U.S. - India Aviation Cooperation Program

Shared Horizons

U.S. – India Aviation Cooperation Program: "Uddein Saath Saath - Together We Fly"

INSIDE

Message from the Chairman

Sundresh Sarup
ACP Chairman &
Managing Director, Logistics Plus India

On the eve of U.S. – India Aviation Summit at Washington D.C. we are pleased to present to you this special Bi-annual issue of "Shared Horizons" volume 23.

ACP continued its efforts in past months by engaging with all stakeholders in the Indian Civil Aviation Space. Few of the highlights of activities undertaken are as below:

- ACP's participation at Wings India 2024 at Hyderabad
- Members roundtable with visiting FAA leadership at New Delhi
- Members roundtable & Welcome reception in honor of Secretary, MoCA at New Delhi
- Farewell reception in honour of Secretary, MoCA New Delhi
- ACP Members roundtable with Ministry of Civil Aviation on "Shared Best Practices for Future Needs" at New Delhi

We are excited to welcome the new members to the ACP, Hi-Tech IEC, AAR Corp. & Safe – Passage International.

In this 17th year of the US – India Aviation Cooperation, we seek to expand our efforts in line with needs of India's civil aviation. You can be assured that we will continue to approach these efforts with determination, tenacity, innovation, and passion.

I look forward to see you all at The U.S. – India Aviation Summit and to further strengthening the relationship between the U.S. and India.

(Sundresh Sarup)

ACP in Partnership with

नागर विमानन मंत्रालय
MINISTRY OF CIVIL AVIATION
सत्यमेव जयते

Directorate General of Civil Aviation

भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

BUREAU OF CIVIL AVIATION SECURITY
सत्यमेव जयते

ACP Ongoing Projects

→ Airport Emergency and Operations Management Pilot Project and Feasibility Study

ACP Past Successes

→ Business Case for GAGAN Extension

→ GBAS Pilot project at Chennai Airport

→ Aviation Safety Technical Assistance Phase – II

→ Aviation Security Equipment Testing & Evaluation Program (ASETEP)

→ Airport Geographic Information System (AGIS) for Indian Airport

→ Technical Training for Aerospace Industry

→ ProVision Body Scanner System Pilot Project

→ Technical, Management, and Operational Development Training (TMODT) Phase – II

→ Aviation Safety Technical Assistance Phase – I

→ Total Airspace and Airport Modeler (TAAM)

→ Technical, Management, and Operational Development Training (TMODT) Phase – I

→ AAI Air Traffic Control Officers (ATCO) Manpower Assessment

→ Helicopter Aviation Safety Technical Assistance

→ Aviation Standard Technical Training

→ CNS/ATM Modernization Roadmap

→ Sustainability Master plan for Kolkata and Lucknow Airports

→ Executive Development Training Program (EDTP) – 1

→ Executive Development Training Program (EDTP) - 2

MISSION

→ The U.S.-India Aviation Cooperation Program (ACP) was established in 2007 as a public-private partnership between the U.S. Federal Aviation Administration (FAA), the U.S. Trade and Development Agency (USTDA), the U.S. Departments of Commerce and State, Transportation Security Administration and U.S. Companies.

→ The ACP supports the growth of the Indian civil aerospace sector by working directly with the Government of India (GOI) to identify and execute projects that encourage collaborations between US and Indian stakeholders, in the area of aerospace technology and best practices.

Objective & Priorities

OBJECTIVE

- ✈ Promote greater engagement between US and Indian Government agencies and industry to enhance civil aviation in India.

- ✈ Undertake projects that advance Cooperation in domains such as aviation safety, security, regulatory oversight and management.

- ✈ Provide training and technical assistance to accelerate excellence in aviation operations.

- ✈ Within India, increase awareness of, and facilitate access to, US expertise, technology and best practices to assist India's aviation growth.

PRIORITIES

- ✈ **Confident Travel**

  a. Cooperate on scientific studies and data driven approaches to restore confidence in the flying public

  b. Undertake projects to advance cooperation and joint development of technology to make aviation travel safety

- ✈ **Foster and continue to develop stronger government to government ties**

  a. System Safety Approach: Promote risk-based data-driven decision making that is built on Safety Management System (SMS) principles to proactively address emerging safety risk by using data to make safer and smarter decisions

  b. Continued engagement to improve airport operations, safety, capacity, and innovation and foster growth and safe integration of Unmanned Aircraft Systems operations in the present airspace ecosystem

- ✈ **Aviation in India's National Logistics Policy**

  a. Provide US expertise and technology to help modernize and improve efficiency of India aviation supply chains

  b. Foster interactions and partnership between U.S.-India aviation cargo industries

- ✈ **Aviation Maintenance Repair and Overhaul (MRO)**

  a. Explore opportunities for industry to partner on India's vision to develop an MRO hub

  b. Industry-led MRO training to meet expected new demand following national policy changes

- ✈ **Aviation Training**

  a. Foster partnership between U.S. industry and Indian pilot training organizations

  b. Provide industry-led cooperation to accelerate excellence in airline operations and management

- ✈ **Aviation Security**

  a. Undertake projects that investigate use of digital technology and analytics to make airport passenger and cargo flows more efficient, touchless screening and security by evaluating and validating the performance of checkpoint CTs, security scanners, and ASLs

  b. Facilitate implementation of seamless process for security access/clearances to aviation facilities for technical experts, pilots & engineers to promote technical cooperation and interaction

- ✈ **Airspace Optimization**

  a. Continue cooperation on Communication, Navigation and Surveillance/Air Traffic Management (CNS/ATM) modernization building on developed roadmap

  b. Foster US-India government and industry interactions on Unmanned Traffic Management (UTM) implementation in India and explore inclusion in overall CNS/ATM roadmap

  c. Safe airspace integration, framework and policy for regulatory capacity building on UTM

- ✈ **Sustainability**

  a. Foster U.S.-India government and industry cooperation in furtherance of national and international aviation sustainability and climate goals including implementation of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

  b. Facilitate cooperation, joint development and certification of airplane technology

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ACP Milestones

2024

- U.S. – India Aviation Summit, June 24-26, 2024 at Washington D.C.
- ACP's participation at Wings India 2024 from January 18-21, 2024 at Hyderabad
- ACP Members roundtable with visiting FAA leadership on January 15, 2024 at Hotel – The Leela Palace, New Delhi

2023

- ACP Members roundtable & Welcome reception in honor of Secretary, MoCA on October 23, 2023 at New Delhi
- ACP's Farewell reception in honor of Secretary, MoCA on October 23, 2023 at New Delhi
- ACP Members roundtable with Ministry of Civil Aviation on "Shared Best Practices for Future Needs" on July 24, 2023 at New Delhi
- ACP Members roundtable with Ms. Enoh T. Ebong, Director – USTDA & Mr. Rajiv Bansal, Secretary, MoCA on January 18, 2023 at New Delhi

2022

- ACP's roundtable meeting with P&W leadership on October 21, 2022 at New Delhi.
- 2nd phase of EDTP from August 14 – 19, 2022 in Washington D.C.
- ACP Members roundtable with Ministry of Civil Aviation followed by EDTP's closing reception on July 23, 2022 at New Delhi.
- ACP's Executive Development Training Program (EDTP) opening ceremony on July 18, 2022 at New Delhi.
- ACP's Farewell reception in Honor of Mr. Philip Matt Ingeneri, ACP Co-chair (Government) & Economic Growth Unit Chief, EEST – DOS on May 19, 2022 at New Delhi.
- ACP Members roundtable meeting with Minister Scindia and Secretary Bansal, Ministry of Civil Aviation (MoCA) on 25th March 2022 during Wings India 2022 at Hyderabad.
- ACP Members meeting with GMR Leadership on March 24, 2022 at Hyderabad.
- ACP Members' participation at Wings India 2022, Hyderabad.
- ACP Members roundtable with Chris Carter, Director – FAA on March 22, 2022 at New Delhi.
- ACP's webinar "Global Crisis – Devastating New Impacts on Aviation" on March 10, 2022.
- ACP leadership's introductory meeting with Secretary Rajiv Bansal, MOCA on March 7, 2022 at New Delhi.

- ACP Members' meet and greet with Honeywell India's New President, Mr. Rajesh Rege on February 23, 2022 at Gurugram.

2021

- ACP's lunch in honor of Ex. Secretary MOCA, Pradeep Singh Kharola with a unique memento on November 24, 2021 at New Delhi
- ACP Members luncheon with Dr. Shefali Juneja, Chairperson of ICAO's Aviation Security Committee on November 18, 2021 at New Delhi
- ACP's webinar with MOCA; FAA & TSA on "Unmanned Aircraft System (UAS)/Unmanned Traffic Management (UTM)" on August 24, 2021
- USTDA-ACP Virtual Seminar on "Conversations on Sustainable Aviation and Climate Resiliency" on August 17-18, 2021
- Virtual Roundtable with Yamuna Expressway Industrial Development Authority / Noida International Airport Limited & ACP Member Companies
- ACP's webinar with AAI on "Water Resources Engineering & Waste Management"
- Boeing/USC's SMS Training Program with IAA
- ACP Members' own Society "US-India Aviation Cooperation Program" formed and received Certificate of Registration from Registrar of Societies
- ACP's webinar on "Future of Travel & Work Post COVID-19"
- ACP's participation at Aero India 2021 at Bengaluru

2020

- ACP-MOCA's open discussion on Aviation in US & India, post COVID scenario and exchange of New Year Greetings
- ACP-MOCA's interactions on "Ease of Doing Business – Airport Access"
- ACP's webinar with IAA "Navigating through COVID Clouds to Safer Cruising Heights"
- ACP's webinar "Restoring Confidence in Air Travel"
- ACP's participation at Wings India 2020 at Hyderabad

2019

- ACP' Year-End Get-Together at New Delhi
- ACP's annual "Innovation in Aviation" workshop 2019 at Hotel – The Oberoi, New Delhi
- ACP Members roundtable with Mr. Thomas R. Hardy, Director (Acting), USTDA & Mr. Pradeep Singh Kharola, Secretary, Ministry of Civil Aviation at New Delhi

- U.S.- India ACP India RTM - Air Navigation Services, July 28 – August 3, 2019 at USA
- ACP Members Meeting with Dr. Guruprasad Mohapatra, Chairman-AAI at New Delhi
- ACP's participation at MOCAs' roundtable discussion on Skills Development at New Delhi
- U.S.- India ACP Aviation RTM - Airport Development, March 24-30, 2019 at USA
- ACP's participation at Aero India 2019, Bengaluru
- ACP's participation at MOCA's 2019 Global Aviation Summit, Mumbai

