RNI NUMBER: DELENG/2008/24198

SP's airbuz

AN SP GUIDE PUBLICATION

ISSN 2230-9217

OCTOBER-NOVEMBER 2024
₹100.00
(INDIA-BASED BUYER ONLY)

VOLUME 17 • ISSUE 5
www.spsairbuz.com

AN EXCLUSIVE MAGAZINE ON CIVIL AVIATION FROM INDIA

60 1964-2024 YEARS OF SP'S

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Pratt & Whitney continues its industry leadership with next-generation propulsion technologies that will further reduce carbon emissions, including ultra-high bypass ratio and thermally efficient engines, hybrid electric and hydrogen-powered engines

Cover Design: **SP's Design**

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www.spguidepublications.com

Owned, published and printed by Jayant Baranwal, printed at Kala Jyothi Process Pvt Ltd and Published at A-133, Arjun Nagar (Opposite Defence Colony),
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60 1964-2024 YEARS OF SP'S

India's aviation landscape reflects a dual commitment to innovation and sustainability, positioning the country as a global leader in aviation and aerospace. This issue offers an in-depth exploration of these developments, from the skies to the seas, demonstrating how aviation is transforming connectivity, economy, and sustainability in India and beyond.

India's aviation sector is soaring into a transformative era, emerging as a leader in MRO services, cargo operations, and regional connectivity. The country hosted the 2nd Asia-Pacific Ministerial Conference on Civil Aviation, in New Delhi. The conference underscored India's pivotal role in shaping the sector's future. Culminating in the adoption of the 'Delhi Declaration,' this event highlighted India's leadership in aviation safety, security, and sustainability. Prime Minister Narendra Modi commended the initiative as a landmark in regional collaboration, setting the tone for robust growth and innovation in the Asia-Pacific aviation landscape. In this issue, Ayushee Chaudhary delves into the outcomes of the conference, while sustainability takes center stage in global aviation.

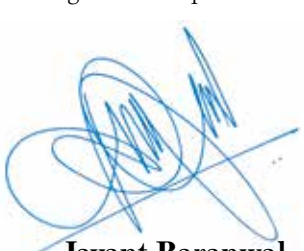
Joseph Noronha addresses the pressing question of whether achieving net zero by 2050 is feasible, emphasising that collaborative, and transformative action are required from governments, airlines, manufacturers, and other stakeholders to invest in SAF, cutting-edge technologies, and innovative operational efficiencies. With insights into IATA's five roadmaps, Noronha highlights the steps necessary to propel aviation toward greener horizons. Complementing this narrative, Sukhchain Singh details how researchers at Argonne National Laboratory have developed a process that converts wastewater into biofuel components, offering a cost-competitive and sustainable alternative for SAF production.

From adopting cutting-edge technologies and renewable fuels to rethinking operational efficiencies and engaging passengers in ecofriendly practices, Rohit Goel sheds light on how commercial airlines are adopting cutting-edge technologies to meet the urgent need for environmental responsibility.

India's efforts in sustainability are paralleled by strides in self-reliance and improved regional connectivity. Recently, sea plane demo flights were held across the country to show how sea plane services can transform regional connectivity in India, boost tourism, create jobs, and foster economic development, particularly in hard-to-reach coastal and inland regions. Swaati Ketkar presents a fascinating look at the 'Seaplane services' trialed across regions such as Andhra Pradesh, Kerala, Meghalaya, and the Lakshadweep Islands, which promises to transform these regions.

Meanwhile, SpiceJet's resolution of its $90 million dispute with Bombardier over Q400 turboprop planes marks a significant moment for the airline and India's regional aviation sector, as Manish Kumar Jha reports. SpiceJet has successfully resolved a significant dispute with Bombardier over a fleet of Q400 turboprop planes in the form of a $90 million settlement, marking the end of a prolonged legal battle that also has broader implications for the Indian aviation sector. As SpiceJet moves forward with its fleet expansion, it remains to be seen how the airline will continue to shape the future of air travel in India, particularly in terms of regional connectivity and service expansion.

All this and more in this issue of *SP's AirBuz*. Welcome aboard and we wish you many happy landings!



Jayant Baranwal
Publisher & Editor-in-Chief

FIVE LAKH DOMESTIC PASSENGERS FLY IN A DAY

The Indian aviation sector achieved a historic milestone on November 17, 2024, with 5,05,412 domestic passengers departing across the country in a single day. This marks the first time domestic passenger numbers have surpassed the 5-lakh mark, showcasing India's growing prominence in the global aviation landscape. More than 3,100 planes took off taking more than five lakh passengers.

The passenger count has been increasing continuously after the UDAN – "Ude Desh ka Aam Nagrik" scheme. This achievement reflects the sector's rapid expansion, supported by enhanced connectivity, passenger-friendly policies, and increased accessibility to affordable air travel. It highlights the seamless efforts of all stakeholders, from airlines to airport operators, in providing reliable and efficient services to passengers.

On this momentous occasion, Civil Aviation Minister Ram Mohan Naidu said, "This number shows that the air travel is now more accessible to the people of India." He added this landmark became possible because of the schemes like UDAN which has brought air travel closer to the people The UDAN has revolutionised the air travel connecting the remote parts of India to global destinations.

APPOINTMENTS

BOMBARDIER APPOINTS CAROLINE MASO AS CHRO

Bombardier announced the appointment of Caroline Maso as Chief Human Resources Officer. Maso will report directly to Éric Martel, President and CEO of Bombardier and, effective early in the new year, will lead Bombardier's worldwide Human Resources practice with a focus on ensuring Bombardier is a best-in-class employer in every country the company operates.

DEUTSCHE AIRCRAFT APPOINTS NICO NEUMANN AS CO-CEO

Deutsche Aircraft, a leading regional aircraft manufacturer, has announced the appointment of Nico Neumann as Co-CEO alongside current CEO, Dave Jackson. Nico Neumann will assume the role of Co-CEO from 1 January 2025 and will relinquish his current position of Chief Operating Officer. Neumann will guide Deutsche Aircraft through its next phase, delivering the D328eco® aircraft to market by 2027. This role is part of a managed transition, with Neumann set to assume full CEO responsibilities for the Deutsche Aircraft-operated businesses in Munich and Leipzig by mid-2025.

EVE AIR MOBILITY ANNOUNCES MEGHA BHATIA AS CHIEF COMMERCIAL OFFICER

Eve Air Mobility is pleased to announce the appointment of Megha Bhatia as its new Chief Commercial Officer (CCO). Based in Melbourne, Bhatia will oversee Eve's global sales, market intelligence, and government relations divisions. Eve boasts the industry's largest backlog with letters of intent for 2,900 eVTOL aircraft, representing a potential $14.5 billion in revenue across 30 customers in 13 countries.

ST ENGINEERING ANTYCIP WELCOMES BENOIT ROLLAND AS NEW CEO

ST Engineering Antycip (Antycip) announced the appointment of Benoit Rolland as its new CEO, effective March 1, 2025. Benoit Rolland joins Antycip with over 25 years of experience in the simulation industry and a strong connection to Antycip, having previously served in a leadership role with the company. He possesses a deep understanding of the market, customers, and the technological advancements that drive the industry forward.

INAUGURATION OF 'AVIATION PARK'

Under the leadership of Kinjarapu Ram Mohan Naidu, Minister of Civil Aviation, India's Ministry of Civil Aviation unveiled the Aviation Park within the premises of the Ministry. Situated amidst a serene waterbody, the park showcases a stunning display of aircraft models, depicting the evolution of planes and the growth of India's Civil Aviation sector. The displays symbolise the ministry's journey towards progress and innovation in the aviation field.

A backdrop of free-standing architectural columns, representing various regions of India, celebrates the rich cultural and architectural heritage of the country. A dedicated path in the park highlights significant milestones in India's civil aviation history, from early flight/aircrafts developments to modern advancements, creating an educational experience for the visitors.

The park has been thoughtfully developed with sustainability in mind. Bamboo has been utilised for shaded seating areas, promoting eco-friendly construction practices. The park promises to be a landmark destination, blending India's aviation achievements with its architectural and cultural legacy, inspiring future generations of aviation enthusiasts.

EIGHT GLORIOUS YEARS OF UDAN

Civil Aviation Minister Ram Mohan Naidu along with MoCA Secretary and senior officials celebrated eight successful years of UDAN – Ude Desh Ka Aam Nagrik. The scheme has achieved significant milestones in advancing remote and regional connectivity.

The Minister, in his address, emphasised that UDAN has revolutionised the air travel connecting the remote parts of India to global destinations. Under the scheme, 601 routes and 86 airports are operationalised, and 1,44,00,000 passengers till now have been benefitted from the scheme. So far, the RCS-UDAN has facilitated travel of more than 144 lakh passengers, demonstrating its success in enhancing air travel accessibility.

The RCS-UDAN is contributing to the growth of the civil aviation industry as many new and successful airlines have come up in the last seven years. The scheme has helped airline operators to start up and develop a sustainable business model. Additionally, it's providing opportunities to small regional airlines Flybig, Star Air, IndiaOne Air and Fly91 to scale up their businesses and their successful run is evidence of the fact that the scheme is creating an amiable ecosystem conducive to airline business.

The scheme's incremental expansion has generated an escalating demand for

new aircraft, concurrently broadening the spectrum of aircraft deployed. This augmentation encompasses a comprehensive range of aircraft and encompasses helicopters, seaplanes, propeller planes, and jet planes. The heightened demand for aircraft is substantiated by Indian carriers' orders, which exceed 1,000 aircraft slated for delivery over the next 10-15 years, representing a significant augmentation of India's existing fleet, which currently comprises approximately 800 planes operated by various airlines.

PRIME MINISTER INAUGURATES AIRPORTS UNDER RCS-UDAN

Prime Minister Narendra Modi inaugurated three airports, developed under the Regional Connectivity Scheme (RCS) – UDAN (Ude Desh Ka Aam Nagrik). These airports are: Rewa in Madhya Pradesh, Ambikapur in Chhatisgarh and Saharanpur in UP. Flights under RCS-UDAN will begin from these airports shortly. From Mundra (Gujarat) to Tezu in Arunachal Pradesh and Kullu in Himachal Pradesh to Salem in Tamil Nadu, RCS-UDAN has connected 34 States/UTs across the length and breadth of the country. A total of 86 aerodromes have been operationalised under UDAN. Ten airports have been operationalised in the Northeast region in addition to two heliports. Many airports that were operationalised under UDAN such as Darbhanga, Prayagraj, Hubli, Belgaum, Kannur, etc have or may soon become sustainable with many non-RCS commercial flights operating from these airports.

IATA EXPANDS PRESENCE IN UNITED ARAB EMIRATES

The International Air Transport Association (IATA) has opened an expanded office in Abu Dhabi featuring a new training centre. This demonstrates IATA's commitment to supporting the Middle East's growing aviation sector and fostering the next generation of industry professionals. Taking advantage of the UAE's strategic location and excellent connectivity, IATA's Abu Dhabi office will provide services to airlines, trainees, strategic partners and governments in the Middle East and beyond.

"Our aim is to facilitate the further successful growth of the region's aviation sector, which is a strategic contributor to the region's social and economic development," said Kamil Alawadhi, IATA's Regional Vice-President for Africa and the Middle East.

KOREAN AIR GETS FINAL APPROVAL FROM THE EC ON ASIANA MERGER

Korean Air has satisfied all conditions set by the European Union competition authority for its merger with Asiana Airlines. The European Commission (EC) announced on November 28 that it has concluded its review after confirming Korean Air's fulfilment of all required conditions for the merger with Asiana Airlines. In February 2024, the EC granted conditional approval subject to two key requirements: ensuring stable operations of a remedy carrier on four overlapping European routes (Barcelona, Frankfurt, Paris and Rome) and the divestiture of Asiana's freighter business. Korean Air has submitted the European Commission's final approval to the US Department of Justice and plans to complete the transaction by December 2024.

AIR INDIA TO SET UP AIRCRAFT MAINTENANCE TRAINING INSTITUTE IN BENGALURU

Air India is setting up a Basic Maintenance Training Organization (BMTO), which will offer an integrated 2+2 year Aircraft Maintenance Engineering (AME) programme certified by the Indian aviation regulator Directorate General of Civil Aviation (DGCA).

The Air India BMTO is a step towards building a robust, future-ready aviation ecosystem in India. It will serve the ambitions of the airline as it moves ahead in its transformation journey, strengthening the availability of aircraft maintenance engineers as Air India expands its fleet, making it self-reliant.

Air India has signed an agreement with Bengaluru Airport City Limited (BACL), a subsidiary of Bangalore International Airport Limited (BIAL), to develop a build-to-suit facility for the AME programme that will feature modern classrooms, well-equipped laboratories for practical training and a team of qualified trainers. The purpose-built campus, spread over 86,000 square feet at Bengaluru Airport City, is expected to be operational by mid-2026.

The BMTO will be housed close to Air India's new 12-bay Maintenance, Repair and Overhaul (MRO) facility in Bengaluru that will be operational in early 2026. The programme at the BMTO will include two years of in-classroom academic coursework followed by two years of practical on-job training at the MRO.

DEUTSCHE AIRCRAFT SELECTS HONEYWELL

Honeywell has been selected by Deutsche Aircraft, a German aircraft manufacturer, to supply its Primus HF-1050 high-frequency (HF) radio system for the recently debuted 40-seater D328eco turboprop. The HF-1050 is designed to deliver global voice communications, leveraging its unique features to enhance reliability and performance for operators worldwide. The selection of the HF-1050 supports Honeywell's alignment of its portfolio to three compelling megatrends: automation, the future of aviation and energy transition.

Honeywell avionics are already widely deployed on in-service D328 aircraft such as the Dornier 328-100 and Dornier 328-300. The selection of the HF-1050 builds on Honeywell's longstanding relationship with Deutsche Aircraft and highlights its continued support for the Dornier fleet.

