professional development.

ADVANTAGES OF ONLINE TRAINING

Online training for pilots offers several advantages. Firstly, it provides unmatched convenience, enabling cockpit crew members to learn from any location, thus overcoming geographical limitations. Whether at home or during layovers between flights, pilots can access course materials at their convenience. Additionally, online training proves to be cost-effective by not only reducing travel expenses but also eliminating the need for physical infrastructure, ultimately making education more financially accessible for aspiring pilots. The flexibility of online courses extends beyond scheduling, allowing pilots to engage in discussions, complete assignments, and access materials according to their erratic aviation schedules. Moreover, the content of online courses is standardised, developed by industry experts to adhere to rigorous industry standards, ensuring consistent and high-quality education across various training programmes. Lastly, online training promotes accessibility, breaking down geographical barriers and connecting pilots from diverse locations worldwide. This inclusivity fosters a globally connected aviation community with access to reliable and comprehensive education.

> Advantages of online training include convenience, cost-effectiveness, flexibility, standardised content, and global accessibility

DISADVANTAGES OF ONLINE TRAINING

Despite its benefits, online pilot education comes with certain drawbacks. One challenge is the limited interaction, as online courses may lack the interactive elements and face-to-face engagement found in traditional classrooms, potentially affecting social learning and peer collaboration—integral aspects of pilot education. Another concern is the susceptibility to technical challenges, ranging from internet connectivity issues to software malfunctions, disrupting the learning experience for both instructors and trainees. Furthermore, while online programmes excel in theoretical knowledge, they may fall short in providing hands-on training compared to traditional courses, impacting the development of crucial practical skills in a pilot's training. Additionally, online learning demands a high level of self-discipline and time management skills, requiring pilots to stay motivated, adhere to schedules, and complete coursework independently—a challenge for those accustomed to a more structured classroom environment.

ORGANISATIONS OFFERING ONLINE TRAINING PROGRAMMES

Several leading organisations actively contribute to the development and delivery of online training programmes for cockpit crew:

- **Unveiling the IATA Advantage:** The International Air Transport Association (IATA), a globally recognised leader in aviation standards and regulations, offers a comprehensive suite of online training programmes designed to equip cabin crew members with the necessary skills and knowledge to excel in their roles. Their "Initial Cabin Crew Training" programme serves as a foundational course, delving into the critical aspects of aviation safety and security, first aid procedures, effective communication strategies, and exceptional customer service techniques. This programme's flexible learning options, accessible via web or mobile devices, allow cabin crew members to tailor their training to their individual schedules and learning styles.
- **Navigating the Skies with Confidence:** Renowned for its unwavering commitment to safety and operational excellence, FlightSafety International boasts an extensive array of online training programmes for pilots. They offer comprehensive "Type-rating Training" programmes, equipping pilots with the specific knowledge and skills required to safely operate a particular aircraft type. Additionally, their "Recurrent Training" programmes ensure that pilots remain current with the latest operational procedures and emergency response techniques. FlightSafety International's commitment to high-fidelity simulation technology and experienced instructors ensures an immersive and engaging learning experience, fostering confident and proficient pilots.
- **Blending Innovation with Expertise:** CAE, a pioneer in aviation training, has revolutionised the learning landscape by offering a unique blend of online and interactive training solutions for pilots, air traffic controllers, and other aviation professionals. Their "Blended Learning Approach" combines online modules with interactive exercises and simulator sessions, providing a comprehensive and multi-dimensional learning experience. CAE's advanced learning technologies, encompassing virtual reality and augmented reality, further enhance the learning process, allowing trainees to engage with course material in a dynamic and interactive manner.
- **Tailoring Training to Individual Needs:** L3Harris Airline Academy, a leader in online and blended training for pilots, understands the importance of individualised learning. Their

"Type-rating Training" programmes are available in both online and blended formats, allowing pilots to choose the learning method that best suits their needs and preferences. L3Harris also offers a range of "Upskilling and Development" courses, designed to equip pilots with specific skills such as leadership, decision-making, and effective communication. These targeted programmes ensure that pilots are prepared to face the ever-evolving challenges of the aviation industry.

- **Ensuring Safety Through Standardised Training:** National Aviation authorities play a vital role in ensuring the safety and security of air travel. Many of these authorities offer online training courses covering essential topics such as regulations and procedures, safety principles, emergency procedures, and security awareness. These courses are developed by experts in the field and are aligned with national and international standards. Their accessibility and affordability make them an invaluable resource for pilots seeking to stay compliant with the latest regulations and maintain a high level of operational proficiency.

personalised training, adapting to individual needs and progress. This entails the development of customised training plans and assessments tailored to each pilot's strengths and areas for improvement, thereby optimising the overall learning experience. The integration of Artificial Intelligence (AI) will further enhance online training by personalising learning pathways, analysing pilot performance, providing targeted feedback, and automating administrative tasks, ensuring a more efficient and effective training process. Moreover, online training is poised to facilitate global standardisation of pilot education programmes, ensuring consistent, high-quality education for pilots worldwide. This move towards standardisation aims to foster a more harmonised and interconnected aviation community, shaping the future landscape of pilot education.

CONCLUSION

Online training for cockpit crew in civil aviation is evolving rapidly, offering a flexible, cost-effective, and accessible solution to meet the surging demand for skilled pilots. Online

(LEFT-RIGHT) THE FUTURE OF ONLINE TRAINING WILL BE SHAPED BY VR/AR INTEGRATION, PERSONALISED LEARNING, AI-POWERED OPTIMISATION, AND GLOBAL STANDARDISATION

The online training landscape for cockpit crew extends far beyond the offerings outlined above. Many airlines have developed their own online training programmes, tailored to their specific operational requirements and aircraft types. Additionally, numerous e-learning platforms offer a diverse range of aviation-specific training courses and resources, catering to various learning styles and career aspirations. Organisations such as the International Civil Aviation Organization (ICAO) and the European Union Aviation Safety Agency (EASA) provide pilots and aviation professionals with valuable resources and information, contributing to a global community of continuous learning and professional growth.

THE FUTURE OF ONLINE TRAINING

The future of pilot education is undergoing a transformative shift with the increasing prominence of online training, driven by several key trends. The integration of Virtual and Augmented Reality (VR & AR) technologies is set to revolutionise training by providing immersive and realistic scenarios, enhancing decision-making skills, and creating a more engaging learning experience. Online platforms are expected to evolve towards

training programmes represent a transformative force in the field of pilot and cabin crew education. Their accessibility, flexibility, and diverse offerings empower cockpit crew to take control of their learning journey, acquiring the necessary skills and knowledge to navigate the ever-changing skies with confidence and competence.