2018

- Webinar on update of MOCA's Global Aviation Summit 2019 at New Delhi
- Grant agreement signed for CNS/Airspace with AAI
- Grant agreement signed for AAAE/IAAE with IAA & GMRAA to provide Training, Accreditation Programs
- ACP's "Innovation in Aviation" workshop with Ministry of Civil Aviation at New Delhi
- Grant agreement signed for Executive Development Training Program (EDTP) with RGNAU at New Delhi
- RGNAU's Eminent Speaker Series with Mr. Mark Searle, University of California Berkeley at New Delhi
- ACP's Eminent speakers series with Hugo Yon, U.S. Department of State (DoS) & Kristen Davis, U.S. Department of Transportation (DoT)
- ACP Members roundtable with GoI & USG officials during US – India Aviation Summit at Mumbai
- 2018 U.S. – India Aviation Summit at Mumbai
- Announcement of MoU between ACP-MOCA on specialized aviation training at Wings India 2018, Hyderabad

2017

- Celebration of ACP's "10 years Anniversary Partnership" at New Delhi
- Celebration of "ACP Diwali Nite" at New Delhi
- Grant agreement signed for Sustainability Master plan of Kolkata and Lucknow Airports
- ACP's "Innovation in Aviation" workshop with Ministry of Civil Aviation at New Delhi
- Aviation Institute of Maintenance's "The Award Dinner" in partnership with ACP at New Delhi
- Airport construction codes + specifications and 777x Airport compatibility workshop with DGCA
- ACP Members meeting with Enoh T. Ebong, Acting Director-USTDA at New Delhi
- Creation of Sub-committee on Aviation and Aerospace Skills Development
- Eminent Speaker Series - Blockchain Technology & its effect on the Aviation Industry
- ACP's participation at Aero India 2017, Bengaluru
- ACP & RGNAU partnership to bring the first Executive Development Program (EDP) for Aviation in India

2016

- Memorandum of Understanding Signing: ACP & Rajiv Gandhi National Aviation University (RGNAU)
- Celebration of "ACP Diwali Nite" at New Delhi
- System Wide Information Management (SWIM) workshop with AAI
- Grant agreement signed for GAGAN Extension Business Case
- Memorandum of Cooperation (MOC) Signing: ACP & National Skill Development Corporation (NSDC)
- ACP roundtable meeting in honour of Lee Zak, Director-USTDA & Sr. USG officials visiting India for US-India Strategic and Commercial Dialogue at New Delhi
- ACP farewell reception in honour of CJ Collins, ACP Co-chair (Government) & Sr. Representative to South Asia, FAA at New Delhi
- ACP Members meeting with Manish Kumar, MD & CEO, NSDC at New Delhi
- ACP Project workshop with Ministry of Civil Aviation at New Delhi
- ACP reception in honour of India Aviation 2016 participants at Hyderabad
- Memorandum of Cooperation (MOC) Signing: ACP & Bhogapuram International Airport Company Ltd., (BIACL)
- ACP Members roundtable meeting with Ministry of Civil Aviation (MOCA) during India Aviation 2016 at Hyderabad
- Grant agreement signed for Aviation Safety Technical Assistance Phase – II

2015

- ACP's Yearend social get-together at New Delhi
- ACP Members meeting with Lee Zak, Director-USTDA during 2015 US – India Aviation Summit at Bengaluru
- 2015 U.S. - India Aviation Summit at Bengaluru
- Workshop on Next Generation Surveillance and Safety using ADS-B Technology at New Delhi

- Grant agreement signed for ProVision Body Scanner System Pilot Project
- ACP Members meeting with USTDA's Global Procurement Initiative (GPI) team at New Delhi
- ACP Members luncheon with Secretary Anthony Foxx, DoT with Delegation at New Delhi
- ACP Members meeting with Hon'ble Minister of Civil Aviation & Hon'ble Chief Minister of Andhra Pradesh at Aero India 2015, Bengaluru
- ACP Members luncheon with Lee Zak, Director-USTDA at New Delhi

2014

- ACP's participation at India – US Technology Summit at Greater Noida
- Honeywell's Udaan' 14 in partnership with ACP on " Propelling India Aviation Growth" at New Delhi
- Grant agreements signed for Aviation Security Equipment Testing & Evaluation Program (ASETEP) & Aviation Safety Technical Assistance Phase – I
- ACP Members roundtable with Ministry of Civil Aviation at New Delhi
- ACP Members meeting with Arun M. Kumar, DG- FCS at New Delhi
- Farewell reception in honour of Margaret Hanson-Muse, Deputy Sr. Commercial officer at New Delhi
- ACP reception in honour of India Aviation 2014 participants at Hyderabad
- Grant agreements signed for Performance Based Navigation (PBN), Technical, Management, and Operational Development Training (TMODT) Phase – II and Airport Geographic Information System (AGIS) for Indian Airport

2013

- U.S. - India Aviation Summit at Washington D.C.
- ACP Members meeting with Lee Zak, Director – USTDA at New Delhi
- Workshop on U.S. - India Aviation Security at New Delhi
- Seminar on General Aviation: The Next Steps at New Delhi
- Seminar on Bilateral Aviation Safety Agreement (BASA) regime at New Delhi

2012

- Honeywell's Udaan' 12 in partnership with ACP on " Indian Air Traffic Modernization & Airspace Decongestion" at New Delhi

- Grant agreement signed for Total Airspace and Airport Modeler (TAAM) at New Delhi
- ACP's participation at India Aviation 2012, Hyderabad

2011

- U.S. - India Aviation Summit at New Delhi
- Grant agreements signed for Technical, Management, and Operational Development Training (TMODT) Phase – I & launching GBAS at Chennai Airport
- Seminar on Airport Economic Reforms – Moving Ahead with Chairman AERA at New Delhi
- Indo – US Aviation Manufacturers Meet at New Delhi

2010

- Conference on Civil Aviation: Creating Sustainable Growth at New Delhi
- Grant agreement signed for Helicopter Safety Technical Assistance
- ACP's Roundtable Discussion on Airport Regulatory & Financing Best Practices
- ACP's participation at India Aviation 2010, Hyderabad
- Seminar on Automatic Dependent Surveillance – Broadcast (ADS–B) & Ground Based Augmentation System (GBAS)

2009

- U.S. - India Aviation Partnership Summit at Washington D.C.
- Grant agreement signed for Aviation Standard Technical Training
- Farewell reception in honour of R.K. Singh, Joint Secretary – MOCA at New Delhi

2008

- FAA conducts Air Traffic Management Training Program (ATMTP)
- Seminar on Indo – US Aviation Cooperation – Growth of Civil Aviation in   India at New Delhi
- AAI Air Traffic Control Officers (ATCO) Manpower Assessment Study
- Seminar on Air Traffic Flow Management (ATFM)

2007

- U.S. - India Aviation Partnership Summit at New Delhi
- U.S. - India ACP Inaugural Session: ACP Formed
- MoU between: U.S. Department of Transportation, U.S. Trade & Development Agency and Ministry of Civil Aviation

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U.S. Department of Commerce
U.S. Embassy New Delhi, India

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India's Airport Infrastructure Development using Technology and with focus on Sustainability

By Dr. Sharad Kumar, Member (Operations) & In-Charge Member (Planning), Airports Authority of India

Introduction:

As the lifeblood of national and international connectivity, airport infrastructure plays a pivotal role in a country's economic and social fabric. In India, this importance is magnified by the nation's rapid ascension as one of the world's largest aviation markets, driven by a burgeoning middle class and increasing air travel demand. Amidst this growth, the Airports Authority of India (AAI) is spearheading an ambitious transformation of the country's airport infrastructure, underpinned by cutting-edge technology, a steadfast commitment to environmental sustainability, and an unwavering focus on enhancing customer experience.

Technology is at the forefront of this transformation in airport infrastructure, revolutionizing airport operations to enhance safety, security & efficiency, and for ensuring world class passenger services. Modern airports are increasingly incorporating advanced environment friendly technologies to enhance efficiency and safety. For instance, biometric systems, such as facial recognition, are being introduced to streamline airport access, check-in, security, and boarding processes, significantly reducing waiting times and enhancing security. Integrated Management Systems are being deployed for real-time monitoring of airport operations, enabling more efficient management of resources and seamless passenger flow. Advanced air traffic management systems, like Airport Collaborative Decision Making (A-CDM), Performance Based Navigation (PBN) and Continuous Descending Operations (CDOs) are being integrated to optimize flight operations, reduce congestion, and minimize delays. Further use of renewable energy sources & green fuel driven energy efficient equipment are incorporated to optimize energy consumption & minimize carbon emissions. These systems improve the coordination between various stakeholders, ensuring timely departures and arrivals, and significantly reducing the carbon footprint of aircraft operations.

Complementing this technological integration is an unwavering commitment of AAI towards sustainability — a commitment that resonates with global efforts to combat climate change and foster environmental stewardship. Indian airports are at the forefront of environmental stewardship, embracing renewable energy sources and green building practices. The ambitious target set by AAI to transition 100 airports on 100% renewable energy by December 2024 exemplifies this dedication. Through a multifaceted approach encompassing solar power installations, green power purchase agreements, and innovative technologies such as geo-thermal systems, airports across the nation are charting a course towards carbon neutrality — a course that embodies India's pledge to safeguard the planet for future generations.

Customer experience is another cornerstone of this transformation. Recognizing that airports are gateways to the world, AAI and other stakeholders are investing in enhancing passenger experience and satisfaction. Modernization efforts include upgraded facilities, digital services for real-time information and seamless navigation, and feedback mechanisms

to continually improve services. Initiatives such as the Regional Connectivity Scheme (UDAN) and the expansion of major airports are designed to ensure that even the most remote regions are brought into the fold of progress and affordable air travel for common man, facilitating economic growth and regional development.

Together, these efforts reflect a strategic vision that positions India's airports as not only hubs of transportation but as engines of economic growth, innovation, social connect, and sustainability. Furthermore, they are preparing Indian airports to effectively tackle future challenges and take advantage of new opportunities.