ATR REINSTATES CORE BUSINESS FOCUS

Following an extensive market review and in light of lingering tensions on its supply chain, ATR has decided to focus efforts on

further boosting the competitiveness of its current product portfolio. As a consequence, ATR will stop the development of its Short Take-Off and Landing variant (STOL), the ATR 42-600S, reflecting the company's commitment to aligning operations with evolving market dynamics.

The comprehensive review of market conditions, technological advancements and future projections shows a reduced addressable market for the variant compared to the initial forecast. In Southeast Asia, for instance, the number of targeted airports requiring STOL-capable aircraft has significantly decreased, primarily because of runway extensions or the construction of nearby alternative airports, and this trend is mirrored in other key target markets. While this reduces the addressable market for the ATR 42-600S, it means that their current product line can operate at its full capacity.

PRATT & WHITNEY AND AIR NEW ZEALAND ANNOUNCE EXPANSION AT CHRISTCHURCH ENGINE CENTRE

Pratt & Whitney and Air New Zealand hosted a groundbreaking ceremony for a $150 million, 14,000 square meter expansion of its Christchurch Engine Centre. The expansion will add maintenance, repair and overhaul (MRO) capabilities for the Pratt & Whitney GTF engine in New Zealand, with capacity for up to 140 GTF engine overhauls planned annually by 2032.

Construction of the facility expansion begins this month, and the first GTF engine overhaul is expected in the fourth quarter of 2026. The Christchurch Engine Centre was founded in 1948 by Air New Zealand. In 2001, the airline and Pratt & Whitney partnered to develop the joint venture, focusing on the maintenance, repair and overhaul of JT8D then V2500 engines.

PRATT & WHITNEY TO DEMONSTRATE HYDROGEN-FUELLED TURBOPROP TECHNOLOGY

Pratt & Whitney Canada will demonstrate hydrogen combustion technology on a PW127XT regional turboprop engine as part of a project supported by Canada's Initiative for Sustainable Aviation Technology (INSAT). The project, named Hydrogen Advanced Design Engine Study (HyADES), will be in collaboration with Next Hydrogen Solutions Inc., which will develop high-efficiency, low-cost electrolyzers needed for establishing hydrogen production infrastructure.

Funding for the first phase of the project will include fuel nozzle and combustor rig testing using hydrogen fuel, while future phases will target full engine ground testing. The PW127XT engine is the most advanced member of Pratt & Whitney Canada's PW100 engine series, which has powered regional turboprop aircraft for forty years and accumulated more than 220 million flight hours. Launched in 2021, the PW127XT engine offers over 3 per cent better fuel efficiency, 40 per cent improved time on wing, and 20 per cent reduced maintenance costs.

MTU AERO ENGINES TESTS AN LH2 FUEL SYSTEM

MTU Aero Engines has reached an important milestone on its path to zero-emission flight—it successfully completed multi-week testing of a liquid hydrogen fuel system for its Flying Fuel Cell™ (FFC). Together with MT Aerospace AG, the engine specialist is developing a complete liquid-hydrogen fuel system for commercial aviation that consists of tanks, sensors, heat exchangers, valves, safety systems, and controls. MT Aerospace is responsible for the liquid hydrogen tank and successfully tested the first system at its headquarters in Augsburg. Now MTU is following suit—these results are important and special because the tests were done with liquid hydrogen, which is the actual operating medium for the FFC.

EMBRAER'S E-FREIGHTER IS CERTIFIED BY THE FAA

The E-Freighter, Embraer's E190F has been fully certified by the Federal Aviation Administration (FAA). Embraer's passenger-to-freighter conversion and the Cargo Loading System, developed by US Cargo Systems, have received the certification by FAA in September 2024. In July, the E-Freighter was certified by the National Civil Aviation Agency of Brazil (ANAC) and EASA certification is due later this year. The aircraft was developed to fill a gap in the air cargo market and to replace older, less efficient models.

The E190F programme was launched in May 2022 to meet the changing demands of e-commerce and modern trade, which require fast deliveries and decentralised operations driving the demand for faster delivery of shipments to regional markets. E-Jets converted to freighters will have over 40 per cent more volume capacity, three times the range of large cargo turboprops, and up to 30 per cent lower operating costs than larger narrowbodies. If combining capacity under the floor and main deck, the maximum structural payload is 13,500 kg for the E190F.

EMBRAER TO INVEST IN NEW MRO FACILITIES

Embraer announced the expansion of its maintenance, repair and overhaul (MRO) services network to support the growing fleet of E-Jets in the Unites States by opening a new Embraer owned service centre in Fort Worth, Texas.

Embraer expects to begin operations in an existing hangar, in the first quarter of 2025, while building a second hangar that should be concluded by 2027. With the new facilities, Embraer's capacity to serve the E-Jets customers is expected to have a considerable increase in the US. The new Fort Worth service center will be added to the global network of Embraer which includes 80 authorised centers and 12 owned service centers around the world. The city of Fort Worth has been selected as the finalist location for the proposed project, subject to approval by local government authorities of certain proposed incentives.

ELECTRA REVEALS DESIGN FOR EL9 ULTRA SHORT HYBRID-ELECTRIC AIRCRAFT

Electra revealed the design of its groundbreaking EL9 Ultra Short hybrid-electric product aircraft, a nine-passenger piloted aircraft built for the electric future that redefines air travel without airports, emis-

sions, or noise. Electra now enters the development phase of the EL9 backed by over a year of successful flight testing of its EL2 Goldfinch two-seat prototype, proving the technology's readiness for the future of electric aviation.

Electra's innovative EL9 hybrid-electric propulsion system with blown lift technology enables ultra-short takeoffs and landings in soccer field-size spaces previously limited to helicopters and eVTOLs, but at one-third the cost and with the improved safety and reliability of a fixed-wing aircraft. This unlocks thousands of new locations for direct air service, including small regional airports or unconventional sites like grass fields or parking lots, offering seamless point-to-point regional connectivity for both passengers and cargo.

Electra has over 2,100 orders for the EL9 from 52 operators worldwide, representing more than $8 billion in market value. The first test flights are planned for 2027, with certification and service entry anticipated in 2029 under FAA Part 23 regulations.

EMBRAER LAUNCHES ONECHAIN PROGRAMME

Embraer has finalised the implementation of the ONEChain Program, an initiative to support the Company growth's strategy that leverages digital transformation to help improve the management of its supply chain. The ONEChain platform was designed to simplify and digitalise supply chain operations by fostering greater transparency, agility, and collaboration through an integrated process that benefits both Embraer and its suppliers worldwide.

By adopting and disseminating the best practices in the market, ONEChain has enabled the company to improve governance, standardise processes, reduce costs and expenses, increase competitiveness, agility, and productivity, as well as to digitise and unify a large part of the supply chain processes in an innovative way.

The programme has been implemented in Brazil and countries where Embraer operates: the United States, China, Singapore, as well as France, the Netherlands and Portugal.

SAUDIA ENHANCES INDIAN OPERATIONS

With over five decades of service in India, Saudia, the national flag carrier of Saudi Arabia, is set to enhance its connectivity and cater to the evolving needs of Indian guests as part of the Kingdom's Vision 2030 initiative. Currently, the airline operates 54 weekly flights across six major cities, including Delhi, Mumbai, Bangalore, Hyderabad, Cochin and Kozhikode, solidifying its position as a leading Gulf carrier in India. Saudia recognises India's immense potential for inbound tourism, with a goal of attracting 7.5 million Indian visitors annually by 2030. This ambitious target aligns with the Kingdom's vision to position tourism as a pivotal component of its economy, making India a vital source of visitors to Saudi Arabia.

EMBRAER AND INDONESIA'S PTDI SIGN MoU

Embraer and PT Dirgantara Indonesia, Indonesia's leading aerospace company, have signed a Memorandum of Understanding (MoU) aimed at growing collaboration in commercial aviation. The MoU was signed at the Indonesia-Brazil CEO Forum, chaired by Indonesian President Prabowo Subianto, on the sidelines of the G20 Summit in Brazil.

Embraer and PTDI will conduct joint studies to evaluate partnership opportunities in commercial aviation, in areas such as engineering and the supply of aerostructures. The collaboration framework will be guided by rigorous commercial and technical standards, ensuring alignment with industry best practices and business objectives. Both companies are committed to exploring opportunities that create mutual value while maintaining the highest quality and performance standards in aerospace manufacturing.

This agreement represents a significant step in advancing aerospace collaboration between Brazil and Indonesia, fostering technological innovation and industrial partnerships across emerging economies.

BOEING: AIR CARGO TRAFFIC TO DOUBLE BY 2043

With a strong air cargo market exceeding pre-pandemic levels, Boeing forecasts continued long-term growth, saying air cargo traffic will increase by an average of four per cent per year through 2043. These projections appear in Boeing's 2024 World Air Cargo Forecast (WACF), the biennial overview and long-term outlook for the air cargo industry.

- The global air cargo fleet is forecast to rise to 3,900 airplanes by 2043, a two-thirds increase from 2,340 freighters in 2023.
- Driven by demand in high-growth Asian markets, the large widebody freighter fleet will nearly double.
- Nearly half of production and conversion deliveries will replace retiring freighters with more capable and fuel-efficient models
- East and South Asian markets will see the highest traffic growth per year, driven by expanding economies and consumer demand.
- With the Asia-Pacific fleet expected to nearly triple, carriers in that region will require the most deliveries (980), followed closely by North America (955). These two regions will account for more than two-thirds of global deliveries.
- India's domestic air cargo market will nearly quadruple as express and e-commerce networks expand.

AVIA ORDERS UP TO 80 BOEING 737 MAX

Boeing and Avia Solutions Group, the world's largest ACMI (aircraft, crew, maintenance, insurance) provider, announced its first order with the company for 40 737-8s, with the potential to order 40 more later.

Avia Solutions Group has 11 air operator certificates (AOC) including Avion Express, Smartlynx, Klasjet, Air Explore, BBN, Ascend Airways and Skytrans among others. These AOCs operate year round in over 60 countries on behalf of various scheduled airlines and tour operators.

The 737-8 is the market's most versatile single-aisle airplane, capable of operating profitably on short- and medium-haul routes. This flexibility is crucial for an ACMI operator like Avia Solutions Group, enabling it to provide additional capacity to airlines during peak travel periods or support operations during unexpected aircraft or staff outages.

Prime Minister Narendra Modi along with delegates at the 2nd Asia-Pacific Ministerial Conference on Civil Aviation

INDIA PAVES THE WAY FOR REGIONAL AVIATION GROWTH

The 2nd Asia-Pacific Ministerial Conference on Civil Aviation, held in New Delhi, culminated in the adoption of the 'Delhi Declaration,' a roadmap for aviation safety, security, and sustainability in the Asia-Pacific region

BY **AYUSHEE CHAUDHARY**

INDIA HOSTED THE 2ND Asia-Pacific Ministerial Conference on Civil Aviation in New Delhi, setting a new benchmark for regional collaboration on aviation safety, security, and sustainability. The two-day event culminated in the adoption of the 'Delhi Declaration,' an ambitious roadmap for the future of aviation in the Asia-Pacific region. Prime Minister Narendra Modi also attended the event, proclaiming the adoption of the Declaration and applauding it as a significant step forward, underscoring India's leadership in shaping the sector's future.

"This conference and the adoption of the Delhi Declaration represent a significant step forward in advancing safety, security, and sustainability in the Asia Pacific civil aviation sector and highlights the spirit of cooperation that exists among the countries of this region," said the Prime Minister. "This Declaration will advance our commitment to regional connectivity, innovation, and sustainable growth in aviation. We will implement this Declaration and reach new heights with collective strength. The Asia Pacific Region's collaboration in increasing aviation connectivity and sharing knowledge, expertise, and resources among us will likely further enhance our strength. We will also need more investment in infrastructure, and it must remain a natural priority for all relevant countries. However, infrastructure alone will not suffice; a continuous process of skilled manpower and upgraded technology is crucial for development. We need to make air travel safe, affordable, and accessible to everyone. I am confident that this Declaration, our collective efforts, and our extensive experience will be very beneficial."

PHOTOGRAPH: PIB

Prime Minister Modi at the 2nd Asia-Pacific Ministerial Conference on Civil Aviation with Salvatore Sciacchitano, President of the International Civil Aviation Organization (ICAO), marking 80 years of ICAO operations

The Ministry of Civil Aviation (MoCA), in collaboration with the International Civil Aviation Organisation (ICAO), successfully hosted the Asia-Pacific Ministerial Conference on Civil Aviation (APMC) at Bharat Mandapam, New Delhi. The conference saw the participation of delegates from 29 countries, ministers and policymakers, and eight international organisations, including ICAO, which celebrated its 80 years of operations as part of the conference. The conference witnessed engaging discussions and presentations focused on shaping the future of aviation in the Asia-Pacific region.

"Bharat has shown a significant transformation in just one decade. Over these years, Bharat has evolved from being an aviation-exclusive country to an aviation-inclusive one. In this regard, we have taken several initiatives, made policy changes, and developed systems to achieve this. We are moving forward with the goal of creating a network of opportunities in this region—one that will drive economic growth, promote innovation, and strengthen peace and prosperity," said the Prime Minister.

Prime Minister Narendra Modi hailed the Delhi Declaration as a significant step forward in advancing regional connectivity, innovation, and sustainable growth in aviation

Addressing the gathering, after inaugurating the conference, Union Minister for Civil Aviation, Kinjarapu Rammohan Naidu said, "This conference comes at a pivotal time when India's aviation industry is experiencing a significant transformation. As the third-largest domestic aviation market globally, India is positioning itself to become a major hub for Maintenance, Repair, and Overhaul (MRO) services, cargo operations, and overall regional aviation. The ongoing development of new greenfield airports and the progressive policies like UDAN that encourage regional air connectivity are setting India on a path of sustained growth. We are proud to be at the forefront of initiatives that are helping to transform air travel in the Asia-Pacific region. Our vision is not only to fuel the growth of Indian civil aviation but to also play a pivotal role in the region's aviation ecosystem."