As technology advances and online platforms become more sophisticated, online training is poised to play a leading role in shaping the future of pilot education. The integration of virtual and augmented reality, personalised training approaches, the infusion of artificial intelligence, and global standardisation are pivotal trends that will further elevate the effectiveness and efficiency of online training in the aviation industry. Embracing these innovations will not only address the challenges posed by the current pilot shortage but will also contribute to the development of a highly skilled and interconnected global aviation workforce.

As the aviation industry continues to soar towards new heights, online training programmes will undoubtedly remain a crucial component of ensuring a safe, efficient, and ever-evolving air travel experience. SP

PHOTOGRAPHS: BAA TRAINING, EMBRY-RIDDLE/BERNARD WILCHUSKY

MULTIPLE FACTORS ARE DRIVING THE SHORTAGE OF PILOTS IN COMMERCIAL AND BUSINESS AVIATION AND REMAINS A CRITICAL CHALLENGE FOR THE INDUSTRY

TURBULENT SKIES

Navigating Pilot Shortage in Commercial and Business Aviation will require a collaborative approach by all stakeholders

By ROHIT GOEL

IN THE EVER-EVOLVING LANDSCAPE OF COMMERCIAL AND business aviation, the pilot shortage remains a critical challenge demanding strategic and collaborative solutions. As the industry strives to meet the escalating demands of a growing global population, finding a delicate balance between safety, efficiency, and workforce sustainability becomes paramount. By addressing the root causes of the shortage and implementing comprehensive solutions, the aviation industry can navigate these turbulent skies and secure a prosperous future for both seasoned aviators and those aspiring to soar to new heights.

PHOTOGRAPH: EBACE

WHY THE SHORTAGE?

The pilot shortage remains a critical challenge for the aviation industry, driven by factors such as an aging pilot workforce, surging demand for air travel, costly training, and a shortage of qualified instructors. With the average age of pilots surpassing 50, imminent retirements will exacerbate the deficit of skilled pilots. The escalating demand for air travel, projected to increase by 5 per cent annually over the next decade, further underscores the urgency of addressing this shortage. However, the escalating costs of pilot training act as a significant deter-

rent for aspiring aviators. In addition, the shortage of proficient flight instructors creates a bottleneck in the training pipeline, resulting in delays for new pilots to commence their careers. Some of the key factors that typically influence the requirement of Pilots in Commercial and Business Aviation are:

- **Growing Air Travel Demand:** At the heart of the pilot shortage saga is the exponential growth of the aviation industry. Emerging markets, in particular, have experienced a surge in demand for air travel that has outpaced the supply of qualified pilots. While this growth is indicative of the industry's vitality, it has inadvertently led to an imbalance between supply and demand. This sustained growth creates a need for more pilots to operate the expanding fleet of aircraft. Airlines are grappling to secure an adequate number of pilots, resulting in operational challenges and potential compromises in safety standards.
- **Aging Pilot Workforce:** The aviation industry has been facing an issue with an aging pilot workforce. Many seasoned pilots are on the brink of retirement, creating a vacuum that proves difficult to fill. The impending retirements exacerbate the existing shortage, as the industry struggles to replace the wealth of experience and expertise set to exit the cockpit. Balancing the need for fresh talent with the irreplaceable knowledge of veteran aviators becomes a delicate task, requiring strategic planning and foresight.
- **Expanding Airline Fleets:** Airlines worldwide are continuously expanding their fleets to meet the growing demand for air travel. The introduction of new routes and the acquisition of additional aircraft require a larger pool of pilots. These fleet expansion plans are typically outlined in airline strategies.
- **Stringent Training Requirements and Entry Barriers:** Becoming a commercial pilot is a journey fraught with challenges, both in terms of time and financial investment. The extensive training required, coupled with stringent regulatory requirements, can dissuade potential pilots from pursuing a career in aviation. The arduous path to certification acts as a formidable barrier, deterring aspiring aviators and limiting the influx of new talent into the industry. Addressing this issue necessitates a re-evaluation of training programmes, exploring avenues to make them more accessible and cost-effective without compromising safety standards.
- **Regulatory Requirements:** Aviation authorities, such as the FAA (Federal Aviation Administration) in the United States or EASA (European Union Aviation Safety Agency), often impose regulations related to pilot-to-aircraft ratios, rest periods, and other safety measures. Compliance with these regulations can necessitate the hiring of more pilots.
- **Emerging Markets:** The aviation industry is experiencing rapid growth in emerging markets, particularly in Asia and the Middle East. New airlines and increased connectivity in these regions contribute to higher demand for pilots. Airlines operating in these areas may seek to hire both local and foreign pilots.
- **Pilot Retirement Patterns:** The retirement patterns of pilots can vary by region and airline, but many pilots retire between their late 50s and early 60s. This predictable attrition rate requires airlines to have a pipeline of newly trained pilots to fill these positions.
- **Training Capacity:** The capacity of flight training schools and academies can influence the availability of new pilots. The expansion of training programmes and facilities can help meet the increasing demand for qualified pilots.
- **Economic Factors:** The financial landscape for aspiring pilots, particularly at the entry level, has been a cause for concern. Many regional airlines offer starting salaries that are relatively low, making alternative career paths with better compensation more attractive. This economic reality has played a role in dissuading potential pilots, exacerbating the shortage. For the Airlines, the economic conditions can impact pilot hiring trends. Economic downturns may result in widespread layoffs, furloughs, and a reduction in training capacities leading to reduced pilot recruitment.
- **Technological Advancements:** Advancements in aircraft technology, including automation and avionics, may affect the number of pilots required for specific aircraft types. More automated systems may change the pilot-to-aircraft ratio.

Moreover, the scarcity of adept flight instructors, attributable to various factors including their aging demographics, escalating training costs, and insufficient government backing, compounds the predicament. This deficiency translates into extended waiting periods for aspiring pilots to embark on their professional journeys.