Empowering Airports: Innovative and Sustainable Technological Integration in Infrastructure:

The Airports Authority of India (AAI) is spearheading a holistic approach to airport infrastructure development, intertwining sustainability and technological innovation to create airports of the future. These initiatives encompass a wide array of strategies aimed at reducing carbon emissions, enhancing operational efficiency, and elevating the passenger experience.

One key aspect of this transformation is the adoption of smart airport concepts, that adhere to the highest environmental standards. AAI is committed to constructing all future terminals as Green Buildings with the highest GRIHA rating (5 Star), employing sustainable materials and energy-efficient equipment. Airport infrastructure are designed incorporating local architectural aesthetics, art & culture with optimal use of renewable resources. Furthermore, installation of solar power plants across various airports coupled with the adoption of energy-efficient HVAC systems, ECBC+ rated equipment, Electric Vehicles (EVs) and LED lighting, etc. are helping AAI to optimise energy consumption and minimize carbon footprint.

The introduction of the DigiYatra initiative represents a significant leap forward in passenger convenience and security. DigiYatra leverages biometric authentication, facial recognition, and digital identity management to enable paperless travel, streamlining terminal access, check-in, security, and boarding processes. Passengers can enjoy a seamless travel experience with minimal human intervention while reducing the use of paper and plastic, contributing to sustainability efforts.

Automation and robotics play a crucial role in enhancing operational efficiency and passenger experience. Automated baggage handling systems ensure smooth and reliable luggage transfer, minimizing errors and delays. Digital displays, information kiosks and customer help-desks provide assistance and information to passengers, enhancing service efficiency and reducing wait times. These technological advancements not only improve passenger satisfaction but also optimize resource utilization, energy performance and reduce operational costs as well as carbon footprint.

Electrification of the ground fleet is another pivotal step towards sustainability. Major airports such as Chennai and Kolkata have already embraced Battery Electric Vehicles (BEVs) in their ground fleet, with plans underway to introduce TaxiBots — semi-robotic, pilot-controlled electric towing tractors — and Fixed Electrical Ground Power (FEGP) and Pre-conditioned Air (PCA) units to further reduce emissions and reliance on Aviation Turbine Fuel (ATF). AAI has also implemented advanced systems such as Building Energy Management Systems (BEMS) to monitor and optimize energy usage in terminals.

Operational infrastructure is also undergoing significant enhancements through advanced air traffic management systems. AAI's in-house developed Airport Collaborative Decision Making (A-CDM) system integrates seamlessly with Air Traffic Management (ATM), reducing departure congestion and optimizing flight paths. Central Air Traffic Flow Management (CATFM) techniques strategically manage air traffic

flow, minimizing delays and fuel consumption. Performance-Based Navigation (PBN) supports the development of efficient air routes, further reducing fuel consumption and greenhouse gas emissions.

Additionally, AAI is focusing on optimizing airfield capacity and exploring utilization of shortest feasible air-routes under Flexible Use of Airspace in coordination with the Air Force and the implementation of Continuous Descent Operations (CDOs). Departure Slot Management (DSM) improves airline punctuality and reduces congestion, leading to fuel savings and lower emissions.

By embracing these advanced technological solutions and operational strategies, AAI is not only revolutionizing airport operations but also setting new standards for sustainability and passenger experience in the aviation industry. These initiatives underscore AAI's commitment to innovation, efficiency, and environmental responsibility, positioning Indian airports as global leaders in the 21st century aviation landscape.

AAI's Sustainable Initiatives: Leading the Way Towards Green Aviation:

Continuing its commitment to sustainability, the Airports Authority of India (AAI) has set an ambitious target to transition its airports to 100% renewable energy sources by December 2024. As of March 2024, significant progress has already been made, with 67 AAI airports already operating on 100% renewable energy. This remarkable achievement translates to approximately 80% of the total electricity requirements of AAI airports being met through green and renewable energy sources. The transition of 100 airports to 100% renewable energy will lead to substantial carbon emission reductions. AAI estimates that this switch will help save approximately 284,000 tonnes of CO2 equivalent emissions per year.

17 MWp Solar Power Plant at Netaji Subhas Chandra Bose International Airport, Kolkata

To facilitate this transition, AAI has installed around 56.4 MW of on-site solar capacity across 61 airports, contributing significantly to the generation of clean energy. Notable installations include the 17 MWp solar power plant at Netaji Subhash Chandra Bose International Airport, Kolkata, the largest of its kind among AAI airports, which alone generates approximately 22 MU of green energy annually, resulting in the removal of approximately 17,000 tons of CO2 equivalent emissions from the environment. Similarly, an 8 MWp solar power plant at Hubballi Airport effectively meets the 100% electricity requirements for AAI airports in Karnataka.

In addition to solar power, AAI is also exploring the installation of a state-of-the-art carbon-free geo-thermal system integrated with solar power plant at Kushok Bakula Rimpochee (KBR) Airport, Leh to achieve carbon-neutrality. This pioneering initiative, expected to reduce electricity intensity by approximately 75%, underscores AAI's commitment to leveraging cutting-edge technologies for sustainable airport infrastructure development.

AAI is also taking strong measures in waste management and has successfully implemented single- use plastic ban at its airports. AAI is the first PSU in India to set up a Paper Recycling Unit in line with GROW (Government Recycled Office Waste) initiative of Government of India. For water conservation and management, AAI airports are equipped with Sewage Treatment Plants (STPs) and Rainwater Harvesting Systems.

AAI's efforts towards sustainability have been validated by its certification under the Airport Carbon Accreditation program launched by Airports Council International (ACI). Currently, 26 AAI airports hold ACI-ACA Level-2 accreditation certificates, demonstrating adherence to best practices in greenhouse gas emission reduction.

Overall, AAI's concerted efforts towards sustainability are enabling AAI to lead the charge towards a greener and more sustainable aviation sector in India.

Enhancing Passenger Experience: AAI's Dedication to Customer Satisfaction:

While sustainability and technological innovation are integral pillars of airport infrastructure development, enhancing customer experience remains paramount in ensuring passenger satisfaction and loyalty. The Airports Authority of India (AAI) recognizes the pivotal role of passenger-centric initiatives and is committed to providing world-class amenities and services across its airports.

Modernization efforts are underway to upgrade airport facilities and amenities, catering to the evolving needs and preferences of travellers. AAI is investing in the expansion and refurbishment of terminals to accommodate increasing passenger traffic and provide a more comfortable and seamless travel experience. Upgraded lounges, dining options, and retail outlets offer passengers a diverse range of choices to relax and indulge while waiting for their flights. AAI has meticulously prepared master plans for all its airports, projecting forward until 2047, to ensure a seamless and top-tier experience for the growing number of passengers served by these airports.

Real-time information and seamless navigation are essential components of modern air travel. AAI ensures passengers have access to essential flight information through digital displays and information kiosks strategically placed throughout terminals. Additionally, passenger assistance desks staffed with well-informed personnel are available to address inquiries and provide assistance as needed.

To streamline passenger processes and reduce wait times, AAI has implemented efficient security and boarding procedures. Automated baggage handling systems and dedicated security lanes expedite the check-in and security screening processes, minimizing queues and enhancing overall efficiency.

Furthermore, AAI places great emphasis on gathering and acting upon passenger feedback to continually

Modernized Terminal at Netaji Subhas Chandra Bose International Airport, Kolkata

improve services and facilities. Surveys and feedback mechanisms are in place to capture passenger sentiments and identify areas for enhancement. This proactive approach allows AAI to address passenger concerns promptly and implement targeted solutions to improve the overall passenger experience.

In addition to these efforts, AAI is committed to promoting regional connectivity and accessibility. Initiatives such as the Regional Connectivity Scheme (UDAN) aim to enhance connectivity to underserved and unserved airports and make air travel affordable for every citizen, fostering economic development in regional areas and improving accessibility for passengers across the country.

AAI's dedication to enhancing passenger experience underscores its commitment to customer satisfaction and excellence in service delivery. By investing in

modernization and efficient processes, AAI continues to set the standard for airport service excellence in India.

Conclusion:

In conclusion, the Airports Authority of India (AAI) stands at the forefront of airport infrastructure development, prioritizing sustainability, technological innovation, and passenger-centric initiatives. Through the integration of advanced technologies, commitment to environmental stewardship, and dedication to enhancing customer experience, AAI is redefining the standards of excellence in the aviation industry. As India's aviation landscape continues to evolve, AAI's strategic vision ensures that its airports are not only hubs of transportation but also drivers of economic growth, connectivity, and sustainability for generations to come.

भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

Digi Yatra: Revolutionizing Air Travel in India with Exemplary Leadership

By Suresh M Khadakbhavi, CEO, Digi Yatra Foundation

Introduction:

Air travel in India is witnessing unprecedented growth, with the country poised to become the world's third-largest aviation market in the coming years. Recognizing the need to enhance customer experience, increase operational efficiency, and generate additional revenue streams, India embarked on a major digital transformation journey. The result? Digi Yatra, a groundbreaking concept that has redefined the passenger journey and elevated travel experiences in Indian airports. Under the exceptional leadership of the Ministry of Civil Aviation, Digi Yatra has become a shining example of innovation, collaboration, and effective implementation.

Background: A 'Concept' to 'Proof of Concept'

Digi Yatra originated during a brainstorming session at an airport, where multiple internal departments explored ways to enhance the passenger experience. The proposal of using "Single token face biometrics" to create a seamless, paperless, and hassle-free journey gained traction. The airport further developed the concept, partnering with leading biometric service providers to conduct a Proof of Concept (PoC) with live flights in early 2017. Passengers immediately embraced the simplicity and convenience of the biometric process, catching the attention of government authorities who were impressed by its potential.

The Digi Yatra Policy: Setting the Stage for Success

Under the leadership of the Secretary of the Ministry of Civil Aviation, a national framework was created to draft the Digi Yatra Policy. This framework comprised a Steering Committee (Digital Cell) and a Technical Working Committee (TWC) with experts from airports, airlines, and relevant agencies. Extensive workshops were conducted to gather consensus among stakeholders, overcoming initial challenges surrounding Aadhaar validation. A Not-for-Profit Joint Venture Company, Digi Yatra Foundation, was formed and tasked with creating the "Digi Yatra Central Identity Management Platform" (DYCIMP), a world-first scalable national-level trusted-traveler program based on a single-token biometric identity.