Naidu was nominated as Chairman of the Asia-Pacific Ministerial Conference on Civil Aviation (APMC), with Fiji's Deputy Prime Minister Viliame Gavoka, appointed as Vice Chairman. In his address, Naidu highlighted the Asia-Pacific region's emergence as the largest aviation market by 2035, emphasising the need for strategic investments in infrastructure and collaboration to ensure sustainable growth.

The Prime Minister further added that the demand created by the UDAN (Ude Desh ka Aam Nagrik) scheme has led to the establishment of new airports in many small cities and hundreds of new routes; Bharat is set to become one of the most connected regions in the world in terms of air connectivity. "We are also making decisions to strengthen maintenance, repair, and overhaul (MRO) services. This is leading to the creation of high-skilled jobs. Bharat is moving forward with the goal of

PHOTOGRAPH: PIB

becoming a leading aviation hub by the end of this decade, with a $4 billion MRO industry. You are all familiar with innovations like multiport. This is a model of air transport that is enhancing ease of travel in cities. We are also preparing Bharat for advanced air mobility. Our aviation sector is greatly supporting our mission of women-led development. Nearly 15 per cent of pilots are women in Bharat, compared to a global average of just five per cent. Bharat has also implemented necessary advisories to make this sector more women-friendly, including return-to-work policies for women and special leadership and mentorship programmes," he added.

Minister Naidu also called for regional collaboration to enhance safety standards, air traffic management, and gender equality in aviation, noting India's target to increase women's participation in the sector to 25 per cent by 2025. He further informed that by 2035, the region is expected to account for over 40 per cent of global air traffic, with nearly 3.5 billion passengers traveling annually. He also showcased India's success with its UDAN scheme, which has opened 583 new regional routes, making air travel accessible across underserved regions. He discussed India's leadership in adopting modern technologies like Digi Yatra, advancements in Vertical Take-Off and Landing (VTOL) aircraft, and fostering a robust drone ecosystem through initiatives like the Drone Didi Yojna. He also highlighted India's progress with carbon-neutral airports and the nation's ambitious goal to blend SAF with jet fuel for international flights.

India's Civil Aviation Minister Kinjarapu Rammohan Naidu inaugurated the 2nd Asia Pacific Ministerial Conference on Civil Aviation

In the last decade, the number of aircraft in India has increased from 400 to more than 800 and airports have exponentially grown from 74 to 157. The growth is exemplified by Indian Airlines ordering more than 1,200 aircrafts in the last year alone. In addition, Advanced Air Mobility (AAM) stands poised to revolutionise short to medium distance air travel, alleviating urban congestion and enhancing connectivity. The expanding collaboration between the public and private sectors signal a transformative era for Indian aviation, positioning it as a key driver of economic development and enhanced connectivity. The aviation sector is on a steep growth trajectory and has been one of the world leaders in surpassing the pre-covid levels of domestic and international travellers.

ICAO President Salvatore Sciacchitano also praised the region's resilience, noting its recovery to pre-pandemic levels by early 2024. He stressed the importance of collaboration to ensure the sector's sustainable growth and recognised the significance of the Delhi Declaration, symbolising a collective commitment to safety, sustainability, and innovation in aviation. "Our primary focus is to continue to pursue high levels of safety and security. We must remain focused on enhancing these fundamental aspects of aviation, not allowing ourselves to become complacent when we consider the very positive statistics," he added.

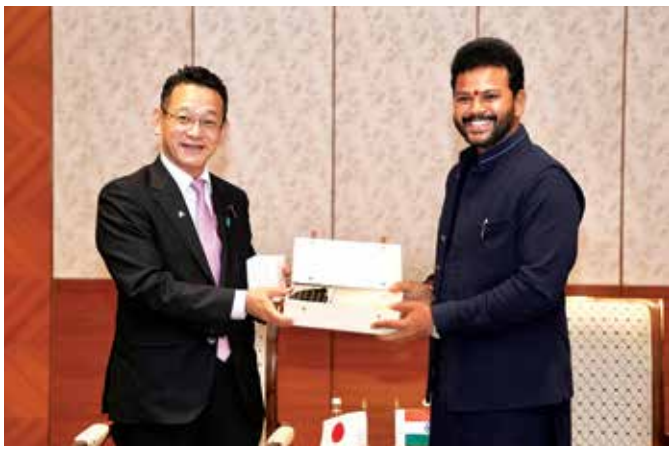
Also touching upon drones, Prime Minister Modi said, "Bharat has launched a very ambitious drone project in rural areas, especially in the agriculture sector. We have created a pool of trained drone pilots through the village-to-village 'Drone Didi' campaign. A new and unique feature of Bharat's aviation sector is the Digi Yatra initiative. Many countries worship Lord Buddha. If we undertake a campaign to connect Buddhist pilgrimage sites across Asia, we can create a win-win model for the aviation sector in related countries, and travellers in general. We should make efforts in that direction. The Asia Pacific Region is now becoming a business hub. Executives or employees from around the world are coming to this region in large numbers. Naturally, some people have established offices here, leading to increased frequent travel. What common routes do these professionals frequently use? Can we re-route these routes with a comprehensive approach to better cater to their needs and make travel more convenient? I would like you to consider this direction as well, as the region's development is assured, and the convenience for professionals will accelerate work progress. I am also aware of your concerns regarding cybersecurity and data security. While technology presents challenges, solutions also come from technology. We need to strengthen international collaboration, share technology and information openly, and thereby keep these systems secure. This Delhi Conference will reinforce our resolve to move forward with unity and shared purpose.

By 2035, the Asia-Pacific region is expected to account for over 40 per cent of global air traffic, with nearly 3.5 billion passengers traveling annually

The Delhi Declaration sets a clear framework for continued growth, emphasising the need for sustainability, technological innovation, and workforce development in the aviation sector. With India leading the charge, the Asia-Pacific region is poised to become the world's largest aviation market by 2035, underpinned by a collective commitment to safety, security, and sustainability.

The conference was marked by several key highlights, including a presentation by ICAO on the establishment of the Pacific Small Island Developing States Liaison Office, aimed at supporting smaller nations in addressing aviation challenges.

PHOTOGRAPH: MoCA_GoI / X

During the Conference, India's Civil Aviation Minister Rammohan Naidu had meetings with prominent delegates: (top Left-Right) Salvatore Sciacchitano, President of the ICAO Council; Kokuba Konosuke, Deputy Minister, Japan; (above Left-Right) Chandra Bahadur Gurung, Minister of Infrastructure and Transport, Bhutan; Ibedul Lebuu Littler, Administrator, National Aviation Administration, Palau.

Additionally, a ceremony was organised to commemorate the 80th anniversary of ICAO and the Chicago Convention, further highlighting the organisation's role in shaping international aviation standards over the past eight decades. Along with Symposiums and seminars on a wide range of important subjects like Airspace Optimisation, Cyber Security, Net Zero Carbon Emission, a drone show also showcased India's innovation might and cultural programmes as well to showcase India's rich cultural heritage.

India's aviation sector is undergoing a major transformation, with India poised to become a leading hub for Maintenance, Repair, and Overhaul (MRO) services, cargo operations, and regional aviation growth

The conference welcomed delegates from countries such as Bhutan, Cambodia, China, Democratic Republic of Korea, Fiji, India, Japan, Lao PDR, Maldives, Nepal, Palau, Philippines, Republic of Korea, Samoa, Singapore, Solomon Island, Tonga, and Vietnam. President of ICAO along with Heads of Organisations Association of Asia Pacific Airlines (AAPA), Civil Air Navigation Services Organisation (CANSO), Airports Council International (ACI), International Air Transport Association (IATA), European Civil Aviation Conference (ECAC), European Union Aviation Safety Agency (EASA), Transport Security Administration (TSA), Federal Aviation Administration (FAA), African Civil Aviation Commission (AFCAC) and ICAO Council Representatives - Australia, Brazil, China, Republic of Korea, Singapore, Nigeria were also present along with Director Generals & Dy. Director Generals and equivalent of the Civil Aviation Authority - Cambodia, China, China (Hong Kong), China (Macao), Fiji, Indonesia, Lao PDR, Malaysia, Maldives, Nepal, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka. Thailand, Tonga coming over for the Asia-Pacific Ministerial Conference. SP

PHOTOGRAPHS: MoCA_GoI / X

IS AVIATION NET ZERO 2050 FEASIBLE?

Achieving net zero by 2050 requires immediate, collaborative, and transformative action from governments, airlines, manufacturers, and other stakeholders to invest in SAF, cutting-edge technologies, and innovative operational efficiencies

BY **JOSEPH NORONHA**

THE NEWS ABOUT GLOBAL warming leading to climate change gets worse by the day. In October 2024, a new UN report warned that without determined action to decarbonise the economy the world could warm by a huge 3.1C this century, leading to dramatic increases in extreme weather events, including heatwaves and floods. It says that the goals of the Paris Agreement to keep global warming under 2C while making efforts to stay below 1.5C are now in very serious danger. The landmark Paris Agreement of 2015, that sought to address climate change and its negative impacts, was adopted by nearly every nation of the world. Pledges galore followed. Indeed, if every country simply puts their stated plans into action and honours their own net zero pledges, the global temperature rise could still be contained to 1.9C. Yet action on the ground has been unimpressive, to say the least.

Currently, only about 10 per cent of the global population flies and aviation accounts for just 2.5 per cent of global greenhouse gas (GHG) emissions. But when non-CO2 effects are included, aviation's contribution to global warming increases to approximately 4 per cent. This figure could triple by 2050, as rising incomes encourage more people to travel by air. The International Air Transport Association (IATA), at its Annual General Meeting in October 2021, pledged to achieve net zero carbon emissions by 2050. Adding weight to this decision, in October 2022, member states of the International Civil Aviation Organization (ICAO) also agreed to a long-term aspirational goal (LTAG) of net zero emissions from avi-

All next-generation aircraft, like the Boeing 777X and Airbus A350, must be capable of operating on 100 per cent SAF

PHOTOGRAPH: Boeing

ation by 2050. Net zero means the amount of GHG removed from the atmosphere is equal to that emitted by the specific human activity, in this case aviation.

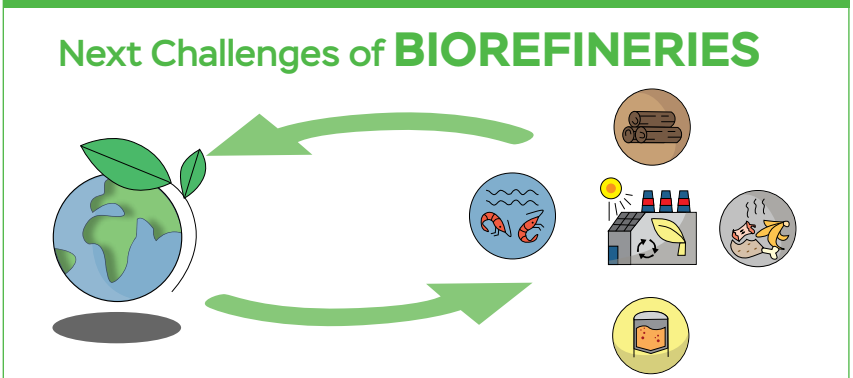
Is aviation net zero by 2050 an achievable goal? Some analysts declare that it is unlikely, perhaps even impossible. However, while recognising that aviation is one of the most stubbornly difficult industries to decarbonise, IATA asserts that net zero by 2050 is definitely practicable. To bolster its claims it has released five net-zero roadmaps. Researchers at the University of Cambridge broadly agree. They have released their own blueprint which says the sector could reach net zero by 2050 if urgent action is taken in the next five years.

IATA'S NET ZERO ROADMAPS.

IATA's five roadmaps are a step-by-step listing of the main actions required to be taken not just by the aviation industry, but also by governments, suppliers, and financiers, to accelerate the transition to net zero by 2050. They were formulated by comparing 14 leading aviation net zero transition roadmaps. According to Willie Walsh, IATA's Director General, "The roadmaps are a call to action for all aviation's stakeholders to deliver the tools needed to make this fundamental transformation of aviation a success with policies and products fit for a net-zero world." IATA says that success will depend mainly on early policy support and the pace at which solutions are implemented.

- **Aircraft Technology Roadmap:** Around 15-20 per cent improvement in jet aircraft efficiency, compared to the best technology today, is still achievable. In addition, all next-generation aircraft must be capable of operating on 100 per cent Sustainable Aviation Fuels (SAF). Key milestones for conventional aircraft are already backed by investment and demonstrator programmes, including new engines, aerodynamics, aircraft structures and flight systems. However, what is urgent and essential, is the development of revolutionary aircraft that will be operated with hydrogen or batteries, fully eliminating carbon emissions from their operations.
- **Energy and New Fuels Infrastructure Roadmap:** In IATA's thinking the widespread transition to SAF is the single most important factor on the road to net zero. The airline industry will require assured SAF infrastructure upstream from the airport (for feedstock collection, refining, and blending). IATA's central scenario requires SAF to constitute 80-90 per cent of aviation fuel use in 2050, which would reduce emissions by 62 per cent. To achieve this massive transition, IATA estimates that 5,000-7,000 biorefineries will be required for aviation alone by 2050. That's not all. To produce such vast amounts of SAF, the aviation sector could require close to 100 Mt of hydrogen by 2050, an amount comparable to all hydrogen production worldwide in 2023.
- **Operations Roadmap:** According to IATA, air traffic management should be treated as a key part of national infrastructure and prioritised in the overall strategy for sustainable aviation.
- **Finance Roadmap (September 2024 update):** According to this Roadmap, to reach net zero by 2050, the annual average capex needed to build new facilities over the 30-year period is about USD128 billion per year. Success would be easier if governments redirected subsidies away from fossil fuels and toward renewable energy production. The most important determinant of how many new facilities need to be built is probably the proportion of SAF production in refineries' total output. This is because SAF is often competing with other refinery products like biodiesel. Hence a major reduction can be achieved in the number of new plants, and the corresponding investment, by maximising SAF co-processing at existing refineries. Co-processing involves inserting a bio-based intermediate into existing petroleum refineries for simultaneous processing with petroleum feeds. This will increase SAF volumes immediately as it requires neither lead time nor additional investments.