STEPS TAKEN TO AUGMENT PILOT INTAKE AND TRAINING

Addressing the pilot shortage requires a comprehensive and collaborative approach. Airlines, governments, and industry organisations often implement initiatives to address the pilot shortage. These efforts can include scholarship programmes, incentives for aspiring pilots, and partnerships with flight training institutions. To mitigate this shortage, multifaceted measures are being implemented:

- **Airlines' Incentives:** Airlines can play a pivotal role in attracting and retaining qualified pilots by offering competitive salary packages, signing bonuses, and comprehensive benefits. Implementing tuition reimbursement programmes and other financial incentives can alleviate the economic burden on aspiring pilots, making the profession more appealing and financially viable for a broader range of individuals.
- **Investment in Training Programmes:** Airlines are investing in specialised training programmes designed to equip pilots with the requisite skills for commercial flying. Notably, Delta Air Lines has unveiled an accelerated training programme enabling pilots to obtain a commercial pilot license in just 12 months.
- **Government Intervention:** Governments, recognising the gravity of the situation, are taking concerted measures. The US government has launched an ambitious programme with the aim of training 10,000 new pilots within the next decade. Additionally, grants are being extended to flight schools to help defray the costs of training.
- **Private Sector Contributions:** Private companies are making significant strides in pilot training. These programmes, often more cost-effective and time-efficient than traditional flight schools, present a viable alternative for aspiring aviators. The ATP Flight School, for instance, offers a programme that can be completed in as little as nine months.

ADDITIONAL CONSIDERATIONS FOR LONG-TERM SOLUTIONS

In tandem with these measures, several additional strategies warrant consideration:

- **Regulatory Changes:** Streamlining and modernising the regulatory process for pilot certification is paramount. Expedited processes can significantly contribute to the faster training and hiring of new pilots. Moreover, collaboration between international regulatory bodies is essential

(LEFT-RIGHT) ADDRESSING THE COMPLEX ISSUE OF PILOT SHORTAGE DEMANDS SUSTAINED, COLLABORATIVE ACTION ACROSS THE INDUSTRY, PRIORITISING LONG-TERM STRATEGIES

to ensure consistency in standards, promoting a more cohesive and globally aligned approach to pilot certification.

- **Industry Collaboration:** Open communication and collaboration between airlines, training organisations, and regulatory bodies are critical. Establishing industry-wide initiatives to share best practices and collectively tackle challenges can lead to more effective solutions. By fostering a culture of collaboration, the aviation industry can develop sustainable strategies to address the pilot shortage and promote a robust workforce.
- **Affordable Training:** Endeavours to make pilot training more financially accessible are pivotal. This may involve government subsidies for flight training or the development of innovative, cost-efficient training methods.
- **Diversity and Inclusion Initiatives:** Promoting diversity and inclusion in the aviation industry is imperative. Implementing targeted programmes to encourage a more diverse pool of pilot candidates, including women and minorities, is a step toward addressing the shortage. Presently, these groups are underrepresented in the field, necessitating focused efforts to promote inclusivity. Removing systemic barriers and biases in recruitment processes ensures equal opportunities, fostering an inclusive environment that reflects the diversity of the global population.
- **Technological Innovations:** Harnessing technology, particularly virtual reality, can revolutionise pilot training. By providing realistic simulations, it has the potential to significantly reduce the time and financial investments required for training in actual aircraft. Exploring advances in aviation technology, such as increased automation and remote piloting capabilities, presents opportunities to alleviate pressure on the pilot workforce. However, careful consideration of safety implications and the development of comprehensive regulatory frameworks are essential. Striking a balance between technological innovation and maintaining the highest safety standards is crucial for the successful integration of new technologies.

FUTURE OUTLOOK AND OPTIMISTIC DEVELOPMENTS

The pilot shortage is a multifaceted challenge necessitating a concerted, industry-wide effort. While the current initiatives are commendable, sustained focus on long-term solutions is imperative. By making training more accessible, promoting diversity and inclusion, and leveraging technological advancements, the aviation industry can navigate through this shortage and ensure a robust pipeline of pilots to meet the escalating demands of air travel. It is of paramount importance to act now, proactively!

While the challenges presented by the pilot shortage are significant, there are promising developments on the horizon. Technological advancements are underway that could revolutionise pilot training. For instance, the integration of virtual reality training could potentially streamline and enhance the learning process, making it more accessible and cost-effective. Furthermore, there is a growing interest in aviation among young people. This presents an opportunity to inspire the next generation of pilots and ensure a steady influx of talent into the profession. Initiatives such as aviation education programmes in schools and community outreach efforts can play a pivotal role in nurturing this interest.

The shortage of pilots in commercial and business aviation is a multifaceted issue stemming from factors like an aging pilot workforce, increased demand for air travel, expensive training costs, and a shortage of qualified instructors. While the industry is taking commendable steps to address these challenges, including offering incentives, investing in training programmes, and implementing government-backed initiatives, more comprehensive strategies are needed.

Efforts to make pilot training more affordable and accessible, as well as endeavours to diversify the pilot workforce, should be prioritised. Additionally, the integration of emerging technologies holds great potential in revolutionising the training process. By proactively addressing these issues, the aviation industry can work towards alleviating the pilot shortage and ensuring a sustainable and thriving future for commercial and business aviation. SP

ILLUSTRATIONS: SP'S TEAM

DEMAND FOR PRIVATE JET CHARTER FLIGHTS IN THE MIDDLE EAST IS EXPECTED TO CONTINUE GROWING AND EXPAND FROM $511.52 MILLION IN 2023 TO $851.90 MILLION BY 2028

PHOTOGRAPH: JETEX

POISED FOR GROWTH

The Middle East stands as one of the fastest-growing aviation markets globally, with an annual regional fleet expansion of 5.1 per cent over the next decade

By AYUSHEE CHAUDHARY

BUSINESS AVIATION HAS BEEN A GROWING MARKET AFTER COVID-19 in many parts of the world. While the fluctuations have impacted even the private aviation market, it has more or less seen better days than commercial aviation. The global business aviation sector was valued at $42.14 billion in 2022 and is poised for significant growth. Forecasts indicate an increase from $43.97 billion in 2023 to an impressive $62.66 billion by 2030. This surge is driven by a notable rise in high-net-worth tourists, escalating the demand for private aviation and propelling global business aircraft sales.