Vision, Objectives, and Goals: Transforming the Passenger Experience

The vision of Digi Yatra is to create a delightful and memorable digital travel experience. Its objectives include enhancing passenger experience, achieving seamless and paperless processes, improving operational efficiency, and enhancing security standards. Key goals involve setting standards for digital transformation, establishing a pan-India Identity Management service platform, and enabling face biometric boarding processes across all airports in India.

Post-Pandemic: The Evolution from DYCIMP to DYCE

To prioritize data privacy and security, the Digi Yatra Central Ecosystem (DYCE) was introduced, shifting from a centralized to a decentralized model. The Technical Working Committee recommended adopting W3C standards and implementing the concept of Self Sovereign Identity using Verifiable Credentials (VCs), Decentralized Identifiers (DIDs), and a Distributed Ledger framework. Personally Identifiable Information (PII) data is encrypted and securely stored in passengers' smartphones within the DYCE App, following Universal Wallet standards. Verifiable Credentials such as identity, health, and travel data are stored in the secure wallet and shared only by the passengers with authorized verifiers (airports) during travel. The DYCE architecture adheres to Privacy by Design (PbD) principles and complies with privacy norms and standards, ensuring data protection and minimizing the risk of data loss or breach.

Leadership by the Ministry of Civil Aviation: Guiding Digi Yatra's Success

The Ministry of Civil Aviation played a pivotal role in spearheading the Digi Yatra journey. With remarkable foresight, the Ministry recognized the potential of Digi Yatra and engaged various stakeholders to ensure a coordinated approach. Through workshops, committees, and strategic decision-making, the Ministry fostered collaboration among government agencies, airport authorities, regulatory bodies, and industry experts.

The Ministry's leadership extended beyond addressing regulatory challenges and forging public-private partnerships. The establishment of the Digi Yatra Foundation and the DYCE showcased the Ministry's commitment to creating a scalable infrastructure for Digi Yatra implementation at airports across India. The transition to DYCE in the post-pandemic phase further highlighted the Ministry's forward-thinking approach and emphasis on data privacy and security.

Conclusion:

The leadership demonstrated by the Ministry of Civil Aviation in driving the Digi Yatra initiative has been exemplary. With a clear vision, strategic planning, and a proactive approach, the Ministry has united stakeholders, overcome challenges, and transformed the Indian aviation industry. Digi Yatra has revolutionized air travel by enhancing passenger experiences and positioned India as a global leader in leveraging digital technologies, setting a new Global benchmark in seamless passenger processing. As Digi Yatra continues to evolve, the Ministry's unwavering leadership ensures that the journey towards a seamless, paperless, and secure travel experience remains on track, setting new benchmarks for innovation and customer-centricity in the aviation sector. The next step would be to enable seamless travel for passengers across international borders, covering departure immigration and arrival immigration at the destination airport through the interoperability of Digi Yatra with other global frameworks.

Promoting Women Leaders in Aviation in India and South Asia

By Mehnaz Ansari, Sr. Regional Representative - South Asia, Indo Pacific Region, U.S. Trade and Development Agency

"Katharine Wright, the forgotten sister:

The Wright Brothers, Wilbur, and Orville are considered famous pioneers, but they may owe some of their success to their sister, Katharine. After graduating from college, the young woman joined her two brothers in Europe as their spokesperson, while they were presenting their invention in various salons. Having learned French for the occasion, she met with several major political figures of the time, such as King Edward VIII of England, and the French Prime Minister Georges Clemenceau. She was qualified by the local newspapers as the "human side of the Wrights". Wilbur himself said: "If ever the world thinks of us in connection with aviation, it must remember our sister."

Women are the cornerstones of every society. As we talk about the tremendous growth of aviation sector in India and South Asia, it is important that the women are made an integral part of this growth story. When any nation promotes to work on a sector, and that too in the 21st century, it is important to take together the 50 percent of the population's (women) requirements into account. And to effectively suffice to the requirements, it is important that women are made an integral part of the decision making. As a frequent flyer, I get the opportunity to travel to many different parts of India, South Asia, and the world. There are challenges and there are experiences. And numerous can be accounted for, such as security queues which are divided by gender in India and South Asia are 1:x presuming more men travel by planes than women. And if you get a middle seat in between two men,

your flight can become a challenging experience. Very rarely, I find female immigration officers at the airports in these airports. I am sure everyone goes through an experience flying once in their lives.

The empathy and responsibility which women can bring into the system needs to be seriously acknowledged. From safety, to security, design to construction, flying to attending, air navigation to ground management, women are needed and can work everywhere. Often a boy is sent to an English medium school and the sister/daughter behind must go to a local school. Yet times are changing, and I often see a spark and desire to fly in the eyes of many girls coming from conservative and not so affluent families. Hence, we need a baseline plan, and we need to train the trainers program. We need encouragement for the girl not to give up due to family expectations if she is a trained engineer, pilot, administrator, or servicing staff. When the pool of this baseline grows, we can encourage more leaders to come forward. Women are sensitive to sustainable societies and work in the backdrop to make it happen. Hence, let's discuss what we can do to make it happen. How we help bring a gender balance in aviation boardrooms, on the ground and in the sky.

Ministry of Civil Aviation in India plans to increase the number of airports from 130 to 200 in next 10 years. In a country, where disposable income allows middle class population to indulge in brands like Starbucks coffee, Birkenstock Shoes, Apple phones, Nike shoes, luxury hotels and holidays, aviation sector growth is bound happen especially with more than 500 million

people in the middle-income category. We add other South Asian countries to it as fast emerging economies such as Bangladesh, Nepal, Maldives and others, this number gets even bigger.

With this growth comes the requirement of talent pool to support the aviation industry. Pilots, engineers, airports, safety, security resources are in short supply in India. To add to it, India serving as a feeder of talent pool to the gulf region only adds to the shortage. Talent pool of women resources in this sector (except for cabin crew) are not just available enough. There are various factors which contribute to this challenge such as industry awareness and interest to bring diversity, lack of family support and availability of reputed institutions to provide such training. We need to create several platforms of professionals and organized support that can work systematically and aggressively towards enhancing awareness for women and diverse population in this industry, enable strengthening the training processes and talent absorption process. India being at the position of entering into top aviation market of the globe, there is a need to attract and enable growth for women in this industry.

The areas where we must work together are in:

→ **Promoting Gender Diversity:** To promote gender diversity and inclusion in leadership positions within the Indian aviation sector by advocating for the advancement of women professionals and leaders.

→ **Capacity Building:** To facilitate capacity building initiatives that provide women in the Indian aviation industry with the skills, knowledge, and resources necessary to succeed in leadership roles, including training programs, workshops, and mentoring opportunities.

→ **Advocacy and Policy Development:** To advocate for policies and initiatives that support the advancement of women in aviation leadership positions, both within

India and through collaboration with international partners like the, Women in Aviation International, Indian Women Pilots' Association amongst others.

→ **Networking and Mentorship:** To establish networking opportunities and mentorship programs that connects women in aviation leadership roles in India with mentors, peers, and industry stakeholders globally who can provide guidance, support, and career development opportunities.

→ **Research and Data Collection:** To conduct research and collect data on the representation of women in aviation leadership positions in India, identify barriers to advancement, and develop evidence-based strategies for promoting gender diversity and inclusion.

→ **Visibility and Recognition:** To raise awareness and visibility of women leaders in the Indian aviation industry, highlighting their achievements and contributions to inspire future generations of women to pursue leadership roles.

→ **Partnerships and Collaboration:** To collaborate with government agencies, industry associations, educational institutions, and other stakeholders to promote gender diversity and leadership development in the Indian aviation sector, leveraging resources and expertise to achieve shared goals.

→ **Professional Development:** To provide professional development opportunities for women in aviation leadership positions in India, including leadership training, skill-building workshops, and career advancement seminars.

→ **Monitoring and Evaluation:** To monitor progress towards gender diversity and inclusion goals within the Indian aviation

industry, evaluate the effectiveness of initiatives and programs, and adjust strategies as needed to ensure continuous improvement.

Collaboration with US India Aviation Cooperation Program: The US India Aviation Cooperation Program (ACP) is poised to become an anchor to bring the best experience and training to India. The partnership under the US and Indian governments and support of US and Indian industry can help to initiate this initiative to promote Women in Aviation Leadership. Program management expertise to do educational, technical and leadership capacity building is available with the US industry and the ACP partners. Boeing's Sukanya program was recently launched by India's Prime Minister. Prat and Whitney are promoting Women in aviation and sustainability. Each ACP member is committed to do their bit. And American Universities are poised to support this initiative as well. The US Trade and Development Agency (USTDA) have been working to strengthen this work to promote more women leaders in India. The leadership talent developed can be used in the following areas:

→ **Airlines:** Women can hold leadership positions in airlines as C-suite and other executive roles overseeing operations, finance, marketing, customer experience, IT, and other functions.

→ **Airports:** Leadership roles in airport management, including Airport Directors, General Managers, and heads of various departments such as operations, security, commercial, and customer service.

→ **Aerospace Manufacturing:** Women can lead in aerospace manufacturing companies as plant managers, production managers, quality assurance managers, and in other leadership roles overseeing manufacturing processes and operations.

→ **Air Traffic Management:** Leadership roles in air traffic management organizations, such

as Air Traffic Controllers (ATCs) and Air Traffic Services (ATS) managers, overseeing safe and efficient air traffic flow.

→ **Air Freight and Supply Chain:** Women play vital roles in cargo and supply chain operations within the aviation industry, contributing to the efficient movement of goods across the globe in the areas related to Custom and Compliance, Cargo handling technology and solutions, Freight forwarding and logistics companies.

→ **Aviation Regulatory Authorities:** Women can lead in regulatory bodies such as the Directorate General of Civil Aviation (DGCA) or the Civil Aviation Authority, shaping policies, regulations, and standards for the aviation industry.

→ **Aviation Training Institutes:** Leadership roles in aviation training institutes and academies as directors, heads of training programs, and instructors, shaping the next generation of aviation professionals.

→ **Aviation Consultancy and Services:** Women can establish and lead aviation consultancy firms, providing expertise in areas such as aviation management, safety, security, and regulatory compliance.

→ **Aircraft Maintenance and Repair:** Leadership roles in aircraft maintenance organizations as maintenance managers, quality assurance managers, and in other positions overseeing aircraft maintenance, repair, and overhaul (MRO) operations.

→ **Aviation Technology and Innovation:** Leadership roles in aviation technology companies, startups, and research institutions driving innovation in areas such as aircraft design, avionics, drone technology, and sustainable aviation solutions.