IATA's CENTRAL SCENARIO REQUIRES SAF TO CONSTITUTE 80-90 PER CENT OF AVIATION FUEL USE IN 2050



Source: IATA

IATA's FIVE NET ZERO ROADMAPS AND THE AREAS THEY COVER

	Aircraft Technology Roadmap	Operations Roadmap	Infrastructure Roadmap	Policy Roadmap	Finance Roadmap
Reduce in-flight energy use	○	○		○	○
Change the fuel	○		○	○	○
Re-capture emitted CO_2			○	○	○

Source: IATA

- **Policy Roadmap (September 2024 update):** This emphasises the critical importance of strategic policy sequencing and the need for global collaboration, including beyond the aviation sector.

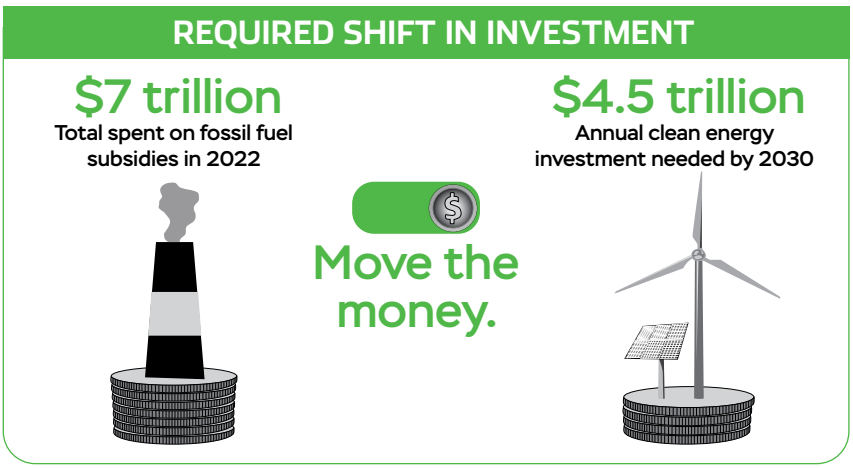
IATA lists four key conclusions of the five roadmaps:

- The air transport industry's energy transition is feasible on the 2050 horizon.
- The amounts of investments needed to make that possible are comparable to those engaged in previous creations of new renewable energy markets.
- Success in the transition depends critically upon policymakers' unity of purpose.
- The time left for joining forces in air transportation's energy transition is shrinking by the minute. Every action delayed is an opportunity missed.

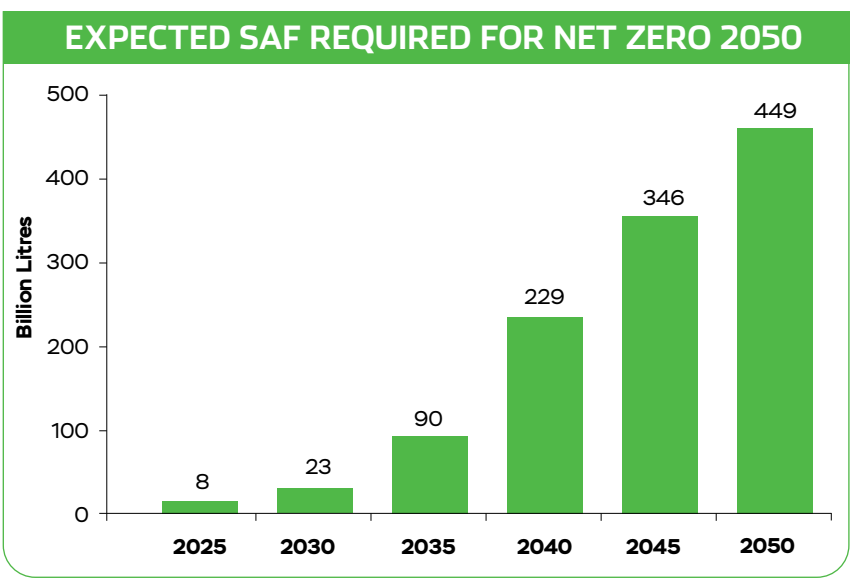
UNIVERSITY OF CAMBRIDGE REPORT. A report entitled "Five Years to Chart a New Future for Aviation", published in September 2024 by the University of Cambridge's Aviation Impact Accelerator (AIA) global initiative, outlines an ambitious five-year plan to shift the aviation sector onto a sustainable path. It establishes four pivotal 2030 Sustainable Aviation Goals, each targeting key leverage points within the sector. If initiated in 2025 and implemented within the next five years, these could help set the sector firmly on the road to net zero 2050.

- **Goal 1:** Operation Blue Skies: Governments and industry need to create several 'Airspace-Scale Living Labs' to enable a global contrail avoidance system to start to be deployed by 2030. Contrail avoidance can potentially deliver quick environmental gains for the industry, giving it more time to switch to SAF.
- **Goal 2:** Systems Efficiency: Governments should signal a clear commitment to the market about their intention to drive system-wide efficiency improvements. In tandem, efficiency strategies need to be developed so that, by 2030, a new wave of policies can be implemented to unlock these systemic efficiency gains.
- **Goal 3:** Truly Sustainable and Scalable Fuel: Governments should reform SAF policy development to adopt a cross-sector approach, enabling rapid scalability within global biomass limitations. This would help SAF production to move beyond purely biomass-based methods, incorporating more carbon-efficient synthetic production techniques.
- **Goal 4:** 'Moonshots': Several high-reward experimental demonstration programmes need to be launched to enable the focus on, and scale-up of, the most viable transformative technologies by 2030.

Echoing an IATA conclusion, the authors of the AIA stress that time is of the essence for these four interventions to have the desired impact.



Source: Post by António Guterres, UN Secretary General



Source: Earth.org

SAF REIGNS SUPREME. A common feature of every roadmap to aviation net zero is SAF. SAFs are synthetic alternatives to fossil fuels, made from renewables like waste cooking oils, vegetable fats and agricultural waste, which are rather limited. An alternative and practically unlimited production method is called 'power to liquid' (PtL), in which water and CO2 are broken down, with the resulting carbon and hydrogen combined to create liquid fuel. In order to be truly sustainable, PtL would require large quantities of renewable electricity, as well as a substantial increase in carbon capture and storage. However, although SAF production is expected to triple to 1.875 billion litres in 2024, this amounts to just 0.53 per cent of aviation's fuel needs and 6 per cent of total renewable fuel capacity. According to IATA, as much as 449 billion litres of SAF will be required by 2050.

New technologies to power aircraft, such as hydrogen power and electrification, are likely to play a role, at least on shorter routes, by the early 2040s. But hydrogen is bulky and difficult to store in the huge quantities necessary to power aviation on a large scale. To be sustainable, it has to be made from renewable sources of which supplies are limited. Batteries are very heavy in

Pratt & Whitney GTF Advantage flight testing on Airbus A320neo Aircraft. Pratt & Whitney continues to be a reliable power source for hundreds of airlines and operators for embedding sustainability into their operations.

relation to the energy they contain. Neither can they power large planes, nor last over long distances. In contrast, SAF is a 'drop-in' fuel – ready to be used in today's aircraft.

However, at present SAF is so much more expensive than normal fuel, and its supply is so limited, that it may take decades to attain financial viability. Besides, the vast and hurried expansion of production required to feed the growing thirst of the airline industry comes with environmental and societal risks. Prime among these is the already rampant diversion of forested areas and fertile land for food crops – to crops for SAF production.

Overdependence on SAF as a solution also discourages other more lasting options to curb carbon output, like designing and developing true zero-emission aircraft. In July 2024, Airbus projected that the global fleet of commercial passenger and freighter aircraft will roughly double during the next 20 years, from 24,260 today to 48,230 in 2043. Boeing predicts a similar trend. A July 2024 report from the International Council on Clean Transportation (ICCT) warned that the aviation industry will miss its net-zero goal unless all new aircraft delivered after 2035 are net zero over their entire operational lifetimes. Unfortunately, all indications are that Airbus and Boeing's next-generation jets will be of relatively conventional design, with fuel-burning engines, and only incrementally more efficient than current airliners.

TIME IS OF THE ESSENCE. Planet Earth is sitting on a ticking time bomb. Climate change poses an existential threat to humanity, with global warming intensifying natural disasters, and devastating impacts on ecosystems and biodiversity. This underscores the need for urgent collective action to reduce GHG emissions and transition to a more sustainable future. Therefore, the aviation industry's growing awareness of its need to achieve environmental sustainability is encouraging. However, its eloquently articulated intentions need to be backed with decisive interventions over the next five years to create a feasible path to net-zero aviation by 2050.

IATA says that success of net zero 2050 will depend mainly on early policy support and the pace at which solutions are implemented

The road ahead is subject to numerous uncertain factors involving technology, regulations, government policies, and geopolitics. At present many of these are dangerously off track. For instance, all indications are that the new Trump administration in the US may not be particularly environmentally friendly. And in a telling sign of how fragile even 'firm' commitments are, Air New Zealand – a company previously heralded as one of the most sustainability-focused airlines – has abandoned its 2030 carbon intensity reduction targets. It blamed lack of political support, limited aircraft technologies, and a shortage of SAF. Thankfully, it has retained its commitment to reach net-zero emissions by 2050. Other carriers may be forced to follow suit. Indeed, IATA laments that it is impossible today for many airlines to meet the obligations that are being imposed on them, without necessary supportive action.

Yet, it would be wrong to succumb to despair. According to Willie Walsh, IATA's director general, "The updated IATA Policy and Finance Net Zero Roadmaps make it clear that decarbonisation by 2050 is possible. They also sound a warning bell that, to achieve this, all stakeholders, particularly policymakers, must collaborate more broadly and act with greater urgency."

Achieving net zero by 2050 requires immediate, collaborative, and transformative action from governments, airlines, manufacturers, and other stakeholders to invest in SAF, cutting-edge technologies, and innovative operational efficiencies. In a nutshell, what is needed is less talk and more action. SP

PHOTOGRAPH: Airbus

Airbus partners with DG Fuels to foster SAF production in the US

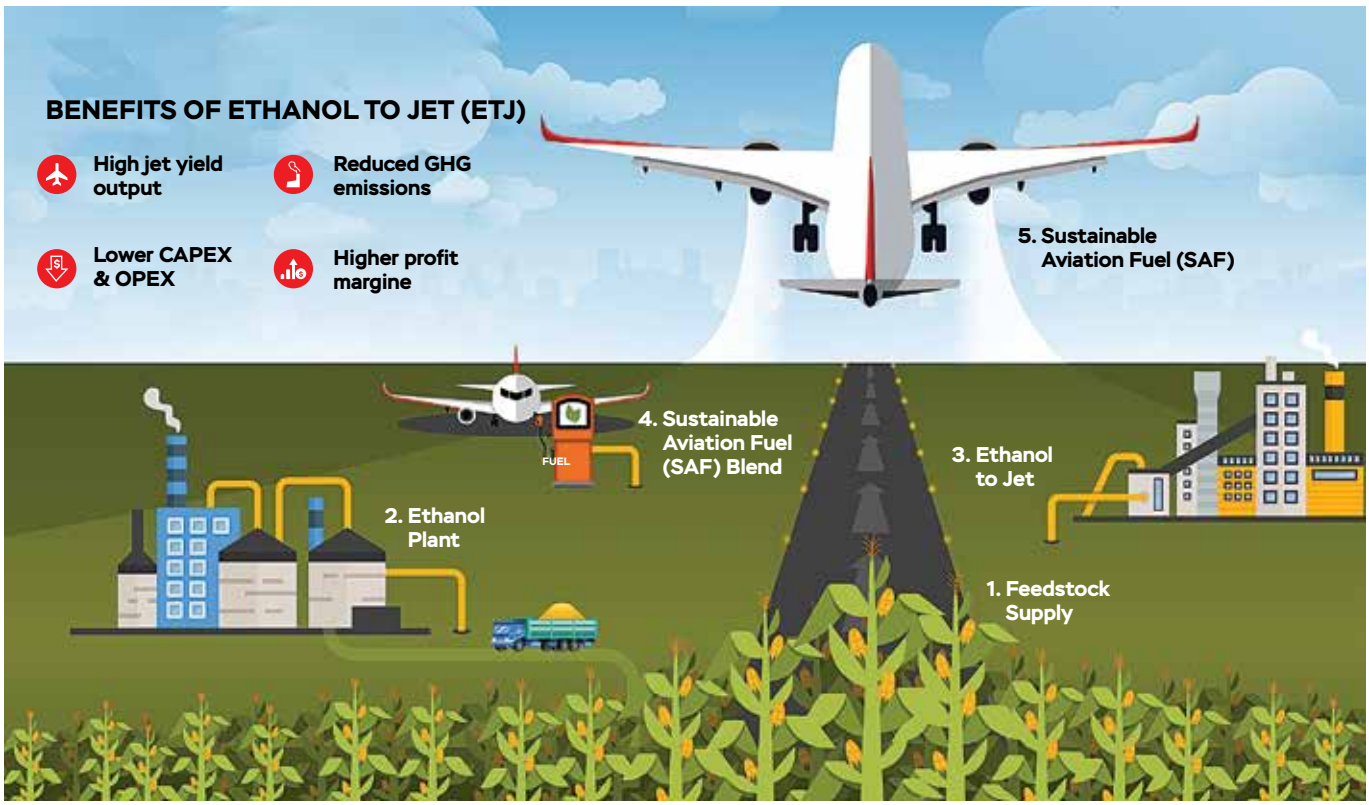
CONVERTING WASTEWATER TO SUSTAINABLE AVIATION FUEL

Researchers at Argonne National Laboratory have developed a process that converts wastewater into biofuel components, offering a cost-competitive and sustainable alternative for SAF production

BY **SUKHCHAIN SINGH**

PHOTOGRAPH: Airbus

AIRCRAFT HAVE BEEN FUELLED by kerosene over the last century and have been emitting high volumes of Greenhouse Gas Emissions (GHG). Now, a new generation of sustainable aviation fuels have been developed which have the potential to halve the aviation industry's carbon emissions by 2050. Sustainable aviation fuel (SAF) is a certified jet fuel (Jet-A/A1). However, unlike traditional jet fuel that is, from fossil resources, today's SAF is a blend of conventional fossil fuel and synthetic components that are prepared from a range of renewable "feedstock" (such as used cooking oils, fats, plant oils, municipal, agricultural and forestry waste). SAF can be blended at various levels with limits between 10 per cent and 50 per cent, depending on the feedstock and how the fuel is produced. SAF so blended with



Fueling the Future for Cleaner Skies: Take off with UOP's ethanol to jet (ETJ) process technology. The next generation of renewable fuels.

conventional Jet A can be used as drop-in fuel for the existing engine & aircraft integration.