The Middle East has been seeing significant growth, further driven by tourism and global events being organised. In the Middle East Aviation Market, valued at $60 billion in 2023, RationalStat analysis predicts substantial growth at a CAGR of 3.9 per cent from 2023 to 2030. Despite a 6 per cent year-over-year decline, the sector is 47 per cent ahead of 2019, with Al Maktoum International Airport in Dubai standing out, surpassing its last year's activity by 4 per cent. The Middle East demonstrates resilience, with certain hubs like Dubai maintaining robust activity. Business jet growth in the Middle East has been strong in recent years and is expected to continue. According to Aviation Week Network's 2024 Business Aviation Fleet & MRO forecast, the private jet fleet in the region is projected to grow by 141 (reaching 480 in-service aircraft) over the 10 years from 2024-2032, with a sales value of $9.1 billion. The region primarily sees a dominance of long and ultra-long-range jets, aligning with travel profiles to Europe, Asia, or North America.

Constructive growth in the Middle East during the forecast period is anticipated due to substantial demand in economic powerhouses such as the UAE and Saudi Arabia. This surge is further fueled by the need for private and environmentally friendly aircraft due to escalating aviation emission regulations. The Middle East stands as one of the fastest-growing aviation markets globally, with an annual regional fleet expansion of 5.1 per cent over the next decade. Notably, the Middle East outpaced the rest of the world in reviving international air travel, surpassing

"MEBAA has been dedicated to serving as a strong advocate for the industry, tirelessly working behind the scenes to address challenges and champion the interests of our members. Throughout our journey, MEBAA has played a pivotal role in shaping policies, influencing regulations, and promoting best practices to ensure a thriving and sustainable business aviation ecosystem."
— Ali Ahmed Alnaqbi, MEBAA Founding & Executive Chairman and Chair of the Governing Board of IBAC

pre-pandemic levels in the first quarter of 2023. Demand for private jet charter flights in the Middle East is expected to continue growing and reports project the Middle East and Africa jet charter market to expand from $511.52 million in 2023 to $851.90 million by 2028. With these predictions and various developments, alongside new orders and announcements expected from the Dubai Airshow 2023, the Middle East is certainly solidifying its position in the business aviation market.

DUBAI ESTABLISHING AS THE HOTSPOT AND THE HUB

In Dubai, strong business conditions are evident with the fastest acceleration in new business intakes in four years, driven by the city's 3.2 per cent economic growth in H1 2023. The ambitious D33 economic growth strategy targets a surge in foreign direct investment (FDI) to Dhs650 billion by 2033. Dubai continues to dominate business aviation in the Middle East, driven by robust revenues, highlighted at the Dubai Airshow with new facilities like the ExecuJet FBO. The Mohammed Bin Rashid Aerospace Hub (MBRAH) recorded over 15,400 business jet movements in 2022, with sustained momentum at 7,300 movements in H1 2023.

Government initiatives and global events like the FIFA World Cup 2022 in Qatar have boosted private jet movements to Dubai, solidifying its position as the region's aviation hub. Growth opportunities in Saudi Arabia position the Gulf region as a focal point for private aviation diversification. The region also eyes participation in eVTOL air taxi services, aiming for a comprehensive aviation ecosystem. Investments in MBRAH, totaling $820 million, show a commitment to further growth, with expectations to reach $1.6 billion by 2026.

SAUDI ARABIA EMERGING AS A GROWTH CENTER

Saudi Arabia is re-emerging as a growth center for business aviation, with companies like Jet Aviation looking beyond the dynamic Dubai market. Jet Aviation is consolidating its UAE operations while exploring significant growth opportunities in Saudi Arabia, aligning with the country's Vision 2030 strategy. Positive sentiments about Saudi Arabia's business aviation sector indicate upward growth, supported by expansions in line maintenance capabilities. EAG's aircraft management division is expanding its fleet, showing sustained interest in new private aircraft in the Middle East. Jetex, aiming for 50 FBOs by 2025 or 2026, prioritises acquisitions for network growth. The return of demand for new private aircraft, especially in the Middle East, reflects a robust market, with Middle Eastern buyers preferring new aircraft. Global Jet Capital expects continued growth in new deliveries and strong activity in both new and pre-owned markets.

UAE MOVING UPWARDS

Ali Ahmed Alnaqbi, Founder and Executive Chairman of the Middle East and North Africa Business Aviation Association (MEBAA), recently noted that the United Arab Emirates (UAE), constituting 35 per cent to 40 per cent of business aviation movements in the Middle East and North Africa, is the largest market in the region. The number of private or business aircraft in the UAE has surpassed 500, indicating a substantial increase. Alnaqbi highlighted that the cooperation agreement between MEBAA and the General Civil Aviation Authority (GCAA) aims to boost the business and private aviation sector, with the UAE aspiring to be the primary base and headquarters for business aviation in the region. The agreement involves signing contracts and establishing specialist committees, with the goal of solidifying the UAE's position as the main hub for business and private aviation services in the region.

MEBAA STRENGTHENING BUSINESS AVIATION

According to the MEBAA, a substantial 70 per cent of private jet flights in the Middle East region serve business purposes. Leading countries in the region with extensive business aviation fleets include Saudi Arabia, Turkey, the UAE, Israel, and Egypt. In 2022, the Middle East's private aviation sector experienced robust growth, witnessing a yearly increase of 25 to 27 per cent in aircraft movements. Notably, individuals who shifted from first and business-class travel to private aviation during the COVID-19 pandemic have sustained this trend, opting for chartered flights over scheduled airlines.

MEBAA, a key driver behind the growth of business aviation in the Middle East, plays a crucial role in unifying the industry, fostering innovation, and ensuring a conducive environment for thriving businesses. Founded by Ali Alnaqbi, who is also the Chair of the Governing Board of the International Business Aviation Council (IBAC), MEBAA is instrumental in championing common standards, safety, and sustainability for streamlined operations.

In our interconnected world, business aviation is a vital catalyst for global economic growth and connectivity, facilitating rapid market access, encouraging collaboration, enabling swift humanitarian response, and building bridges among nations, Alnaqbi shared recently. He further emphasised the swift recovery of business aviation under MEBAA's influence. The upcoming MEBAA edition, scheduled for December 10-12, 2024, in Dubai, follows the highly successful 9th edition, which saw over 10,000 attendees and exhibitors from 95 countries. MEBAA Show 2022, a cornerstone event in the Middle East business aviation calendar, witnessed a 90 per cent increase in new visitors, providing an ideal platform for global industry networking and concluded with key deals and announcements poised to drive the business aviation sector forward.