→ **Aviation Finance and Investment:** Women can hold leadership positions in aviation finance companies, investment firms, and leasing companies, managing aircraft financing, leasing, investment portfolios, and financial strategies.

These are just a few examples, and there are numerous other areas within the aviation industry where women can excel and contribute as leaders, driving innovation, growth, and sustainability in the sector.

How can we get there? Here are ways where work can take place:

→ Find ways to attract and tap talent early on during school days by collaborating with schools and introduction of the industry topic in their curriculum.

→ Bring wider focus on Tier 2 and 3 cities of India to pick up talented young girl children for sponsorship within India and abroad for relevant and shortlisted deep dive specialization courses.

→ Team up with authentic training centers of the country to support their quality and output.

→ Enable colleges/universities/training centers to communicate better with the industry with an aim to share knowledge and talent needs.

→ Work towards getting Indian government to support this platform to work more effectively.

→ Look at sponsorship projects for chosen and deserving candidates for training, studies, and internship projects esp for economically challenged girls.

→ Provide this forum a larger platform to connect with Global Women in Aviation member and exchange ideas for growth.

There are multiple ideas and more can be explored together to take this initiative forward. The foresight to execute this mission and work together would enable each daughter to fulfill her dream to fly!

USTDA
U.S. TRADE AND DEVELOPMENT AGENCY

Achieving Aatmanirbharta in the Indian Aerospace Industry

By Ryan Weir, Vice President of Commercial Sales and Marketing for India & South Asia, Boeing Commercial Airplanes

India, one of the world's fastest-growing economies, offers vast growth and productivity opportunities. Over the past three decades, it has accounted for 90% of South Asia's economic output, ranking among the leading global economies. Projected to grow at 5.8% between 2023 and 2028, India's economy is set to outpace the global average of 3.4%.

The increased demand, combined with the country's strategic geographic position and a previously underserved domestic market, presents a significant opportunity in the growing aviation sector in the country. As the world's third-largest civil aviation market, India's fleet is expected to nearly quadruple by 2041 compared to 2019. The country is also projected to receive over 90% of South Asia's airplane deliveries, requiring more than 2,500 new aircraft, while its cargo market is set to expand significantly, with the fleet growing from 15 to 80 airplanes by 2042. The Boeing Pilot and Technician Outlook forecasts South Asian demand for 37,000 pilots and 38,000 maintenance technicians over the next 20 years.

The resurgence of Indian domestic passenger air traffic, surpassing pre-pandemic levels, highlights pent-up demand for travel and underscores the industry's adaptability. This resurgence reflects substantial long-term growth opportunities. India's growing middle class, with rising disposable incomes, is a significant driver of air travel demand, both domestically and internationally. Furthermore, the growth in e-commerce is boosting demand for narrowbody conversions, while the expansion of India's electronics manufacturing industry, particularly in higher-value segments, is fuelling increased demand for cargo services.

Long-standing partnership with India

Boeing's relationship with India goes back to the 1940s. It began by partnering with the current Air India, then Tata Airlines. In 1941, the Indian government lent a Douglas aircraft (now a part of Boeing) to Tata Airlines for a historic flight from Karachi to Baghdad. This paved the way for a long-standing relationship that remains strong today. Over the decades, Boeing supported Air India to become a pioneer of jet-powered flight in Asia. From operating the historic Boeing 707 to today's 777 models, Air India and Boeing have worked together to reach new heights.

Recognizing the potential for growth over time, Boeing has developed relationships with Indian organizations across manufacturing, infrastructure, engineering services, and research and technology for both civil and military aviation. Not limited to products and services, Boeing has helped to establish key aerospace infrastructure and capabilities to support India's aspirations to become a global aerospace leader.

Today, Boeing is by far the largest foreign OEM in terms of sourcing from India, with over $1.25 billion annually through its large and growing network of 300+ supplier partners, with over 25% as Micro, Small and Medium Enterprises (MSMEs), that are an integral part of our global supply base.

Supporting the growth of the aviation ecosystem

As a company with over eight decades of presence in India, Boeing continues to support the development of indigenous aerospace and defence capabilities in support of the Aatmanirbhar Bharat vision. Boeing is a proud proponent of the "Make-In-India" and "Skill India" initiatives, and this is at the core of our long-term business strategy in India. Today, India has become the largest site for Boeing outside of the United States in terms of workforce.

Boeing's overall investments in India span development in sustainment and services, localization of maintenance, repair and overhaul, indigenous supplier agreements, and skill development and training to develop talent for the rapidly growing market.

➢ Recently, we inaugurated the new India Distribution Center in Khurja, Uttar Pradesh, to provide efficient and cost-effective service solutions to regional customers, ensuring higher fleet utilization and mission readiness rates.

➢ In 2023, Boeing has partnered with GMR Aero Technic to establish a Boeing Converted Freighter line in Hyderabad. This collaboration supports cargo growth and expands aircraft modification capabilities and Maintenance, Repair and Overhaul (MRO) services in India. It contributes to India's ambition of becoming a regional MRO hub.

➢ Additionally, we also established a Global Support Center in Gurgaon to provide customized operational efficiency and safety improvement projects for airline customers, regulatory bodies, and other stakeholders.

➢ Boeing also announced a $100 million investment in infrastructure and programs to train pilots in India, which will support India's need for new pilots over the next 20 years.

➢ Earlier in 2022, Boeing also completed a comprehensive 10-year road map for Airports Authority of India to modernize its Communication, Navigation and Surveillance/ Air Traffic Management (CNS/ATM) system. This plan aims to improve airspace utilization across CNS/ATM, aligned with global standards. It was developed with a grant from the U.S. Trade and Development Agency.

Additionally, in alignment with the guidance provided by the Honourable Prime Minister, Boeing has initiated the Boeing Sukanya Program aimed at further fostering women's participation in the aviation sector. This initiative spans the multiple stages of a woman's professional career, nurturing future leaders, and fostering a more inclusive industry.

➢ Establishing STEM Labs in girls' schools

➢ Supporting university education through digital products and courses.

➢ Providing scholarships for flight training, covering various aspects.

➢ Investing in full-flight simulator capacity and Competency-based Training and Assessment (CBTA) courseware to produce a pipeline of female pilots.

➢ Designing leadership development modules, mentoring programs, and knowledge retention initiatives to increase women's representation in the aviation sector.

India holds a position of strategic significance for Boeing, being one of the three key regions actively supported by the Global Strategic Initiatives team. Noteworthy programs led by the team in India include:

➢ **India Air Cargo Symposium:** Focused on the air cargo market, fostering industry dialogues on growth drivers, opportunities, and industry challenges, providing valuable perspectives to shape strategic decisions.

- ✈ **India Pilot Roundtable:** A dedicated platform for India's pilot community to engage with Boeing's expert panel, emphasizing industry-leading best practices in commercial aviation, with a key focus on safety, efficiency, and innovation.

- ✈ **Executive Development Programs:** A series of collaborations with elite institutions, tailored for airline customers, industry stakeholders and government agencies across the region.

- ✈ **Sustainability Workshop:** Workshop with our customers and industry stakeholder on India adopting CORSIA and prioritizing Sustainable Aviation Fuel (SAF) for decarbonization.

Boeing has set an ambitious target to address the long-term sustainability of commercial aviation by committing that its commercial airplanes are capable and certified to fly on 100% sustainable aviation fuels by 2030. We see great potential for SAF production in India and by India. As a member of the World Economic Forum's Clean Skies for Tomorrow (CST) initiative, Boeing contributed to the first report "Deploying Sustainable Aviation Fuels at Scale in India" in 2021 as a starting point for a public-private taskforce to design an implementable policy framework for decarbonizing aviation in India. As a key contributor to this report, Boeing helped determine that ~10% of India's SAF needs by 2030 can be met through domestic production. As a result, we entered a partnership with SpiceJet and the Council of Scientific and Industrial Research – Indian Institute of Petroleum (CSIR-IIP) to help test and certify a domestically produced SAF.

Boeing's partnership with India's civil aviation sector is helping support its unprecedented growth and development. Through manufacturing and infrastructure partnerships, training and workforce-development collaborations, and sustainability initiatives, Boeing and India share the goal of advancing the country to the status of a global aviation leader and of becoming Aatmanirbhar in aerospace and defence.

BOEING

# Making the world a safer place – Smiths Detection

By Vikrant Trilokekar, Managing Director – India Region, Smiths Group

Smiths Detection is a business division of the Smiths Group that provides threat detection and security screening technology to help protect people and infrastructure, making the world a safer place. The company delivers solutions needed to protect society from the threat and illegal passage of explosives, prohibitive weapons, contraband, biological threats, toxic chemicals, and narcotics. With over 70 years' experience, our mission is to use technology to develop innovative solutions and services which protect life, safeguard our society and uphold the free flow of trade. Smiths Detection provides solutions for Aviation, Ports & Borders, Urban Security and Defence.

At Smiths Detection, we pride ourselves on developing quality products that are built to last decades not years.

They are designed to be serviceable and upgradable to meet changing needs. Our equipment has among the highest energy efficiency in our industry, reducing both our customers' operating costs and greenhouse-gas emissions.

We recently launched the SDX 10060 XDi - a "ground-breaking" X-ray scanner powered by diffraction technology - marking a new era in airport security screening XRD is a well proven, powerful inspection technology offering highly accurate material discrimination and substance identification based on molecular structure. It creates a 'diffraction fingerprint' to differentiate between materials – even those with very similar densities.
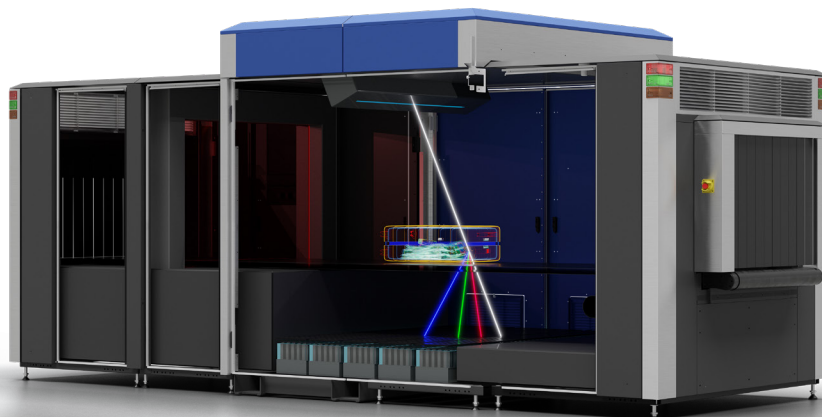
XRD is particularly suited to detecting evolving compounds in powder, liquid or solid forms, such as homemade explosives or narcotics, even for materials with similar densities.