Worldwide, 12 per cent of all carbon dioxide (CO_2) emissions are from the transportation sector of which aviation accounts for 2-3 per cent of all CO_2 emissions. ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) plugs the net CO_2 aviation emissions at 2020 levels through 2035. The international aviation industry has set an aspirational goal to reach net zero carbon by 2050. SAF presents the best near-term opportunity to meet these goals.

SAF can be produced from a variety of non-petroleum-based renewable feedstocks like food and waste portion of municipal solid waste, woody biomass, fats/greases/oils, and other feedstocks. There are multiple technology pathways to produce these fuels which are approved by American Society for Testing and Materials (ASTM) and also their blending limits based on these pathways. ASTM D7566 Standard, Specification for Aviation Turbine Fuel Containing Synthesised Hydrocarbons, dictates fuel quality standards for non-petroleum-based jet fuel and outlines approved SAF-based fuels and the percent allowable in a blend with Jet A. ASTM D1655 Standard, Specification for Aviation Turbine Fuels allows co-processing of biomass feedstocks at a petroleum refinery in blends up to five per cent. Both ASTM standards are continuously updated to allow for developments in technology to produce SAF. The nine approved pathways are:

- **Fischer-Tropsch (FT) Synthetic Paraffinic Kerosene (SPK):** Woody biomass is converted to syngas using gasification, then a Fischer-Tropsch synthesis reaction converts the syngas to jet fuel. Feedstocks include various sources of renewable biomass, primarily woody biomass such as municipal solid waste, agricultural wastes, forest wastes, wood, and energy crops. ASTM approved this in June 2009 with a 50 per cent blend limit.
- **Hydro-processed Esters and Fatty Acids:** Triglyceride feedstocks such as plant oil, animal oil, yellow or brown greases, waste fat, oil, and greases are hydro-processed to break apart the long chain of fatty acids, followed by hydro-isomerisation and hydrocracking. This pathway produces a drop-in fuel and was ASTM approved in July 2011 with a 50 per cent blend limit.
- **Hydro-processed Fermented Sugars to Synthetic Iso-paraffins:** Microbial conversion of sugars to hydrocarbons. Feedstocks include cellulosic biomass feedstocks (e.g., her-

The international aviation industry has set an aspirational goal to reach net-zero carbon emissions by 2050, with SAF presenting the best near-term opportunity despite challenges such as high costs and limited feedstock availability

ILLUSTRATION: Honeywell

SAF is produced using renewable feedstocks such as used cooking oils, municipal and agricultural waste, and woody biomass, blended with conventional jet fuel for compatibility with existing aircraft engines

baceous biomass and corn stover). Pre-treated waste fat, oil, and greases also can be eligible feedstocks. ASTM approved in June 2014 with a 10 per cent blend limit.

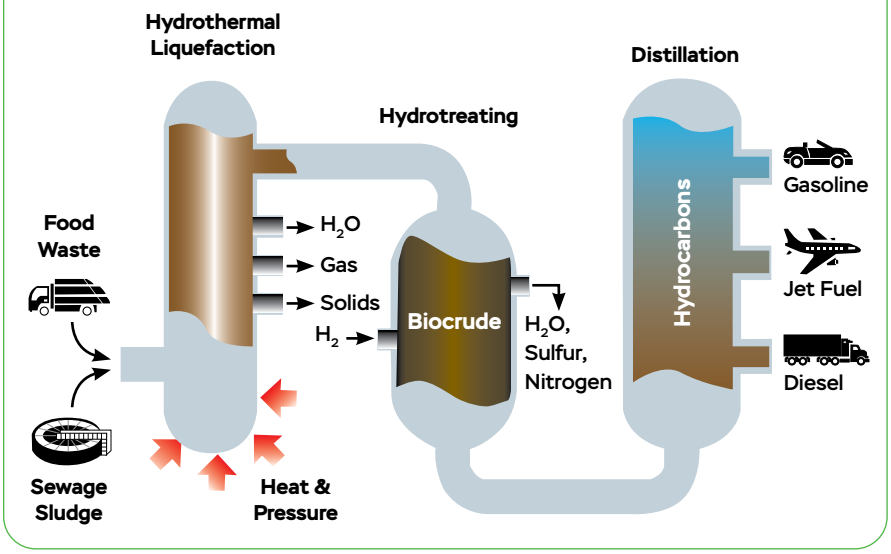
- **FT-SPK with Aromatics:** Biomass is converted to syngas, which is then converted to synthetic paraffinic kerosene and aromatics by FT synthesis. This process is similar to FT-SPK ASTM D7566 Annex A1, but with the addition of aromatic components. ASTM approved in November 2015 with a 50 per cent blend limit.
- **Alcohol-to-Jet Synthetic Paraffinic Kerosene:** Conversion of cellulosic or starchy alcohol (isobutanol and ethanol) into a drop-in fuel through a series of chemical reactions—dehydration, hydrogenation, oligomerisation, and hydrotreatment. The alcohols are derived from cellulosic feedstock or starchy feedstock via fermentation or gasification reactions. Ethanol and isobutanol produced from lignocellulosic biomass (e.g., corn stover) are considered favourable feedstocks, but other potential feedstocks (not yet ASTM approved) include methanol, iso-propanol, and long-chain fatty alcohols. ASTM approved in April 2016 for isobutanol and in June 2018 for ethanol with a 30 per cent blend limit.
- **Catalytic Hydro-thermolysis Synthesised Kerosene:** (Also called hydrothermal liquefaction), clean free fatty acid oil from processing waste oils or energy oils is combined with preheated feed water and then passed to a catalytic hydrothermolysis reactor. Feedstocks for the CH-SPK process can be a variety of triglyceride-based feedstocks such as soybean oil, jatropha oil, camelina oil, carinata oil, and tung oil. ASTM approved in February 2020 with a 50 per cent blend limit.
- **Hydrocarbon Hydro-processed Esters and Fatty Acids:** Conversion of the triglyceride oil, derived from Botryococcus braunii, into jet fuel and other fractionations. Botryococcus braunii is a high-growth alga that produces triglyceride oil. ASTM approved in May 2020 with a 10 per cent blend limit.
- **Fats, Oils and Greases (FOG) Co-Processing:** ASTM approved five per cent fats, oils, and greases coprocessing with petroleum intermediates as a potential SAF pathway. Used cooking oil and waste animal fats are two other popular sources for coprocessing.
- **FT Co-Processing:** In association with the University of Dayton Research Institute, ASTM approved five per cent Fischer-Tropsch syncrude coprocessing with petroleum crude oil to produce SAF.

India's first commercial passenger flight using indigenously produced SAF blend flew in May 2023, marking a milestone towards the country's commitment to achieving net-zero emissions by 2070

PHOTOGRAPH: Dennis Schroeder / NREL

RECENT DEVELOPMENT OF WASTEWATER INTO SAF. Researchers at Argonne National Laboratory, USA, have developed a technology that turns wastewater from sources like breweries and dairy farms into ingredients needed to create SAF, particularly volatile fatty acids (VFAs) like butyric acid and lactic acid. This process, known as 'methane-arrested anaerobic digestion' (MAAD), uses bacteria to break down organic matter in wastewater, converting it into these fatty acids, which can then be transformed into biofuels. The team also created an 'in-situ product recovery process' that utilises membrane separation technology to extract the desired organic compounds from complex wastewater mixtures. This method helps improve the yield of butyric acid, making the entire process more efficient and enabling the production of SAF at a much larger scale.

HYDROTHERMAL LIQUEFACTION– PROCESS TO PRODUCE BIO-DERIVED FUELS FOR TRANSPORTATION



Source: Illustration / Michael Perkins

Instead of relying on conventional resources like fat, oil and grease, scientists have used carbon-rich wastewater from breweries and dairy farms as a feedstock for their innovative technology. The novel technology strips organic carbon from these high-strength waste streams that are otherwise difficult to treat economically. This unique approach creates a cleaner, more sustainable fuel alternative and also tackles the environmental problem of wastewater disposal. By converting wastewater into biofuel, the process reduces the carbon extent of traditional wastewater treatment, which contributes to harmful algal blooms and ecosystem disruption.

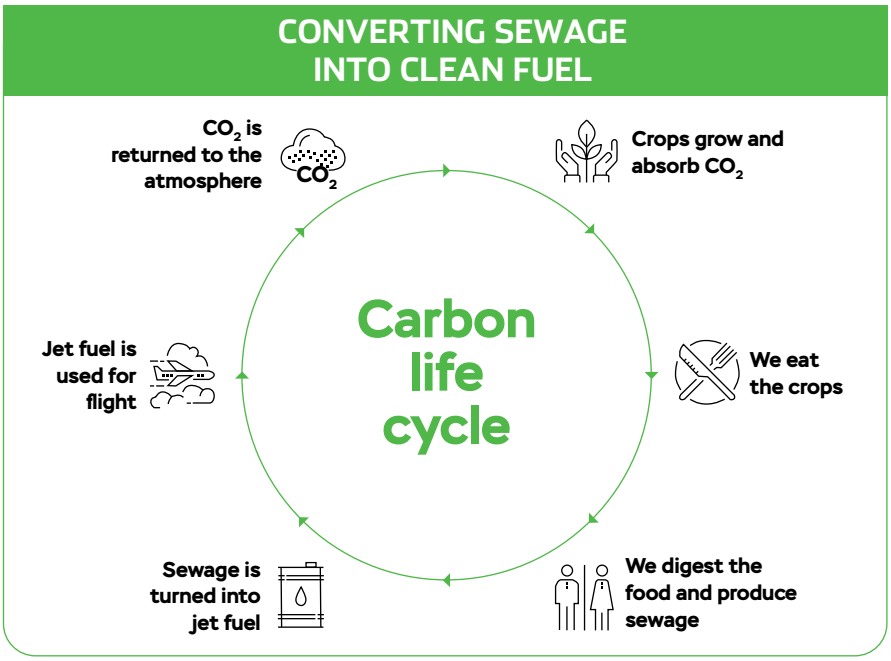
This path breaking technology creates a cost-competitive SAF that could reduce GHG emissions in the aviation industry by up to 70 per cent. Argonne's life cycle and techno-economic models have been used to analyse the environmental impacts and economic viability of the SAF.

It has been indicated that scientists at Argonne National Laboratory will continue to work on improving the sustainability of their findings, and even researching other materials from feedstock that could be used with this technology. The study also expands the use of lesser-used waste materials at a time when demand for typical bio-feedstock for SAF results in a shortage. While research will continue, ultimately, scientists hope to commercialise the patent-pending process and scale the technology for widespread use. These efforts were funded by the DOE's Office of Energy Efficiency and Renewable Energy's Bioenergy Technologies Office. The hope is that by funding the research efforts, scientists will meet their goal of commercialising the process and scaling it to create sufficient SAF to meet 100 per cent of the demand from the commercial sector.

India's abundance of ethanol feedstock and supportive policies under the Ethanol Blending Programme position the Alcohol-to-Jet pathway as the most viable option for scaling SAF production domestically

HOW DOES SAF REDUCE THE AVIATION INDUSTRY'S CARBON FOOTPRINT? Air transport represents approximately 2-3 per cent of global human-induced GHG emissions. SAF is one of the means the aviation industry is using to reduce that carbon footprint. On average, SAF can reduce CO_2 emissions by 80 per cent compared to traditional jet fuel. This substantial reduction is crucial to the industry's progress towards decarbonisation. The key to SAF's impact lies in its life cycle. When burned, SAF still produces emissions similar to those emitted by fossil fuels. But unlike conventional jet fuels, which take fossil resources out of the ground and release previously stored carbon into the atmosphere, SAF primarily uses carbon that is part of the current carbon cycle in various feedstocks. This means that the CO_2 emitted during an aircraft's flight is re-absorbed by the biomass used in SAF production.

The SAF ecosystem is in its infancy across the globe. Limited volumes mean SAF is much more expensive than conventional jet fuel. As production expands, SAF prices will reduce, but, it still requires collaboration between governments, industry and regulators on a global scale for its large-scale infusion in the aviation fuel ecosystem. Appropriate regulatory mechanisms and innovative arrangements need to be established. Even then, there are challenges associated with the limited availability of land and biowaste. As the SAF ecosystem matures, it is expected that multiple pathways utilising the most regionally appropriate feedstocks will



Source: Firefly Green Fuels

be established. It is clear that both biomass sources and E-Fuels will be necessary to meet the demand. (E-fuels are synthetic fuels produced through electrolysis).

DISTRIBUTION ISSUES. SAF must be blended with Jet A prior to use in an aircraft. If SAF is co-processed with conventional Jet A at an existing petroleum refinery, the fuel would flow through the supply chain in a business-as-usual model via pipeline to terminals and onwards by pipeline or truck to airports. It is expected that SAF produced at biofuels facilities would be blended with Jet A at existing fuel terminals and then delivered to airports by pipeline or truck. The fuels could also be blended at the terminal directly upstream of an airport or thousands of miles away and transported by pipeline or barge to a terminal near the airport. There would be no change to fuel operations at the airport, as airports are expected to continue to receive blended fuel in the same pipelines and trucks as they do today. While it is technically possible to blend fuels at an airport, it is not the most practical or cost-effective method due to the need for additional equipment, staff, and insurance. Due to strict fuel quality standards, it is preferable to certify SAF as ASTM D1655 upstream of an airport.