Alnaqbi also expressed enthusiasm about the show's success and the industry's transformative growth. He emphasised the industry's transition with innovation, technological advancements, and digital transformations, indicating sustained growth well into the future. SP

BOEING'S SUPERSONIC B-1 LANCER BOMBER MADE A DYNAMIC APPEARANCE, MAKING TWO PASSES AT THE DUBAI AIRSHOW, SHOWCASING ITS PROWESS AND ADDING TO THE EVENT'S EXCITEMENT

PHOTOGRAPH: US AIR FORCE

A GRAND SHOWCASE OF AEROSPACE EXCELLENCE

The latest innovations and advancements on display, the most thrilling airplanes taking to the skies, sustainability and advanced air mobility developments and significant deals, made the Dubai Airshow 2023, an aerospace spectacle

By AYUSHEE CHAUDHARY

THE 18TH EDITION OF THE DUBAI AIRSHOW WAS A RESOUNDING success, bringing together more than 1,400 exhibitors hailing from over 95 countries. The event boasted a stellar lineup, featuring 350+ distinguished international speakers, 80+ innovative startups, and 20 country pavilions. The show also presented a spectacular display of 190+ aircraft, both on static exhibits and engaging in dynamic flying displays. With the latest innovations and advancements on display, the most thrilling airplanes taking to the skies, sustainable and advanced air mobility developments, and huge deals being signed, the Dubai Airshow was a pivotal glimpse of the global aviation industry especially that of the Middle East.

DISPLAY DECORUM

Boeing's Beasts. Among the standout displays at the Dubai Airshow was Boeing's invitation to visitors to step inside the 777-9, one of the four test aircraft in the 777X programme. Scheduled for certification as a widebody, long-haul airliner in 2025, the

777-9 is equipped with cutting-edge GE9X engines and distinctive folding wingtips, marking a significant leap in capability and efficiency for the big twin family.

Making its public debut was the Boeing 777-300ERSF, a passenger-to-freighter (P2F) conversion engineered by Israel Aerospace Industries' Bedek Aviation Group. Originally a regular passenger aircraft with Emirates Airline, this prototype conversion showcased the future of freighter capabilities, illustrating the adaptability of existing aircraft for cargo operations.

Boeing is on the verge of a pivotal moment in its journey toward certifying the 777X—achieving type inspection authorisation (TIA). With its sights set on securing US FAA approval by 2025, the aerospace giant showcased the flight test vehicle WH001, a 777-9, at the Dubai Airshow. This strategic move aims to not only garner momentum but also instill confidence in customers who have collectively placed orders for well over 300 of these widebody aircraft.

Satcom Direct's Plane Simple Ku-band Terminal. The Dubai Airshow witnessed a significant milestone for aviation connectivity in the UAE as Empire Aviation Group announced its plans to deploy Satcom Direct's Plane Simple Ku-band terminal. This advanced two-line-replaceable-unit aircraft connectivity system will undergo installation by ACC Columbia Jet in Hamburg, Germany, on a Bombardier Global XRS, showcasing the industry's commitment to cutting-edge technology.

Leonardo's AW169 Utility Helicopter. Leonardo showcased the latest skid-equipped version of its AW169 utility helicopter, underlining its versatility in various operational scenarios. This helicopter, recently delivered to Italy's Guardia di Finanza, exemplifies Leonardo's commitment to delivering adaptable solutions for diverse mission requirements.

(LEFT) EVE AND KOOKIEJAR TO DEVELOP URBAN AIR TRAFFIC MANAGEMENT SYSTEM FOR OPERATIONS IN DUBAI; (RIGHT) OMAN AIR TAKES DELIVERY OF FIRST 737-800 BOEING CONVERTED FREIGHTER.

PHOTOGRAPHS: EVE AIR MOBILITY, BOEING

DYNAMIC FLYING DISPLAYS

The opening act of the 2023 Dubai Airshow's flying display was a spectacular flypast featuring a diverse array of aircraft representing both military and commercial services for the United Arab Emirates. The Armée de l'Air et de l'Espace (French Air and Space Force) took center stage during the event, presenting a captivating in-flight demonstration of the Rafale. An Indian Air Force (IAF) contingent, featuring the Light Combat Aircraft (LCA) Tejas and Advanced Light Helicopter (ALH) Dhruv, was also present at the biennial Dubai Airshow. The Tejas was featured in static and aerial displays, while the Sarang Helicopter Display Team showcased their formation aerobatics skills. This marked the Tejas and Sarang teams' second consecutive appearance at the Dubai Airshow, following their participation in 2021.

The People's Liberation Army Air Force August 1st, or Ba Yi Aerobatic Team, showcased their skills in the Chengdu J-10 multirole fighter, paying homage to the founding date of the People's Liberation Army. Russia's aerospace industry, despite facing restrictions at various global aviation exhibitions, made a substantial impact at the Dubai Airshow. The Russian Knights display team, featuring a mix of Sukhoi Su-30SM and Su-35S fighters, returned to Dubai with a remarkable presence.

The Dubai Airshow audience was treated to the awe-inspiring display of the Dassault Mirage 2000-9 fighter jet from the United Arab Emirates, leaving a lasting impression on spectators.

The UAE's F-16 Block 60 Desert Falcon Fighter took to the skies, demonstrating the capabilities of these aircraft that have been a part of the UAE's fleet since 2004.

The Calidus B-250 Light Attack/Trainer Aircraft, developed in Brazil and built in the UAE as part of the Bader programme, presented its capabilities, contributing to the diverse lineup of aircraft at the Dubai Airshow.

A FLIGHT OF DEALS

New Zealand Airline Academy Limited (NZAAL) Takes Flight. This announcement, encompasses a fleet expansion of 10 aircraft. NZAAL's strategic selection includes eight single-engine P2008 JC models meticulously designed for nighttime visual flight rules (VFR) operations. Complementing this lineup is a single-engine P-Mentor IFR trainer, boasting RNAV capabilities and equipped with a ballistic parachute. Rounding off the order is the versatile P2006T light twin, promising a multifaceted approach to aviation training.

Airbus and Emirates Seal the Deal. Emirates, the flagship carrier of the UAE, inked an agreement for an additional 15 A350-900 widebody aircraft. This strategic move elevated the total A350-900 order for Emirates to an impressive 65. On November 15, Ethiopian Airlines added to the momentum by signing a memorandum of understanding (MoU) for an extra 11 A350-900s. This agreement positions the African carrier's total backlog for the A350 at 33 units, encompassing 4 of the larger A350-1000 model.

Flydubai and CAE Pioneer Aviation Training. Flydubai and

CAE joined forces to establish a state-of-the-art pilot training center in Dubai. This $56 million facility is slated to house six full-flight simulators dedicated to Flydubai's Boeing 737 MAX fleet.