Smiths Detection's SDX 10060 XDi can transform the airport screening process by automating the resolution of potential explosive alarms, in turn improving both security and efficiency. Due to its high sensitivity, XRD technology can also be deployed to support customs agencies in screening for a range of items, including narcotics.

X-ray Diffraction will future-proof operations for a large variety of sectors, and we are proud to play a pivotal role in shaping the landscape of future threat detection.

Multilevel baggage and material handling operations and express forwarders are under pressure to screen huge volumes quickly and efficiently. The SDX 10060

XDi is able to transform this process by automating the resolution of potential explosive alarms, in turn improving both security and efficiency. Typically, Explosives Detection Systems (EDS) automatically clears 70-80% of items at Level 1, meaning 20-30% alarmed images are sent to analysts for on-screen resolution at Level 2.

Using the latest X-ray Diffraction (XRD) technology, the groundbreaking Smiths Detection SDX 10060 XDi transforms this process by automating up to 80% of these Level 2 decisions – in turn, improving both security and efficiency.

Due to its exceptional sensitivity, XRD technology can also be very effectively deployed to support customs agencies in screening for a range of contraband items including narcotics, helping to mitigate ever-growing threats to society.

Creating Greener And Better Supply Chains In India

By Kami Viswanathan, SVP & President, FedEx MEISA

The logistics sector plays a pivotal role in leading us to a greener future. In India and beyond, businesses are starting to contribute by adopting more sustainable practices.

With our environment in a state of emergency, collective action is urgently needed to create solutions. Robert Swan, one of the world's greatest explorers, rightly said, "The greatest threat to our planet is the belief that someone else will save it."

In other words, embracing sustainability is no longer a choice; it is the right thing to do.

Sustainability is now a key driver for success, shaping business strategies across all industries. Embracing sustainable practices fosters innovation, attracts purpose-driven stakeholders, and builds resilience. It helps businesses pave the way towards a cleaner future, where profits align with the well-being of our people and the planet.

Growing calls for sustainability in the logistics sector

The environmental impact of the logistics sector has sparked concerns about the sustainability of industrial operations. People are calling for the transition to green solutions and for businesses to address these concerns.

In India, the logistics market is set to grow at a compound annual growth rate (CAGR) of 8.36%, reaching US$650.52 billion by 2028, up from US$435.43 billion in 2023. The International Energy Agency also highlighted that the sector contributes to 37% of global carbon emissions, offering a major decarbonization opportunity. With the anticipated rise in GDP and e-commerce, the logistics market value is expected to soar from US$10.7 trillion in 2022 to US$18.2 trillion by 2032.

Sustainability is everyone's responsibility

In today's business landscape, sustainability is more important than ever for corporates, suppliers, and regulatory bodies. As investors place greater emphasis on ESG criteria, regulatory bodies are implementing stricter regulations and requirements. Rating agencies and indices, such as the Logistics Performance Index (LPI), now incorporate ESG factors into assessments and benchmarks.

Governments and international organizations are also pushing to achieve sustainable development goals through countrywide policies.

Take India as an example, where the Indian government has set a goal to achieve net zero by 2070. To make this happen, it has launched several initiatives, such as the Green Freight Corridor Project and the National Mission on Transformative Mobility and Battery Storage, encouraging adoption of sustainable practices.
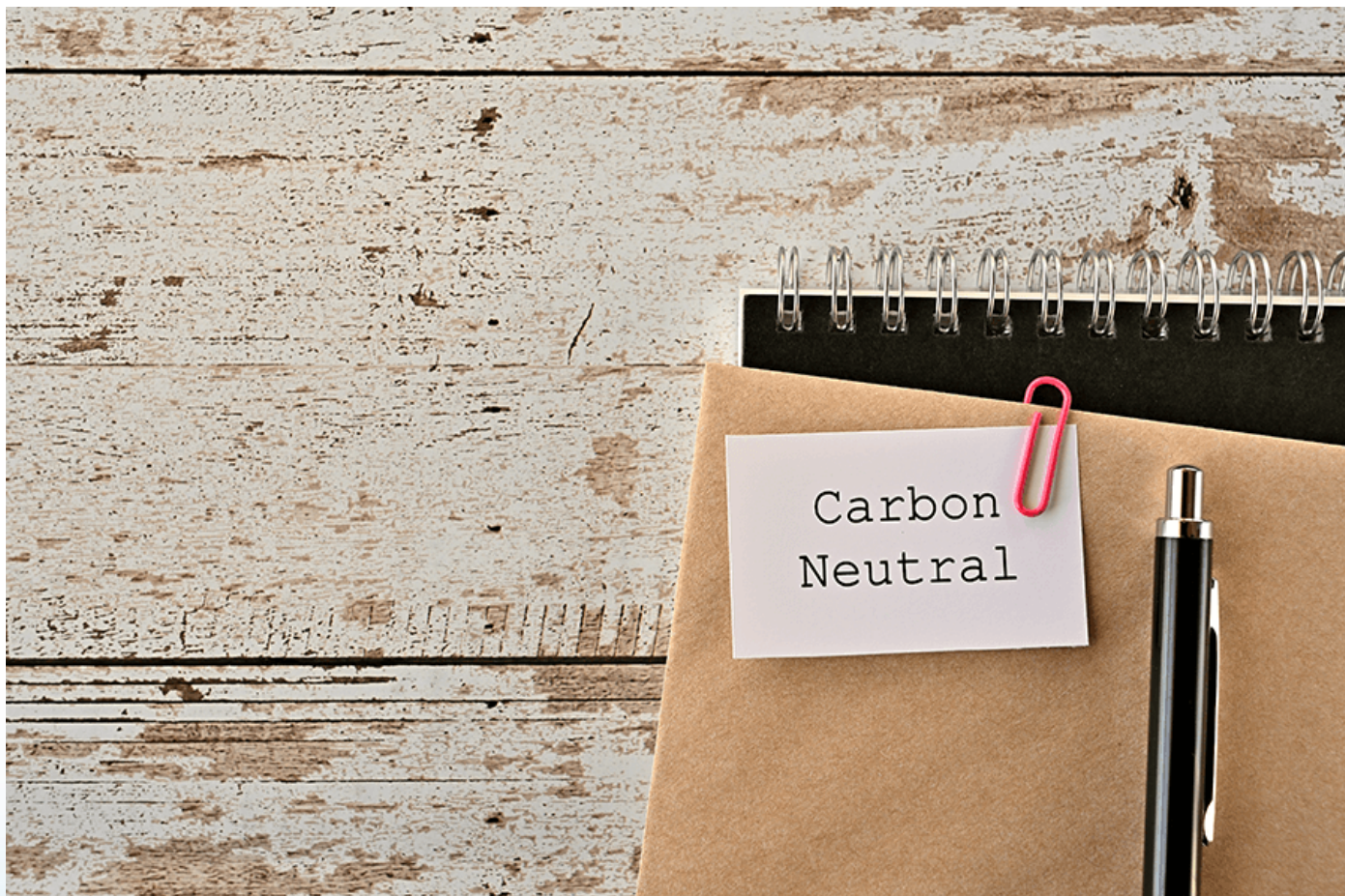
Moreover, the Securities and Exchange Board of India (SEBI) mandates the top 1,000 listed companies to disclose their environmental and corporate governance initiatives, compelling other companies to align with international best practices.

On an international level, there is a greater push toward private sector responsibility, with the launch of the ISO Net Zero Guidelines at COP27. Together, these efforts drive us towards a greener future.

Making sustainable consumption a conscious choice

ESG integration is now a critical mandate for companies as more stakeholders, particularly millennials and Gen Z consumers, demand sustainable products. A Deloitte survey indicates that 73% of Gen Z consumers are willing to pay extra for sustainable products and prefer working with companies with commitments to sustainability. The results align with our e-commerce research, where 83% of Indian consumers prefer buying from companies with a well-defined ESG strategy.

Indian consumers increasingly prioritize responsible products, meaning companies need to adopt sustainable solutions if they want to grow.

Driving sustainable success with ESG

Companies can improve their long-term societal, environmental, and financial value by understanding

their impact. Identifying opportunities to integrate sustainability into business strategies is crucial. Visibility is also key. Monitoring and transparently reporting outcomes contribute to this positive transformation.

As one of the world's largest transportation companies, we're committed to reducing our carbon footprint. Through the Reduce, Replace, Revolutionize strategy, we at FedEx are taking bold actions to achieve our goal of carbon neutral operations globally by 2040. To make this happen, we have pledged an initial investment of more than US$2 billion in three critical areas:

→ **Vehicle electrification:** In line with our global goal, we have deployed 30 Electric Vehicles in New Delhi, and we aim to have an all-electric pickup and delivery fleet by 2040.

→ **Sustainable energy:** We are committed to reducing emissions and waste. In FY22, we invested in 29 on- and off-site solar energy facilities globally, generating 102 terajoules of clean electricity - enough to fully charge more than 14 million smartphones.