Sustainable aviation fuel (SAF) has the potential to halve the aviation industry's carbon emissions by 2050, with lifecycle emissions reductions of up to 80 per cent compared to traditional jet fuel

SAF IN INDIAN AVIATION. In a significant development towards decarbonising of the aviation sector, India's first commercial passenger flight using indigenously produced SAF blend was successfully flown on May 19, 2023. Air Asia flight (I5 767) flew from Pune to Delhi fuelled by SAF blended ATF produced by Praj Industries Ltd by using indigenous feedstock, supplied by Indian Oil Corporation Ltd and used by Air Asia.

Describing the occasion as a significant milestone in the country's efforts towards Net Zero emissions by 2070, the then Union Minister of Petroleum & Natural Gas and Housing & Urban Affairs, Hardeep Singh Puri had said, "This would be the First domestic commercial passenger flight with SAF blending up to one per cent as demonstration mode". "By 2025, if we target to blend one per cent SAF blending in Jet fuel, India would require around 14 crore litres of SAF/annum. More ambitiously, if we target for five per cent SAF blend, India required around 70 crore litres of SAF/annum". With a focussed vision of Atmanirbhar Bharat, the Petroleum Minister said, "Production of SAF using sugarcane molasses as indigenous feedstock and technology in India is a major step towards self-reliance and de-carbonisation of the aviation sector in line with our commitment for achieving Net Zero by 2070."

India is blessed with a variety of feedstocks (both sugar, starch, and lignocellulosic) in abundance. These feedstocks are the basic ingredients for SAF production via the Alcohol-to-Jet (ATJ) pathway. There are nine pathways already approved and certified by ASTM globally. Sachin Raole, the CFO, Praj Industries, has indicated that, "For India, the ATJ is the preferred pathway because of the substantial availability of ethanol with supportive policies and an ecosystem well established with the Ethanol Blending Program in action. Under the ATJ pathway, multiple alcohol like ethanol, isobutanol, etc, can be converted into SAF."

Globally the SAF cost is about 2-3 times that of ATF which is largely due to the high prices of the feedstock i.e., low CI ethanol, which is the main contributor to the cost of SAF production via the ATJ pathway. Raole has detailed that, "A clear and firm long-term policy is necessary for the SAF growth in India. The expectation from the government would be to come up with a definite pricing framework. For some early projects, special pricing, or viability gap funding (VGF) is required. Similarly, clarity on offtake agreements, take or pay agreements, would help participating stakeholders make concrete investments and decisions in the SAF sector".

Although India has embarked on the path for the use of SAF blend in ATF, the commercial viability of SAF production poses a significant challenge to the successful commercialisation of SAF in India. India is still taking baby steps, but if the oil companies, feedstock producers and aviation industry put their heads together they can work out a reasonable way of promoting SAF, considering the domestic market's price sensitivity. The government of India is likely to come up with mandates for blending of SAF with aviation ATF for domestic flights only after the global mandates for international flights kick in from 2027. SP

United adds new Corporate Partners to Sustainable Flight Fund that now exceeds $200 Million

AIRLINES CHARTING A GREENER PATH

From adopting cutting-edge technologies and renewable fuels to rethinking operational efficiencies and engaging passengers in eco-friendly practices, commercial airlines are evolving to meet the urgent need for environmental responsibility.

BY **ROHIT GOEL**

COMMERCIAL AIR TRAVEL IS the only viable option for transporting large groups of people quickly over large distances, faces increasing pressure to reconcile its essential role in travel and commerce with the imperative to reduce environmental impact. Responsible for approximately 2-3 per cent of global carbon emissions, the sector is being challenged to innovate and implement sustainable practices. Airlines, as key players, have responded with initiatives encompassing alternative fuels, fleet modernisation, advanced operational strategies, and collaborative frameworks but what makes the picture truly worrisome is that air traffic is surging across the globe, so aviation's emissions could well triple by 2050.

Acutely aware of the looming possibility that commercial aviation could effectively become environmentally unsustainable, in October 2022, member states of the International Civil Aviation Organization (ICAO) agreed to a long-term aspirational goal (LTAG) of net zero emissions from aviation by 2050. Net zero means the amount of GHG removed from the atmosphere is equal

PHOTOGRAPH: United

to that emitted by that activity. A near-term milestone of reducing carbon emissions by five per cent by 2030 has also been formulated. So, what is the airline industry doing to promote sustainability?

AIMING AT EVERYTHING. Sustainable aviation is a multi-disciplinary field that seeks to reduce aviation's environmental footprint through innovation and new practices. Some measures are fairly obvious and ongoing. For instance, thanks to airframe redesign and more fuel-efficient engines, a typical flight today generates just half the CO2 it would have in 1990. Many airlines are resolutely getting rid of their older aircraft and investing in modern, fuel-efficient planes. However, rather than wait endlessly for new airliners, airlines are also striving to enhance operational efficiency and reduce emissions by optimising flight routes, minimising aircraft taxi times, and reducing weight. No sustainability measure is too small. Artificial intelligence (AI) can help avoid flight delays, reduce fuel consumption and select flightpaths that avoid or reduce contrail production. A relatively modest investment in new, lightweight seating can reduce aircraft weight and significantly lower emissions over time. Similarly, sustainable cabin practices can make a substantial contribution to going green. For instance, some airlines are reducing the use of single use plastics because they generate huge amounts of GHG and create mountains of waste. They are striving to recycle on-board waste, and even aiming for more sustainable catering options. Carbon offsetting programmes or "green fares" allow conscientious passengers to voluntarily offset the emissions from their flights by contributing to projects that reduce emissions, such as renewable energy installations or reforestation efforts.

One clear indication of the seriousness with which the industry is striving for sustainability is that some airlines are integrating air travel with other modes of transportation to reduce emissions. For example, Lufthansa offers passengers combined air and rail tickets for convenient and eco-friendly short journeys.

THE PIVOTAL ROLE OF SAF. Sustainable Aviation Fuels (SAFs) represent a transformative solution for reducing aviation's carbon footprint. Unlike conventional jet fuel, SAFs are derived from renewable feedstocks such as agricultural residues, municipal solid waste, and algae. When measured across their lifecycle, SAFs can reduce carbon emissions by up to 80 per cent.

United Airlines has taken a leadership position in SAF adoption. In 2021, the airline made history by operating a passenger flight with one engine powered entirely by SAF, demonstrating its readiness for integration into commercial operations. United has also committed to purchasing over 3 billion gallons of SAF by 2030—a bold move supported by strategic investments in Fulcrum BioEnergy and Alder Fuels. These partnerships aim to scale SAF production, addressing the high costs and limited availability that have hampered widespread adoption.

Across the Atlantic, British Airways is championing waste-to-fuel technology. Its collaboration with Velocys focuses on building a facility in Immingham, UK, that will convert non-recyclable waste into SAF. This project underscores British Airways' broader strategy of embedding sustainability into its operations, with the airline targeting a 10 per cent SAF blend in its fuel mix by 2030.

Singapore Airlines is similarly forward-thinking, having launched a pilot SAF programme in partnership with the Civil Aviation Authority of Singapore and ExxonMobil. The initiative integrates SAF into routine operations at Changi Airport, aiming to assess long-term feasibility and demonstrate scalability within Asia's bustling aviation market.

INVESTING IN NEXT-GENERATION AIRCRAFT. The efficiency of modern aircraft is critical to achieving sustainability goals. Airlines are replacing older, less efficient models with state-of-the-art aircraft that consume less fuel and emit fewer pollutants.

British Airways to become the largest purchaser of carbon removals in the UK

PHOTOGRAPH: British Airways

Zunum Aero, backed by Boeing and JetBlue Technology Ventures, is developing hybrid-electric aircraft for fast and affordable travel

Delta Air Lines has invested heavily in next-generation aircraft, including the Airbus A321neo and Boeing 737 MAX. These planes feature advanced aerodynamics, lightweight composite materials, and more efficient engines, collectively reducing fuel consumption by up to 30 per cent. Delta's broader sustainability strategy integrates these aircraft into routes with high demand, ensuring optimal efficiency while maintaining passenger comfort.

Qantas Airways is undergoing a similar transformation. Its ambitious "Project Sunrise" initiative aims to operate ultra-long-haul flights using Airbus A350-1000 aircraft. These planes are equipped with Rolls-Royce Trent XWB engines, which are among the most fuel-efficient in the world. By combining these advancements with a focus on route optimisation, Qantas anticipates significant reductions in fuel burn per passenger kilometre.

Even low-cost carriers like Ryanair are making notable contributions. The airline, known for its cost-efficiency, operates a fleet of Boeing 737-800s and has invested in the latest Boeing 737 MAX models. These aircraft, designed specifically for high-frequency operations, consume 16 per cent less fuel than their predecessors, aligning cost savings with environmental benefits.

OPTIMISING OPERATIONAL EFFICIENCIES. Beyond fleet upgrades, airlines are innovating in operational practices to improve fuel efficiency. From real-time flight monitoring to optimised ground operations, these strategies reduce both costs and emissions.

Airlines are investing heavily in fleet modernisation with next-generation aircraft which consume significantly less fuel and emit fewer pollutants

American Airlines has extensively deployed winglet technology, a modification that improves aerodynamic efficiency. By reducing drag, winglets cut fuel consumption significantly across the airline's large fleet. Additionally, the airline has invested in sophisticated flight planning software that identifies optimal altitudes and speeds, further enhancing efficiency.

Cathay Pacific has adopted a comprehensive approach through its "Eco-Dashboard." This tool collects data from every stage of flight operations, enabling pilots and ground staff to make real-time adjustments that minimise fuel wastage. Such measures have saved Cathay tens of thousands of tonnes of carbon dioxide annually, reinforcing its commitment to operational excellence.

Meanwhile, Southwest Airlines focuses on streamlining ground operations. By reducing taxi times and idling on the runway, the airline has minimised unnecessary fuel burn, translating into both environmental and financial benefits.

EMPOWERING PASSENGERS. While operational improvements address direct emissions, carbon offsetting programmes offer airlines and passengers a way to mitigate their environmental impact further. These programmes fund projects such as reforestation, renewable energy development, and carbon capture initiatives.

Air France-KLM has embedded carbon offset options into its ticketing system. Passengers can directly support initiatives like forest conservation in South America or solar energy projects in India. This seamless integration encourages wider participation, with a growing percentage of travellers opting to neutralise their carbon footprint.

Etihad Airways has taken a bold step by showcasing the potential of net-zero emissions flights. The airline's "Greenliner"

PHOTOGRAPH: Zunum Aero

easyJet's partner Wright Electric begins engine development programme for 186 seat electric aircraft

initiative involves conducting demonstration flights using its Boeing 787 Dreamliner, powered by a combination of SAF, advanced route planning, and offsets. These flights serve as case studies for sustainable aviation practices, demonstrating feasibility and scalability for the broader industry.

Emirates has also introduced robust offset programmes, funding wildlife conservation projects in Africa. By linking its efforts to tangible environmental outcomes, the airline ensures transparency and accountability in its sustainability journey.

INNOVATIONS IN ELECTRIC AND HYBRID AIRCRAFT. The future of sustainable aviation may lie in groundbreaking technologies like electric and hybrid propulsion systems. Although still in their infancy, these technologies promise to revolutionise short-haul aviation.

easyJet has partnered with Wright Electric to develop a fully electric aircraft for routes under 500 kilometres. This collaboration aims to produce a commercially viable electric plane by 2030, which could significantly reduce emissions on high-frequency routes.

JetBlue Airways is exploring hybrid-electric solutions through its partnership with Zunum Aero. The focus is on regional routes, where hybrid aircraft could cut fuel use and emissions by 40 per cent. JetBlue's investment signals its commitment to fostering innovation while addressing operational constraints.

Airlines are leveraging technology and operational efficiencies, such as AI-powered route optimisation, lightweight seating, and carbon offsetting programmes, to lower emissions and promote sustainability

INDUSTRY-WIDE SYNERGIES. The complexity of achieving sustainability necessitates collaboration across the aviation ecosystem. Airlines, airports, governments, and technology providers are joining forces to accelerate progress.

The Oneworld Alliance, comprising airlines like Japan Airlines, American Airlines, and Qatar Airways, has committed to net-zero emissions by 2050. Through shared resources and joint research projects, the alliance fosters innovation while maintaining high standards of accountability.

Lufthansa Group has extended its sustainability efforts to partnerships with airport operators and policymakers. One notable initiative is its collaboration with Frankfurt Airport to develop hydrogen infrastructure, which could facilitate the integration of hydrogen-powered aircraft into commercial operations.

A SUSTAINABLE HORIZON FOR AVIATION. The sustainability journey in aviation is both challenging and inspiring. Airlines are demonstrating remarkable innovation and commitment through initiatives that encompass immediate actions and long-term strategies. While SAF adoption, fleet modernisation, and operational optimisation are yielding tangible benefits, the industry's ultimate success will depend on fostering technological breakthroughs and broadening collaborative efforts.

As airlines continue to invest in a greener future, they are not only transforming their operations but also reshaping the global aviation landscape. The path forward may be steep, but the collective determination to align air travel with environmental goals ensures a promising horizon for generations to come. SP

PHOTOGRAPH: easyJet's

Demo Launch of seaplanes in Andra Pradesh. The Indian government released new Directorate General of Civil Aviation (DGCA) rules in 2024 to simplify and encourage seaplane operations, including relaxed licensing and compliance norms

TAPPING THE UNCHARTED WATERS

Seaplane services are expected to transform regional connectivity in India, boost tourism, create jobs, and foster economic development, particularly in hard-to-reach coastal and inland regions

BY **SWAATI KETKAR**

IF YOU LOOK AT India's topographical map, you will realise that India has a long coastal line of thousands of kilometres stretching across nine states and four union territories namely - Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, and West Bengal and Union Territories - Daman and Diu, Puducherry, Lakshadweep Islands, and Andaman and Nicobar Islands.