Diamond Aircraft Delivers Excellence. In a notable moment of delivery, a Middle East-based customer embraced the future of aviation by taking possession of the Diamond Aircraft Industries DA50 RG at the Dubai Airshow.

Oman Air Soars into Cargo Excellence. Oman Air welcomed its first-ever 737-800 Boeing Converted Freighter (BCF) at the Dubai Airshow. The decision to integrate the BCF into its fleet aligns seamlessly with Oman Air's strategic vision, propelled by a remarkable 42 per cent year-over-year surge in cargo business volume during the initial half of 2023.

Bengaluru's Skyward Ascent with Eve Air Mobility and Hunch Mobility. Eve's pioneering role in India was solidified with the signing of a letter of intent (LOI) with Hunch Mobility, encompassing the purchase of 200 eVTOLs and the adoption of the company's urban air traffic management solution.

Air Arabia's Propulsion Power Play. A substantial order for 240 CFM Leap-1A engines was unveiled, underlining Air Arabia's commitment to powering its existing mandate for 120 Airbus A320neo family aircraft, including the A321XLR. This comprehensive deal extends beyond engine procurement, encompassing a multi-year services agreement and the inclusion of spare engines.

Air Cairo Elevates Service Commitment. Air Cairo formalised a multi-year service agreement. This comprehensive pact encompasses show visits for a remarkable 28 Leap engines, powerhouses propelling 14 A320neos within the Egyptian carrier's operational fleet.

CFM Propels Flydubai's Ambitions. This strategic collaboration is designed to provide robust support for 222 LEAP-1B turbofans, the dynamic force propelling Flydubai's Boeing 737 fleet. This groundbreaking deal extends its reach to engines already in active service and those slated for future orders, totaling 80 aircraft.

Eve Air Mobility Expands Vertiport Horizon. Eve Air Mobility received a letter of intent from Swedish vertiport developer KookieJar. This strategic alliance positions KookieJar as Eve's tenth Urban ATM (air traffic management) customer and fifth vertiport partner. The agreement solidifies Eve's Urban ATM system's entry into Dubai, fostering an innovative approach to urban air mobility.

Gulf Air's Maintenance Commitment with Joramco. Bahrain's national carrier, Gulf Air, solidified its commitment to seamless operations by extending its maintenance, repair, and overhaul (MRO) contract with Jordan Aircraft Maintenance (Joramco). This strategic collaboration ensures fleet support services for an additional four years.

Emirates' Visionary Investment in Engineering Excellence. The renowned airline aims to construct a sprawling 1-million-sq-m engineering facility at the Dubai World Central site. This visionary undertaking, slated to support the airline's fleet and operational needs well into the 2040s, further contributes to the burgeoning MRO complex at Dubai's second airport.

Honeywell's AAM Unit Soars to $10 Billion. Honeywell's Advanced Air Mobility (AAM) unit proudly declared its phenomenal success, raking in over $10 billion in business.

Boeing and Zero Petroleum's Sustainable Initiative. In a collaborative stride towards sustainability, officials from Boeing and Zero Petroleum inked a pivotal agreement aimed at accelerating the development of synthetic sustainable aviation fuel (SAF). Leveraging the Fischer–Tropsch power-to-liquid process, this innovative SAF is meticulously designed for use as a 100 per cent drop-in fuel, distinctively avoiding any mixing with jet-A.

Boeing's latest Commercial Market Outlook (CMO), unveiled on a compelling picture of the Middle East's aviation landscape. Projections indicate a remarkable expansion, with the regional airliner fleet poised to more than double by 2042. The forecast envisions the delivery of a staggering 3,025 new jets, with a diverse range that includes 1,350 widebody models, prominently featuring the Boeing 777-9 showcased at the Dubai Airshow. The comprehensive outlook anticipates 1,570 narrowbodies, 70 purpose-built freighters, and 35 regional jets, marking a significant evolution in the region's aviation footprint.

The Dubai Airshow 2023 has not only provided a platform for industry leaders to present their latest innovations but has also paved the way for collaborative discussions and partnerships that will shape the future of aviation. The dynamic displays and groundbreaking technologies featured at the event underscore the resilience and forward momentum of the aerospace industry on a global scale. SP

This is the second and final part of the Dubai Airshow report. The first part had appeared in issue 11/2023.

(LEFT) EMIRATES TO BUILD NEW $950 MILLION ENGINEERING FACILITY;
(RIGHT) BOEING AND ZERO PETROLEUM TO WORK TOGETHER TO ADVANCE SUSTAINABLE AVIATION FUELS.

PHOTOGRAPHS: EMIRATES, BOEING

LEARJET 23: SPEARHEADING THE BIZJET REVOLUTION

The Learjet 23's sleek, futuristic design, all-metal construction and superlative performance practically screamed "fighter jet". Just like a fighter it could carry out a range of aerobatic manoeuvres.

THE LEARJET 23 WAS A HIGH-SPEED, TWIN-ENGINE BUSINESS jet introduced in service in the United States in 1964. It was the first model produced by the Lear Jet Corporation and transported many of the rich and famous to their glamorous engagements. It triggered a revolution in the aviation world, creating a new market for fast and efficient small business aircraft. In a short space of time "Learjet" became a synonym for any private jet of any brand.

The Learjet 23 came about thanks to William "Bill" Powell Lear (1902 – 1978), an American inventor and entrepreneur. Among the many innovations to his credit were practical home radio, the aerial radio direction finder, 8-track stereo, various car radios, and the first jet autopilot. Although Lear was not an aeronautical engineer he had been flying since he was 30. He was almost 60 – an age when many are ready to retire – when he realised the market potential for small bizjets, despite lacklustre sales by pioneers like the Lockheed Jetstar.

In 1960, Lear moved to Switzerland and founded the Swiss American Aviation Company (SAAC). His aim was to build a private jet based on the FFA P-16 jet fighter – a straight-wing fighter-bomber prototype intended for the Swiss Air Force, but abandoned in 1959. However, impatient with the tardy pace of progress in Switzerland, Lear moved to Wichita, Kansas, where he built a design office and factory. His company was renamed Lear Jet Corporation, and the new aircraft became the Lear Jet (later Learjet) Model 23. At last the project began to pick up speed. From its first flight on October 7, 1963, the private jet needed just a year to enter service on October 13, 1964. Bill Lear immediately publicised it through official flight records. In May 1965, a Learjet 23 covered the nearly 4,000 km distance from Los Angeles to New York, and back, in 11 hours, 36 minutes. And in December 1965, another aircraft climbed to 40,000 feet in 7 minutes, 21 seconds – a feat which rivalled the capability of the latest US Air Force and Navy fighters of the day.