→ **Carbon sequestration:** To accelerate research into carbon capture at scale, we pledged USD100 million to Yale University for establishing the Yale Center for Natural Carbon Capture. This initial focus will help offset greenhouse gas emissions equivalent to current airline emissions.
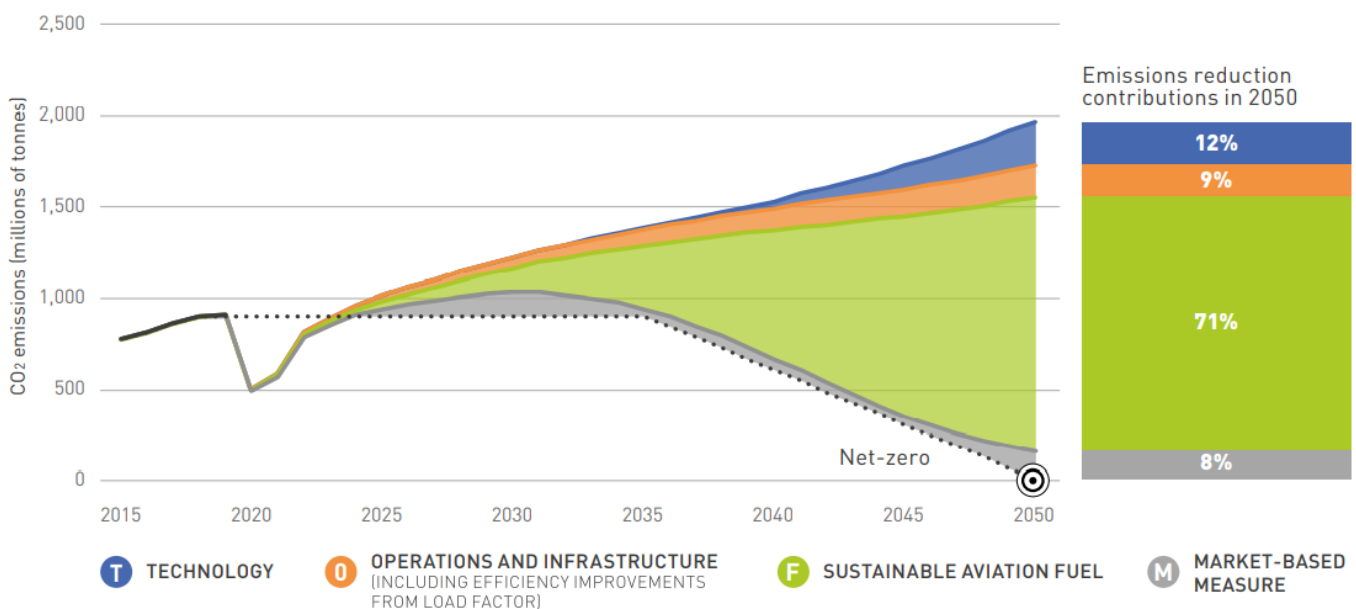
Sustainable Aviation Fuel (SAF) The' real deal' for achieving India's aviation sustainability goals

By Dr. S. Vasudevan, Senior Director & Head - Aviation, Travel & Tourism – India & APAC and Meghna Goradia, Manager – Aviation, Travel & Tourism, ICF International

The aviation industry in India is poised to continue its feat of double-digit growth from FY24 onwards to be on target of flying one billion plus passengers by 2040. With more than 1200 new aircraft on order by Indian carriers and more investments in airport infrastructure the concomitant carbon footprint of these assets in the region will also become a talking point in the context of increasing global focus on impact of CO2 emissions on climate change and livelihoods.

Aviation still contributes less than 3% of global GHG emissions but with more new technology and greening solutions being implemented in energy, mining and surface transport businesses the share of aviation in overall GHG emissions will increase if the sector is behind the curve on implementing its own solutions. While the industry has been constantly innovating in airframe designs, engines and airside equipment for many decades, all of which focused on improving efficiency, comfort and convenience for clients, continued use of

Emissions reduction contributions in 2050

- T — TECHNOLOGY
- O — OPERATIONS AND INFRASTRUCTURE (INCLUDING EFFICIENCY IMPROVEMENTS FROM LOAD FACTOR)
- F — SUSTAINABLE AVIATION FUEL
- M — MARKET-BASED MEASURE

conventional aviation turbine fuel (ATF/ Kerosene) through the decades has far outstripped benefits, given the latter's high emission quotient.

As one of the most convenient means of long-haul travel, increasing global trade and expanding mobility, continual growth in aviation is inevitable. This also makes aviation stakeholders bigger custodians of managing this growth responsibly and in a carbon sustainable environment.

The global aviation industry has committed to net zero emissions by 2050. The only realistic way to achieve this is by rapidly deploying a basket of measures. These include operational improvements, market-based measures (such as CORSIA), advanced aircraft technology (e.g., hydrogen aircraft), and the utilization of **Sustainable Aviation Fuels (SAF).**

Across these aviation decarbonization options, SAF

production is recognized as the most significant lever.

Sustainable aviation fuels can be produced from a variety of feedstock (oils, alcohol, fats, fatty acids, sugars, agriculture waste, hydrocarbons) and can replace the carbon quotient significantly subject when blended with conventional ATF for permissible use in aircraft. The advantage of producing SAF with these pathways is that the end product can be used as "drop-in" fuel with blends of up to 50% in many cases.

Public and private aviation industry stakeholders are working across the world to scale up implementation of SAF. However, notwithstanding industry efforts, a supply gap still remains. From a global point of view, more action needs to be taken on this front. Here is a snapshot of some key initiatives taken by countries in the last few years.

Pathway	Feedstock	Max. Blending Limit
FT–SPK	Biomass (e.g. trash/rubbish, forestry residues, grasses)	50%
HEFA–SPK	Waste lipids & fats (e.g. UCO, tallow, DCO)	50%
HFS–SIP	Sugars to hydrocarbon (e.g. molasses, sugar beet, corn dextrose)	50%
FT–SPK / A	Same feedstock as FT–SPK, but slightly different process	10%
ATJ–SPK	Agricultural waste (e.g. forestry slash, crop straws)	50%
CH–HK	Plant and animal fats, oils and greases (FOGs)	50%
HC–HEFA–SPK	Bio-derived hydrocarbons, fatty acid esters	10%
Co-processed HEFA*	Fats, oils, and greases (FOG) co-processed with petroleum	5%
Co-processed FT*	Fischer–Tropsch hydrocarbons co-processed with petroleum	5%

Source: Waypoint 2050 report ATAG, Scenario 2: aggressive sustainable fuel deployment

🇨🇦 Canada	✈ ICAO | UN Specialised Agency	🛩 Int. Air Transport Association	🇸🇪🇳🇴🇫🇷
Clean Fuel Standard to be introduced from July 1st, 2023	2022: Established a long term goal of net zero carbon emissions by 2050, supported through CORSIA and a basket of measures	Representing 290 airlines, IATA committed achieve net-zero emissions by 2050	Sweden, France and Norway already have SAF mandates in place (<2%)

🇺🇸 United States			🇯🇵 Japan
Federal: – Renewable Fuel Standard (RFS) – Blenders tax Credit (BTC) – Clean Fuel production Credit – 45Q/V Credits **State:** – California, Oregon and Washington Clean Fuel programs			Announced 10% SAF Target, some initial trial flights and production.

			🇨🇳 China
			Target of c. 0.5 MT SAF in 2030, ongoing discussion to extend the ETS to aviation

🇧🇷 Brazil	🇪🇺 The EU	🇬🇧 The UK	🇹🇷 Türkiye	🇮🇳 India	🇦🇺 Australia
World-leading ethanol industry, plan SAF facilities	EU ETS, RED II, Fit for 55 in development	RTFO support, UK ETS, Mandate for 10% ER in 2030	Mandate for 5% SAF by 2030 in discussion	SAF mandate under development	Jet Net Zero council established, first facility announced

The World Economic Forum in collaboration with several stakeholders in the aviation value chain embarked on the Clean Skies for Tomorrow (CST) initiative in 2019 with the shared vision of transporting 100 million domestic passengers in India on SAF by 2030 on a 10% blend, which translates to 360,000 metric tons of SAF. However, this is voluntary at this point in time.

India is the third largest civil aviation market in the world today and is expected to double its air traffic by the end of this decade. Consistent with its position as one of the leading economies of the world and its commitment to the global net zero agenda, the government has made a pledge to progressively increase the use of sustainable aviation fuels (SAF) and use of new technologies to reduce aviation's carbon footprint. Leading airports in the country are invested in this cause and have plans to facilitate infrastructure for supply of SAF in their premises or to be procured from third-party sources, primarily oil companies and logistics service providers. Airlines on their part have also signed R&D agreements and supply contracts with oil companies to secure supply of SAF for their operations, consistent with the Indian government's intent and policy. These independent initiatives have also opened the scope for collaboration between airlines, airports, oil companies and regulators to ensure efficient use of capital and resources. However, these are just baby steps in the long battle for meeting challenging net zero goals.

Several airlines in India have started blending SAF in their one-off flight to be in the elite list of SAF users thus targeting sustainable way of flying. Recently, Air Asia flew a passenger flight using indigenously produced SAF blend by Praj Industries Ltd. supplied by Indian Oil Corporation Ltd. This SAF was manufactured using sugarcane molasses as indigenous feedstock and Alcohol-to-Jet (ATJ) technology. Blended SAF is operationally identical to kerosene.

From current global experience, the four most suited technology based on availability of feedstock in India as suggested by CST report could be:

1. Hydro-processed esters and fatty acids (HEFA), mostly from used cooking oil (UCO)

2. Alcohol-to-jet (AtJ) using agricultural residues and surplus sugar streams such as cane molasses and syrup

3. Gasification/Fischer-Tropsch (GAS-FT), using municipal solid waste and agricultural residues

4. Power-to-liquid (PtL) could be feasible based on hydrogen technology and access to point sources of carbon in the chemical, steel, and cement industries.

While on a global scale the production capacity is slowly ramping up, it may not be sufficient in the current context considering the supply demand gap expected by 2030.

India has feedstock for potential production of 19 to 24[1] million tons of SAF per year, whereas the estimated maximum requirement of SAF in India, considering 50% blend, is around 8 to 10[2] million tons per year by 2030 (could be more with fleet additions0029. Indian players such as Indian Oil Corporation, Praj Industries, Mangalore Refinery and Petrochemicals amongst others have already initiated their production plans to commensurate India's requirement in meeting this objective. While it may seem that India may be self-sufficient in terms of the current requirement, the cost dynamics for SAF may hinder its maximum use.

The SAF industry cannot be considered in isolation of other renewable fuel industries, with many feedstocks applicable to produce several types of fuel, and many other renewable fuel possible intermediaries for SAF production (such as ethanol and bio-methane). Renewable fuel facilities will attempt optimizing production to serve the highest value market, shifting production between road and aviation fuels. While SAF is currently more expensive to produce than fossil fuels, it can potentially provide much more value to the local economy – not just through reduced emissions, but also by enabling more jobs, incomes and economic growth across the entire value chain - construction, operations, and logistics, and many more in the aviation value chain[3].