In order to give a final push to the seaplane service, the government in August 2024 released new Directorate General of Civil Aviation (DGCA) rules for seaplanes allowing non-scheduled operators to provide such services. The rules were simplified with the aim to encourage seaplane operations under the regional air connectivity scheme UDAN (Ude Desh ka Aam Nagrik).

PHOTOGRAPH: ndtv / X

A BRIEF HISTORY OF SEAPLANE SERVICE IN INDIA.

Looking at this huge opportunity, SpiceJet along with Government of Gujrat introduced a seaplane service in October 2020 from Ahmedabad to a famous tourist spot about 200 kilometers away – 'Kevadia'- home to the new 'Statue of Unity' of Former Deputy Prime Minister Sardar Patel.

The new service was inaugurated by Prime Minister Narendra Modi, who joined the first flight and took the 50-minute ride from Kevadia to the Sabarmati Riverfront in Ahmedabad. Just as the first flight took off, it was clear that the service was headed for rough waters. It was found that SpiceJet did not have the necessary environmental clearances related to the construction of water aerodromes in both cities. Apart from the regulatory

Trial run of the first ever seaplane service in Andhra Pradesh, as Chandrababu Naidu was keen on starting the service immediately

PHOTOGRAPH: Yogesh Garg, De Havilland of Canada

issues, there were serious maintenance issues with the aircraft in operation.

SpiceJet leased a 15-seat De Havilland Twin Otter 300 from Maldivian. However, the 52-year-old aircraft required frequent maintenance leading to constant suspension of service. In fact, in the first four months of operation, the aircraft was sent back to Maldives for week-long overhaul, leading to mounting losses for the operator.

Finally, in 2021, SpiceJet discontinued the seaplane service citing operational reasons. In over a year and a half, just 276 flights took off carrying a mere 2,192 passengers. In February 2022, the Government floated another tender for seaplane service. The tender was awarded to Maritime Energy Heli Air Services (MEHAIR). The Government was slightly sure of success this time round due to MEHAIR's prior experience with seaplane services, having served the Andaman and Nicobar Islands for over a decade with a fleet of Cessna Grand Caravans. Besides the aircraft maintenance work could be carried out at Ahmedabad MRO instead of sending the aircraft to Maldives.

The year-2022 went by without any action…Experts felt that somewhere along the way the deal broke-off. The Government still hopeful of a launch floated a new tender in May 2023 but it didn't have many takers, due to obvious reasons.

The government waited and waited, it was just a matter of time now for the investors to get the business model right, and it did. But this time the government was prepared. "There is no deadline pressure. We want to ensure that everything is in place before the services resume," said Captain Ajay Chauhan, director of civil aviation, Gujarat.

GOVERNMENT RELAXED NORMS INVITE FRESH BIDS. Under UDAN 5.4, the government invited fresh bids for routes that were cancelled for some reason or the other, to provide connectivity on unserved routes. The Minister of Civil Aviation also announced that the demonstration flights of the seaplane by manufacturer De Havilland would be held shortly, giving a new lease of life to seaplane operations in the country.

As per the new norms:

- non-scheduled entities would be allowed to operate such services and with a simplified certificate process.
- there will be no need for a waterdrome license and compliance requirements have also been reduced.
- fresh Commercial Pilot License (CPL) holders can now directly obtain seaplane ratings that will allow them to fly seaplanes.

The adoption of Non-Scheduled Operator Permit (NSOP) framework for seaplanes was considered as a significant step forward in the Government's commitment to enhancing regional connectivity. Earlier in June, the DGCA revised norms to streamline infrastructure procedures, pilot training requirements, and regulatory compliances, paving the way for seaplane services to reach remote areas. The revised regulations incorporated easier training requirements and simplified processes for seaplane operations.

The government released these guidelines not only integrate seaplane operations into India's aviation landscape for transportation but also create jobs and foster economic empowerment, making seaplanes a symbol of the country's growth, innovation, and commitment to inclusive development.

The government had an ambitious vision to set up water aerodromes at 18 places spread across Andaman & Nicobar, Lakshadweep, Goa, Assam, Andhra Pradesh and Himachal Pradesh.

And just like that the date was set for trial run. The trial run of the first ever seaplane service in the Andhra Pradesh was to be

Seaplane demo flight in Meghalaya

conducted as Chief Minister N. Chandrababu Naidu was keen on starting the service immediately and necessary permissions from the Centre have been cleared.

THE MAGICAL SEAPLANE DAYS. Among potential seaplane sites, the Airports Authority of India (AAI) identified the Prakasam Barrage as a prime location along with eight other scenic destinations for potential service routes, including Araku, Lambasingi, Rushikonda, Kakinada, Konaseema, Srisailam, and Tirupati. These sites were chosen for their cultural significance and natural beauty with the hope to enhance travel experiences and boost the influx of domestic and international tourist.

The seaplane made its inaugural journey from the Prakasam Barrage in Vijayawada, landing safely in the waters of the reservoir before proceeding to the Srisailam Tourism Boating Team.

The adoption of Non-Scheduled Operator Permit (NSOP) framework and reduced infrastructure requirements have made seaplane operations more feasible, paving the way for India to explore 60-100 seaplane routes over the next five years

The trial run was overseen by a team of officials, including representatives from the National Disaster Response Force (NDRF), Police, Tourism Department, and the Air Force, ensuring all safety measures were in place.

A Day after the after the successful trial run, Andhra Pradesh CM, N. Chandrababu Naidu launched a demonstration flight of a seaplane service. The Chief Minister along with Union Civil Aviation Minister K. Ram Mohan Naidu and Yogesh Garg of De Havilland, Ajay Singh and Avani Singh of SpiceJet along with other officials' journey were onboard the first seaplane to the temple town of Srisailam.

Speaking during the launch, CM Naidu emphasised that the introduction of seaplane services would be an innovative opportunity to promote economic activities to create employment. He further went on to highlight that Prime Minister Narendra Modi also came forward to promote seaplane operations in the southern state, which does not require the expensive infrastructure needed for a regular airport. With this launch, MoCA Naidu said that a new chapter is being opened in Andhra Pradesh, adding that seaplane operations will not only change the future of the state but also India.

The Andhra Pradesh government intends to position the state as a leader in India's water-based aviation industry by launching seaplane services. Thus began the seaplane week in India. One of the names orchestrating this complete module was the Regional Vice President, Sales, Asia-Pacific and Middle East at De Havilland Aircraft of Canada, Yogesh Garg. He hopped from one destination to other the entire week ensuring smooth operations. Sharing his feeling of profound pride after the first take-off Garg said: "Seeing the dignitaries experience the seaplane firsthand was a proud moment, and a powerful reminder of how this initiative can open new doors for development, tourism, and connectivity to Srisailam's heritage."

PHOTOGRAPH: Yogesh Garg, De Havilland Of Canada

Twin Otter Demo launch in Lakshadweep

If you go by road, the journey from Prakasam Barrage to Srisailam Barrage takes eight hours but a seaplane will help you reach your destination in 45 to 50 minutes, that's the magic of seaplanes and remote connectivity.

The second demo flight was conducted in Kerala on November 11, 2024 from Kochi Marina to Madupetty Dam, soaring up to reach one of Kerala's highest and most scenic dams at 5,600 feet. It takes around three hours from the Cochin International Airport and 3.5 hours from the Ernakulam railway station to reach Munnar by road. Once the seaplane is in operation, the travel time of over four hours will be down to 25 short and hassle-free minutes.

The third demo flight took off on November 12, 2024 from Agatti in Lakshadweep to Minicoy Island, the journey that currently takes an entire day, was shortened to just one hour with a seaplane! The Twin Otter's unique capability to operate in challenging weather conditions signalled a new era of seamless connectivity and accessibility for these islands.

Recent trial runs for seaplane services in Andhra Pradesh, Kerala, Lakshadweep, and Meghalaya highlighted the potential for drastically reduced travel times and enhanced connectivity to remote and scenic destinations

A demo of the seaplane was launched from the beautiful Umiam lake on November 11, 2024. For a seaplane to land and take-off it takes 200 metres of water body and five metres of depth and with the terrain and landscape of Meghalaya this will be conducive as water bodies can be created as there is plenty of rainfall. Plus, it would be extremely cost-effective as it would take around ` 15 lakh to build a dam for landing rather than building a runway for an airport.

From Meghalaya the demo flights continued to explore other unchartered waters in North East like the majestic Brahmaputra River in Guwahati, cutting down the travel time from Shillong to Guwahati Airport to just 15 minutes. The final demo flight was conducted at the picturesque Andaman and Nicobar Islands promising gorgeous views, faster travel, and better connectivity to hard-to-reach places in the Islands.

Just as the demo flights concluded, Flybig announced their plans to start the first-ever seaplane services in the Islands by deploying De Havilland's Twin Otter. Apart from the planned routes Flybig plans to add more routes and destinations within the Andamans to its future roster.

SPICEJET'S AMBITIOUS PLANS TO TAP THE UNCHARTED WATERS. Apart from Flybig, SpiceJet has partnered with De Havilland to launch seaplane operations in 2025 connecting India's most remote locations. The airline will provide essential engineering, technical, and logistical assistance for these services. The 20 routes on which seaplane operations will be launched include Lakshadweep, Hyderabad, Guwahati, and Shillong.

Explaining the potential of seaplanes to revolutionise regional connectivity in India, Ajay Singh, Chairman and Managing Director, SpiceJet said: "Seaplanes could make remote and beautiful parts of India more accessible, helping to bridge gaps in infrastructure and transportation."

PHOTOGRAPH: Yogesh Garg, De Havilland Of Canada

SpiceJet Plans to use Seaplanes to make remote parts of India more accessible, helping to bridge gaps in infrastructure and transportation

Sharing her excitement about the seaplane project, Avani Singh, the Chief Executive of Spice Shuttle, SpiceJet's seaplane division said: "SpiceJet's goal in regional connectivity has been to make air travel affordable and accessible to everyone, no matter how remote their location."

Singh believes that seaplanes are a gamechanger for India geographic diversity—such as coastlines, rivers, and islands—can make building traditional infrastructure difficult. Seaplanes can overcome these challenges by connecting coastal areas, islands, and remote inland regions, bringing the benefits of air travel to these previously hard-to-reach destinations. The airline plans to officially launch its new seaplane services in 2025.

WHY IS SEAPLANE A FEASIBLE ALTERNATIVE TO COMMERCIAL AIR TRAVEL & HELICOPTERS?. The seaplanes have come at a time when tourism players have been stressing the need to reduce travel time and Indian aviation market is at its all-time peak. However, unlike traditional airports, water aerodromes require limited infrastructure and construction time, making them efficient and cost-effective solutions for regional connectivity. The government aims to finalise passenger fares following a feasibility study, with full service expected to launch within three months. This venture is structured as a Public-Private Partnership (PPP) to maintain affordability for travellers.

Apart from the time and money saving option for passengers, seaplane operations will give socio-economic boost to the entire region while promoting the tourism industry of the country. Seaplane services are expected to create jobs within aviation and related sectors, driving industrial growth and strengthening the state economy. By drawing more passenger traffic and broadening tourism's footprint, the initiative has the potential to spur local development.

Some of the most obvious advantages of Seaplanes are a significant reduction in travel time and travel cost to remote locations. No motion-sickness due to long and arduous ferry rides. Plus, an added advantage of robust aircraft performance even in rough waters and adverse weather, ensuring reliable operations year-round.

THE FORECAST FOR SEAPLANE OPS AND FUTURE OF TWIN-OTTER IN INDIA. Just as the seaplane demo concluded earlier this month, Yogesh Garg of De Havilland goes on to predict significant growth potential for its DHC-6 Twin Otter aircraft in India. "We expect to see at least 8-10 seaplanes deployed within the next 8-12 months," Garg said.

The plane costs nearly `60 crore per unit. However, it is expected to be deployed under the leasing model. De Havilland's forecasts a requirement of at least 30-40 seaplanes in India over the next five years and expected to increase to about 60-70 aircraft over the next decade. He also forecasted the creation of 60-100 seaplane routes over the next five years, leading to the development of nearly 30 waterdromes signalling a strong future of seaplane connectivity in India. Currently, there are around 30 seaplane routes in India under the central government's air regional connectivity Udan scheme.

Seaplane operations are paving the way for a new era of regional connectivity that is innovative, efficient, and sustainable. All-in-all, a seaplane solution can truly transform lives in India by improving connectivity, boosting tourism, and fostering economic development opening new horizons for remote, uncharted waters. SP

PHOTOGRAPH: Spice Shuttle

SpiceJet has resolved a significant dispute with Canadian aircraft manufacturer Bombardier through a $90 million settlement, ending a prolonged legal battle over Q400 turboprop planes

SPICEJET'S $90 MILLION DEAL WITH CANADIAN Q400 PLANES

SpiceJet has successfully resolved a significant dispute with Bombardier over a fleet of Q400 turboprop planes in the form of a $90 million settlement, marking the end of a prolonged legal battle that also has broader implications for the Indian aviation sector

BY **MANISH KUMAR JHA**

SPICEJET, INDIA'S PROMINENT LOW-COST airline, has successfully resolved a significant dispute with Canadian aircraft manufacturer Bombardier over a fleet of Q400 turboprop planes. The resolution comes in the form of a $90 million settlement, marking the end of a prolonged legal battle and financial tension between the two parties. This deal is particularly notable because it involves the acquisition of 13 Q400 aircraft, a key component of SpiceJet's regional flight network.

According to the airline, the settlement will save SpiceJet $68.3 million in operational costs. On the final settlement and after the prolonged resolution, SpiceJet Managing Director Ajay Singh called the settlement a "major financial milestone". He said the resolution would allow SpiceJet to move forward with a strengthened balance sheet and focus on the Q400 aircraft back into service as quickly as possible.