Indeed, the Learjet 23's sleek, futuristic design, all-metal construction and superlative performance practically screamed "fighter jet". Just like a fighter it could carry out a range of aerobatic manoeuvres. While the wing leading edge had a 13° sweep, it had a straight trailing edge. It had two pilots and could accommodate only 4-6 passengers. The plane was powered by two General Electric CJ610-4 single-shaft axial-flow turbojet engines with 8-stage compressor and 2-stage turbine, each generating 2,850 pounds of thrust. Its cruise speed was an impressive 834 km/h at 40,000 feet, comparable with that of the Boeing 707 airliner of the period. Its maximum range was 2,945 km.

However the Learjet 23 cabin was rather cramped, being just over four feet in both width and height. When questioned about this, Lear famously retorted, "You can't stand up in a Cadillac either!" With its outstanding performance and looks, the Model 23 was an instant hit with the wealthy and influential. Indeed, its small size, high speed, low cost, and easy maintenance made it much more suitable for the early business and private jet market than its nearest rival the JetStar, a four-engine quadjet. Lear also mounted a savvy promotional campaign, giving free, well-publicised joyrides to numerous celebrities, which helped boost sales. However, the first three years of operation also saw many an accident. Most of these were not due to any aircraft design deficiency. It is just that some pilots were inadequately trained to handle such high-performance jets, which obviously had high stall and landing speeds.

Lear Jet built only 101 Model 23 aircraft, ending production within less than two years. More advanced designs were regularly introduced and improved on as technology evolved. The Model 25 which first took to the air in August 1966 could seat eight in comfort. It was this type, more than any other, which reinforced the Learjet's place in the market. Learjet 25 production amounted to 369. By the 1970s, the Learjet sported a turbofan engine and, eventually, winglets that improved both performance and fuel economy.

In 1990, Canadian manufacturer Bombardier acquired the Learjet line and began producing further advanced models. However, bizjets gradually evolved into "an office, a workspace, or home space in the air where you can seamlessly enter the aircraft and carry on your day as if you were still on the ground," as one industry executive put it. That required ample space, which is something Learjets did not have. In February 2021, hit by rising competition, Bombardier announced the end of Learjet production. The final aircraft was delivered in March 2022. Between 1962 and 2022, around 3,040 aircraft bearing the name Learjet were built. Today, over 2,000 Learjets are still on active flying duties. SP

— JOSEPH NORONHA

CIVIL

JYOTIRADITYA SCINDIA CHAIRS ADVISORY GROUP MEETING OF SMALL AIRCRAFT & HELICOPTER OPERATORS

The Minister of Civil Aviation, Jyotiraditya M. Scindia, assured full support to entrepreneurs of small aircraft operators and helicopter services to expand their operations. In an 'Advisory Group' meeting, the Minister individually addressed regulatory and day-to-day operational concerns of each operator, and resolved to take action on the relevant suggestions put forth by the group.

Lauding them for their vital role in connecting Tier 2 and 3 cities under the UDAN scheme, he committed to enhance processes and approvals for participating operators. To that end, a special cell for helicopters and small aircraft will be envisaged, as and when the DGCA ramps up manpower capacities.

At the conclusion of the meeting, operators expressed their gratitude to Scindia for his timely interventions and responsiveness to their needs. They also extended their appreciation to the Ministry of Civil Aviation for the successful implementation of the UDAN scheme, which has played a pivotal role in their emergence and growth within the market.

The meeting also was attended by General (Retd) Dr V.K. Singh, Union Minister of State for Civil Aviation & Road Transport and Highways, Vumlunmang Vualnam, Secretary, Ministry of Civil Aviation (MoCA) and other senior officials from the DGCA, AAI, BCAS and MoCA.

MILITARY

SOUTH KOREA SELECTS THE EMBRAER C-390 MILLENNIUM

South Korea's Defence Acquisition Program Administration (DAPA) has announced Embraer's C-390 Millennium as the winner of the Large Transport Aircraft (LTA) II public tender to provide the Republic of Korea Air Force (ROKAF) with new military transport aircraft. South Korea is the C-390 Millennium's first customer in Asia. Under the signed contract, Embraer will provide an undisclosed number of C-390 Millennium aircraft specially configured to meet ROKAF's requirements, as well as services & support including training, ground support equipment and spare parts. Embraer will also provide a comprehensive consortium and offset package including a significant amount of C-390 Millennium parts to be locally manufactured by Korean partner companies and the development of a local Maintenance Repair and Overhaul (MRO) provider.

MERLINHAWK AND VEGA TO ESTABLISH A JV IN INDIA

Merlinhawk Aerospace, a 100 per cent Indian aerospace and defence Engineering design and manufacturing company has signed a Joint Venture agreement with Vega Composites (Italy), to establish a Composites manufacturing and design facility in the Defence Corridor in Tamil Nadu for advanced composites material-based products. The new entity will be called Merlinhawk Composites and Engineering Private Limited.

This strategic Joint Venture is aimed at tapping the growing market of India while developing design expertise and transferring manufacturing knowhow to India. Merlinhawk Composites will be targeting the growing demand for composites, based products in the Aerospace, Marine, Land and railway sectors. Additionally, the company will be targeting the upcoming Hydrogen storage and Fuel cell markets. Merlinhawk Composites will also be targeting export markets by providing design services and turnkey solutions for customers. Also, the JV involves the transfer of Technology, which will enhance the technical capabilities in the country. ●

APPOINTMENTS

AIR MARSHAL PRAVEEN KESHAV VOHRA TAKES OVER AS SENIOR AIR STAFF OFFICER, WESTERN AIR COMMAND, IAF

Air Marshal Praveen Keshav Vohra has taken over as the Senior Air Staff Officer (SASO) of Western Air Command of the Indian Air Force on December 1, 2023. The Air Marshal was commissioned as a fighter pilot in the Indian Air Force on December 19, 1987. A Category 'Aye' Qualified Flying Instructor, he was one of the founder members of the Indian Air Force's Formation Aerobatic Team, the 'Suryakirans'.

AIR MARSHAL MAKARAND RANADE TAKES OVER AS DIRECTOR GENERAL (INSPECTION AND SAFETY) AT AIR HQ

Air Marshal Makarand Ranade assumed the appointment of Director General (Inspection and Safety) [DG (I&S)] at Air HQ New Delhi on December 1, 2023. Earlier, he was the Senior Air Staff Officer at HQ Western Air Command, New Delhi. The Air Marshal was commissioned in the fighter stream of the Indian Air Force on December 6, 1986. In a career spanning over 36 years, the Air Marshal has held key field and staff appointments.

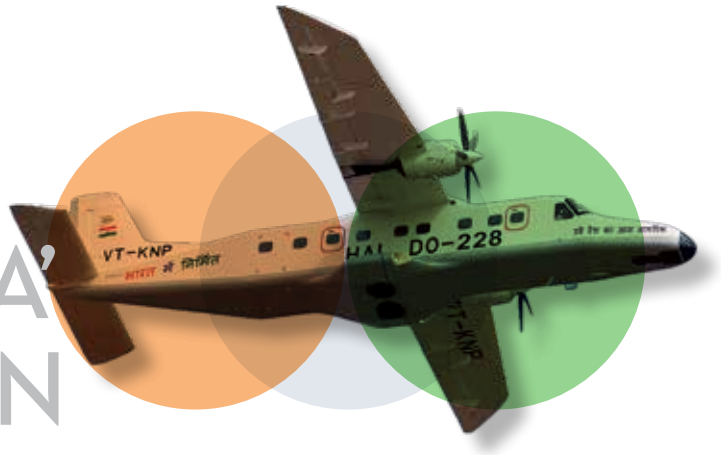
JOSÉ GUSTAVO APPOINTED AS VICE PRESIDENT OF SALES AND BUSINESS DEVELOPMENT FOR EUROPE AND AFRICA

Embraer Defense & Security appointed José Gustavo as the new Vice President of Sales and Business Development for Europe and Africa. The executive has held several leadership positions in defence projects including functions in the NATO Command Structure and has solid sales records for Embraer, which includes the A-29 in Africa and the C-390 sales campaigns in Europe.

HENOK TEFERRA SHAWL APPOINTED AS MANAGING DIRECTOR FOR AFRICA

Boeing has appointed Henok Teferra Shawl as the new Managing Director for Boeing Africa to strengthen the company's operations and relationships across the African continent. Teferra will be based in Addis Ababa, Ethiopia, where Boeing plans to open an office early 2024.

DEVELOP 'ATMANIRBHARTA' IN CIVIL AVIATION



Despite the obvious challenges, a concerted push for Atmanirbharta in Commercial Aviation is required for enhanced technological independence and reduced vulnerability, if India truly wants to be a major player in the global aviation landscape

By ROHIT GOEL

THE AVIATION INDUSTRY HAS FACED SIGNIFICANT CHALLENGES in recent years, with the COVID-19 pandemic and geopolitical conflicts disrupting global supply chains. These disruptions have led to bottlenecks and constraints, posing a significant obstacle to the industry's recovery, despite the anticipated rebound in travel demand. While the Indian aviation sector has made strides in overcoming recent hurdles, it also continues to grapple with supply chain issues that are hindering its recovery. These issues threaten the remarkable growth trajectory of India's aerospace sector, which is driven by a booming economy and ambitious expansion plans. According to CAPA India's forecast, the Indian aviation industry is expected to have approximately 790 aircraft in its fleet by March 2024, with 588 operational aircraft. This means that over 200 aircraft or nearly 25 per cent of the total fleet will be grounded by March 2024. A major concern for mass grounding of domestic airlines is due to supply chain issues. This could disrupt the industry significantly, with major carriers like IndiGo, Air India, and SpiceJet already facing substantial grounding numbers. The current total of over 160 grounded aircraft across Indian airlines paints a worrying picture for the industry's future.

India's aviation industry is soaring high, fuelled by a burgeoning middle class, rising incomes, and an insatiable demand for air travel. Domestic passenger traffic is expected to reach an astonishing 1.1 billion by 2040, solidifying its position as the world's third-largest aviation market. With over 1,000 aircraft on order, India boasts one of the largest aircraft order books globally. However, even if India becomes the third largest aviation market in the world in terms of number of passengers flying, it will remain dependent on foreign companies to fulfill its requirements for airplanes, engines, spare parts, MRO, pilots, training and a whole host of other things. Any bottleneck, at any stage of the entire operations, will severely impact the entire sector, thereby hurting the economy of the country. Do we want to be in such a situation, depending upon foreign companies to ensure that our planes keep flying. Why can't we have 'Atmanirbharta' in Commercial Aviation as well? The rewards of achieving Atmanirbharta are manifold. Not only will it ensure India's self-sufficiency in commercial aviation, but it will also create a thriving ecosystem of innovation, attract foreign investments, and generate countless employment opportunities. India will not just be a major aviation market, it will be exporting its expertise and shaping the future of aviation.

A Government focus on infrastructure development, skill development, and regulatory reforms will be crucial to achieving this goal. Leveraging its strong manufacturing base, India needs to actively collaborate with major players to establish aircraft production facilities within its borders. Recognising the need for skilled professionals, the government should invest in training programmes to ensure a readily available workforce capable of supporting the industry's meteoric rise. To achieve sustainable growth, it will require collaborative efforts from various stakeholders, including the government, airlines, manufacturers, and technology providers. By diversifying supply sources, adopting innovative technologies, and fostering a collaborative environment, India will be able to meet its domestic market requirements and become a major manufacturing hub for the global aerospace market.

India has very successfully implemented the 'Make in India' programme in defence manufacturing with a clear vision to reduce defence imports and promote domestic defence manufacturing industry. The same should be done for commercial aviation as well which is also a very important sector for the growth of the nation's economy. There are plenty of success stories in the design, development and manufacturing of fixed and rotary wing platforms for military aviation in India as a result of the 'Make in India' drive. These experiences should be used to design, develop and manufacture platform for commercial and general aviation in the country. Similarly, as done for the defence sector, government policies and incentives should encourage the private sector to step into and build a robust domestic manufacturing ecosystem for commercial aviation.

There are scattered examples of Indian manufacturing sector's participation in the global supply chain for commercial aviation but those are few are far between. What is required is a concerted effort to drive this forward on all fronts with the involvement of all stakeholders. Unless India is able to do so, even if we have the number of passengers, we will never truly be amongst the top civil aviation markets in the world. SP

PHOTOGRAPH: SP GUIDE PUBNS

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