BACKGROUND OF THE DISPUTE. The roots of the dispute date back to a 2017 agreement between SpiceJet and Bombardier. Under the terms of this agreement, SpiceJet placed an order for up to 50 Q400 turboprop aircraft, with the intention of expanding its regional operations across India. The Q400 aircraft, known for their fuel efficiency and ability to operate in smaller, regional airports, were seen as a perfect fit for the airline's expansion plans.

PHOTOGRAPHS: Bombardier

The Q400 planes are central to SpiceJet's strategy of strengthening connectivity between India's underserved tier-2 and tier-3 cities, leveraging their fuel efficiency and suitability for regional airports

However, the deal quickly ran into complications. SpiceJet faced challenges related to delivery delays, technical issues with some of the aircraft, and concerns over the terms of the purchase agreement. These issues led to the airline and the manufacturer entering a prolonged dispute over the contract, with SpiceJet questioning the quality and the terms surrounding the fleet of Q400s. At one point, the airline sought to cancel or renegotiate the terms, citing the failures and non-compliance with certain delivery schedules.

THE LEGAL BATTLE. As the dispute escalated, it eventually ended up in the courts, with both parties seeking legal recourse to protect their interests. SpiceJet accused Bombardier of failing to deliver the aircraft as agreed upon, while Bombardier, on the other hand, sought to enforce the contract and hold SpiceJet to its financial obligations.

The case drew significant attention, not only because of the high stakes involved but also due to the broader implications it had for the aviation industry. SpiceJet, one of the largest low-cost carriers in India, relied heavily on its fleet of regional aircraft to service a rapidly growing domestic market, while Bombardier's Q400 aircraft were a key part of its strategy to maintain a competitive edge in the regional turboprop market.

THE $90 MILLION SETTLEMENT. After several years of back-and-forth legal wrangling, the dispute was finally resolved with a $90 million settlement. Under the terms of the agreement, SpiceJet agreed to acquire 13 Q400 aircraft from Bombardier, while the manufacturer agreed to settle outstanding claims and provide certain concessions regarding aircraft delivery and performance.

The settlement represents a significant victory for both parties, albeit in different ways. SpiceJet successfully avoided the financial and operational burden of a prolonged legal battle, while securing the 13 aircraft that are critical for its expanding regional network. On the other hand, Bombardier, which has since sold its regional aircraft business to Longview Aviation Capital in 2019, was able to resolve the dispute and close the chapter on this contentious deal.

STRATEGIC IMPORTANCE FOR SPICEJET. For SpiceJet, the acquisition of the 13 Q400 planes is a critical component of its strategy to further strengthen its position in the Indian avia-

"The resolution would allow SpiceJet to move forward with a strengthened balance sheet and focus on the Q400 aircraft back into service as quickly as possible" — Ajay Singh, Managing Director, Spicejet

The settlement enables SpiceJet to acquire 13 Q400 aircraft, critical for its regional flight network, while saving $68.3 million in operational costs

tion market. India's regional aviation market has been experiencing significant growth in recent years, driven by increasing air travel demand, government support for regional connectivity, and the rising popularity of smaller, more affordable aircraft for shorter routes.

The Q400 planes, known for their ability to operate on short regional routes with limited infrastructure, fit seamlessly into SpiceJet's plans to service underserved and smaller airports across India. The airline has made a concerted effort to improve connectivity between tier-2 and tier-3 cities, and the Q400 aircraft will play an important role in meeting this growing demand.

IMPLICATIONS FOR THE INDIAN AVIATION SECTOR. This deal and its resolution also have broader implications for the Indian aviation sector. India's aviation industry has experienced significant growth in the past 10 years. India is the third-largest domestic aviation market and the aviation sector in India has shown substantial growth, with a 15 per cent increase annually. In total, air passengers handled at Indian airports reached 37.6 crore in FY24. The number of operational airports in the country has doubled from 74 in 2014 to 157 in 2024 and the aim is to increase this number to 350-400 by 2047. Domestic air passengers have more than doubled in the past decade, with Indian airlines significantly expanding their fleets.

The government's policies and initiatives in such line have prioritised the sector which was under the scanner for the massive potential and scope for connectivity. One such initiative is the Regional Connectivity Scheme – Ude Desh ka Aam Nagrik (RCS-UDAN) launched in 2016, which aims to provide connectivity to unserved and underserved airports of the country through the revival of the existing airstrips and airports.

The Indian government has heavily invested in improving regional air connectivity through the UDAN scheme, which aims to make air travel affordable and accessible to a wider population. The settlement and the aircraft acquisition align with these goals by enabling SpiceJet to offer more services to underserved regions, stimulating regional economic growth, and providing more affordable travel options.

So far, under the scheme, 83 RCS routes have commenced operations connecting 86 airports including 13 heliports & 2 water aerodromes. According to the Ministry of Civil Aviation (MoCA), more than 1.43 crore passengers have availed of the benefits of the scheme and more than 2.8 lakh flights have operated under the UDAN scheme so far. Under the scheme, ` 4,500 crores have been allocated for the development of airports in the country under the Scheme, out of which ` 3,751 crores have been utilised since its inception.

Additionally, the settlement signals a broader trend in the aviation industry, the increasing importance of regional fleets to airlines that are looking to expand their domestic networks without incurring the massive costs of larger jets. For Bombardier, the successful resolution of the dispute ensures it can maintain its foothold in the regional aircraft market, especially as the global aviation landscape continues to evolve.

The resolution of SpiceJet's dispute with Bombardier over the 13 Q400 aircraft is a significant moment for both the airline and the broader aviation industry. The $90 million settlement brings closure to a contentious legal battle and sets the stage for SpiceJet to enhance its regional network in India. This deal not only benefits SpiceJet's growth ambitions but also underscores the importance of regional aircraft in the ever-expanding aviation sector in India. As SpiceJet moves forward with its fleet expansion, it remains to be seen how the airline will continue to shape the future of air travel in India, particularly in terms of regional connectivity and service expansion. SP

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AVIATION SAFETY IMPROVES

Enhanced safety measures have restored passenger confidence, assuring travellers that their well-being is the top priority. Airlines are now required to maintain meticulous logs of maintenance activities, subject to regular audits, significantly reducing the likelihood of technical malfunctions during flights.

INDIA'S AVIATION SECTOR HAS experienced an unparalleled transformation in safety standards, evidenced by the Directorate General of Civil Aviation's (DGCA) Annual Safety Review for 2023. This comprehensive report underscores the profound progress made through meticulous reforms, regulatory diligence, and enhanced enforcement mechanisms. The country's dedication to aviation safety not only ensures secure skies for passengers but also elevates its standing on the global aviation stage.

A hallmark of DGCA's efforts has been its intensified oversight activities. In 2023, the DGCA conducted a record 5,745 surveillance activities, a 26 per cent increase from 2022. These efforts spanned planned inspections, spot checks, night surveillance, and targeted risk-based audits. This proactive approach ensured that even minor discrepancies were promptly addressed.

The regulator's enforcement actions reflected this rigour, with 542 violations penalised—a significant jump from 305 in 2022. These actions ranged from financial penalties to suspensions of operations, showcasing a zero-tolerance approach to non-compliance. One notable case involved the suspension of Air India's Approved Training Organisation due to lapses in operational standards.

Additionally, major airlines faced penalties for safety violations. Air India was fined ₹1.1 crore for operating Boeing B777 aircraft without adhering to oxygen requirements on specific routes. The airline also incurred a ₹30 lakh fine for deploying inadequately qualified pilots for low-visibility operations. IndiGo and SpiceJet, among others, were similarly penalized for lapses in adherence to safety protocols. These measures signal a resolute commitment to upholding passenger safety.

India's efforts are being recognized globally. The International Civil Aviation Organization (ICAO) audits reflect this progress, with India's Effective Implementation (EI) score rising to 85.49 per cent in 2022 from 69.95 per cent in earlier assessments. This achievement is the result of focused reforms in critical safety areas, including air navigation services, incident investigations, and aircraft maintenance protocols. Such advancements ensure that India aligns with and often exceeds global safety benchmarks.

The transformation in India's aviation safety landscape is deeply rooted in policy reforms spearheaded by the Ministry of Civil Aviation and the DGCA. Regular updates to Civil Aviation Requirements (CARs) have ensured that regulations remain adaptive to technological advancements and evolving challenges. Incident reporting has become a cornerstone of the DGCA's strategy. Every reported incident, irrespective of severity, undergoes thorough investigation, and findings are subject to stringent review. Airlines are held accountable through mandatory corrective actions, creating a culture of transparency and responsibility.

Recognising the pivotal role of technology, the DGCA has modernised aviation infrastructure with advanced radar systems, automated air traffic management tools, and robust communication networks. These innovations significantly mitigate risks associated with human error and enhance operational efficiency. Parallelly, investments in human resources have been prioritised. Safety inspectors and air traffic controllers undergo rigorous training programs to equip them with the skills needed to manage India's growing aviation traffic. By aligning human expertise with technological support, the DGCA has created a resilient safety framework.

India's rise in aviation safety rankings has been supported by strategic collaborations with international aviation bodies like ICAO and the International Air Transport Association (IATA). Regular audits under ICAO's Universal Safety Oversight Audit Programme (USOAP) have identified gaps and facilitated improvements. Such partnerships have fostered knowledge-sharing, enabling India to implement global best practices. The country's achievements have positioned it as a proactive participant in global aviation safety dialogues, setting an example for emerging aviation markets.

Despite its progress, challenges remain. India's aviation sector is one of the fastest-growing globally, with domestic traffic expanding by double digits annually. This growth exerts immense pressure on infrastructure and regulatory capacity. Ensuring adequate staffing levels, upgrading technology to meet rising demands, and maintaining a balance between expansion and safety will be crucial. These challenges necessitate continuous vigilance and adaptability as India seeks to further strengthen its global standing.

The Annual Safety Review 2023 not only highlights past achievements but also provides a roadmap for future advancements. Finally, with sustained investment in technology, training, and global collaboration, India is poised to lead by example, ensuring that aviation safety remains at the core of its rapidly expanding air transport sector. This commitment to excellence guarantees safer skies, reinforcing India's position as a leader in global aviation safety. SP

— ROHIT GOEL

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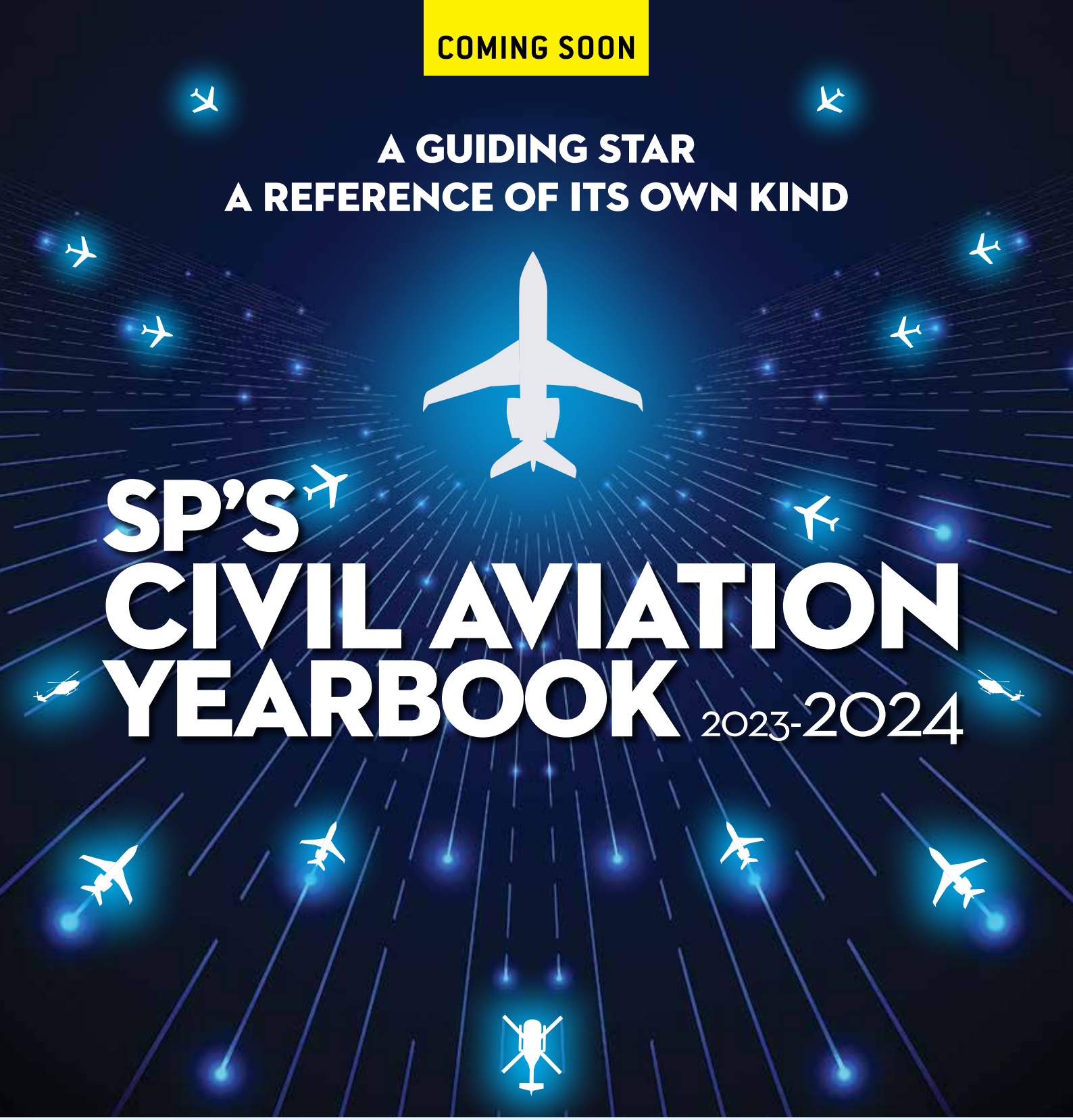

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