In a price sensitive market like India, sustainability and emission reduction goals may not be enough for the deployment of SAF with its cost dynamics. For instance, as per Petroleum Planning and Analysis Cell (PPAC), India's yearly uptake of jet fuel is expected to increase by 17% to reach 8.6[4] million tonnes this year due to surge in air travel demand. This substantial increase in jet fuel consumption is expected to continue until 2030, increasing the need for SAF. Considering the growing global demand for SAF and the *green premium* it requires on top of the cost of fossil-based jet fuel to serve market needs, policy support is crucial to encourage adoption by targeted users if its voluntary or alternatively cross-

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[1] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1925417

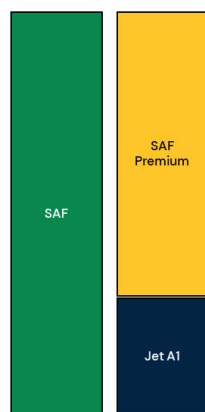[2] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1925417

[3] ICF SAF reports

[4] https://www.thehindubusinessline.com/economy/logistics/aviation-fuel-demand-to-surpass-pre-pandemic-levels-in-fy24/article66564107.ece#:~:text=India's%20consumption%20of%20aviation%20turbine,levels%20for%20the%20first%20time.
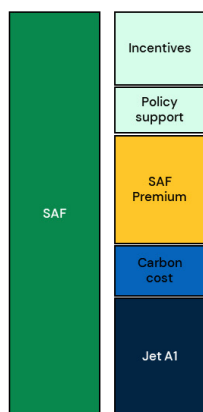
Role of SAF policies/incentives in reducing SAF premium (Illustrative)
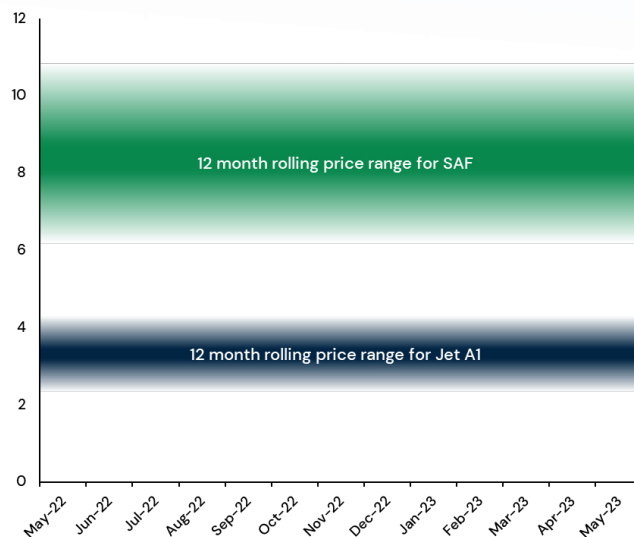USD per tonne SAF

Before policies/incentives | After policies/incentives

SAF vs Jet fuel price
USD/gallon

12 month rolling price range for SAF

12 month rolling price range for Jet A1

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subsidized if use of SAF is partly or fully mandated by policy.

India currently does not have a policy framework around SAF. The need of the hour is a country level SAF strategy and roadmap for implementation that maps actions to targeted net zero goals, with roles clearly identified for all stakeholders on this journey. This document should also call out policy initiatives and incentives that would facilitate a smooth and sustainable transition to SAF and adoption by airlines and other fuel consumers in the aviation value chain, given feedstock, logistics and pricing challenges. Here is an illustration of how the role of each stakeholder in this framework will be critical to make SAF a viable proposition for producers, facilitators and users:

1. **Government** – SAF policy support such as mandates, incentives, grants, tax benefits

2. **Feedstock suppliers** – ability to provide the

requisite feedstock by integrating modern technology.

3. **Fuel producers and suppliers** – Blend and efficient use of distribution infrastructure to transport the fuel at airports.

4. **Airports** – provide infrastructure at airports, cross-subsidize through a portion of user charges.

5. **Airlines** – Guarantee / secure uptake of SAF based on government mandate.

6. **End users** – payment of a reasonable green cess or surcharge on ticket price

India has the benefit of learning what works well and what does not from other major economies like the UK, US and Japan, who have already embarked on this journey and have created a favourable, evolving policy and regulatory framework. Some of their initiatives to move towards cleaner

skies and lower carbon emissions in an airport environment, are worth evaluating and replicating with improvements in the Indian eco-system, taking cognizance of local advantages and constraints.

The nascent SAF industry will require many technologies to be developed and commercialized, and this presents opportunities far wider than just the US, UK and EU markets which have a head-start in SAF production and policy driven mandates. India already has a strong foundation in renewable energy production and technology, with sufficient feedstock available across the country. Building capabilities and production capacities for SAF therefore should not be a challenge especially because of the emergence of a wider global market for SAF at least for another decade. India has the potential to lead SAF production and become a net exporter with self-sufficiency if the right policy framework and priority is accorded to this sector.

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Navigating the skies – Challenges and Opportunities for Regional Airlines

By Girish Nair, Partner & Aviation Sector Lead and Abhishek Somani, Manager - Aviation, KPMG India

The Indian aviation industry has witnessed remarkable growth over the past few decades, positioning the country as the third-largest aviation market globally. While most of the air traffic is between the Tier I-II/I-III cities, regional routes served by regional aircraft (<100 seats) have emerged strongly on account of policy incentives through RCS scheme, supported by the economic rise of Tier 2 and 3 cities and aspirational Indian middle class. Below graph shows that Tier 2 and Tier 3 airport connectivity contribution has increased from 5.5% in 2014 to 9.2% in 2023.

Airlines operating regional aircraft as a part of their fleet include the major airlines as well as airlines operating a dedicated fleet of regional aircraft to enhance regional connectivity.

The regional routes play a vital role in connecting Tier II, III and other remote areas to major cities, promoting travel, business, tourism, and boosting local economies. However, in the past regional airlines in India have faced a multitude of challenges, causing many of them to cease operations. As part of this article, we focus to dwell upon and evaluate the several challenges along with multiple opportunities for the regional carriers.

Domestic Traffic Split 2014, 2019 and 2023[1]

2014

- 43.8%
- 50.7%
- 5.5%

2019

- 35.9%
- 56.2%
- 7.8%

2023

- 31.9%
- 59.0%
- 9.2%

■ Tier I-I   ■ Tier I-II/III   ■ Tier II/ III-II/ III

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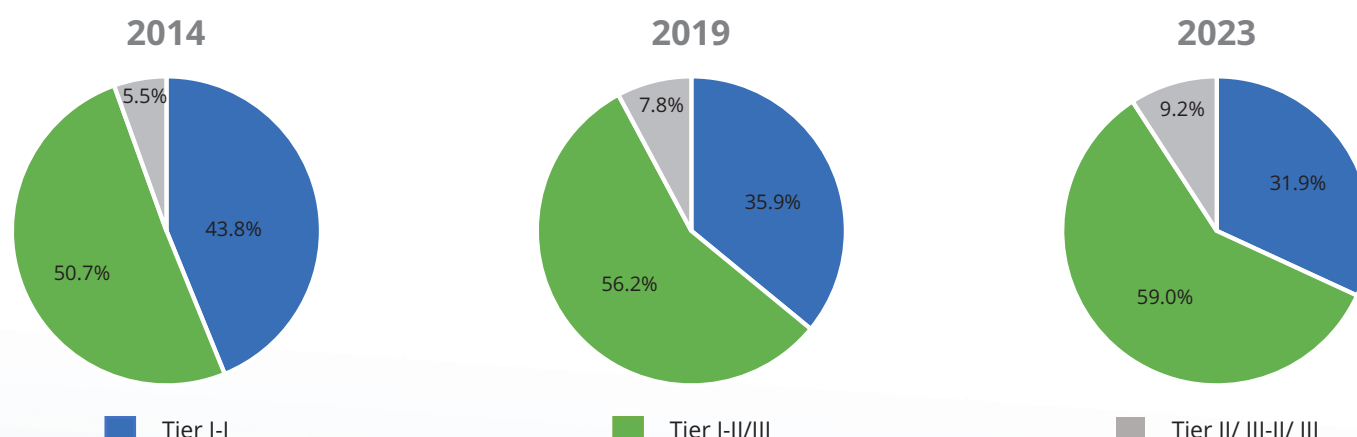
[1] Source – KPMG Analysis, Cirium

India's fleet of major airlines operating regional aircraft (<100 seats)

S. no.	Major regional airlines[2]	Base Airport	Total fleet	ATR-42/72	DHC Dash 8-400	ERJ 145LR/ E175	DHC-6 Twin Otter	Do-228
1	Indigo	Major airports	45	45				
2	Alliance Air	Major airports	21	20				1
3	SpiceJet	DEL, HYD	32		32			
4	Star Air	BLR	8			8		
5	Fly91	Goa (Mopa)	2	2				
6	FlyBig	Lucknow	3				3	
	Total		**111**	**67**	**32**	**8**	**3**	**1**

Opportunities:

1. RCS-UDAN Scheme:

UDAN (Ude Desh Ka Aam Nagrik) scheme has been pivotal in stimulating the regional air traffic demand. The scheme through its initiatives such as financial subsidies, route exclusivity, and infrastructure development has supported Indian carriers. It has led existing airlines to re-think about their business model as well as led to the start of new airlines and to take advantage of this opportunity. RCS has been pivotal in adding 13 mn passengers on more than 500 routes[3] to Indian skies. The scheme will be completing its 10th year in 2026 and it has constantly evolved itself through addition of seaplane routes, scheme for helicopter connectivity and north-east connectivity during its 5 phases of implementation. However, the Government needs to evaluate the challenges faced by the regional airlines during the current scheme for a sustained growth in traffic in the coming years.

2. Latent air traffic potential of Tier 2 and Tier 3 cities:

Fast pace of urbanization in India is a critical enabler for future aviation development and strengthening India's position as global aviation leader. The Indian cities accounted for 460 mn population in 2018 which is expected to increase to 876[4] mn by 2050, accounting for 50% of the Indian population. This is expected to give rise to creation of several new regional/ smart cities (tier-2 and tier-3) with aspirational young population with opportunities to connect to the metro cities (Tier 1) and beyond.

However, the current traffic contribution of Indian airports other than the top 30 airports is a meager ~9%[5] however, in the US and China, it is ~29%[6] and ~22%[7] of their respective total passenger traffic. India has a significant growth potential in the regional air traffic and regional airlines should be focused on tapping this demand to fuel India's aviation growth engines.

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[2] Sources-www.goindigo.in, date accessed: 10 April 2024; allianceair.in, date accessed: 10 April 2024; corporate.spicejet.com, date accessed: 10 April 2024; starair.in, date accessed: 10 April 2024; https://www.planespotters.net, date accessed: 10 April 2024; fly91.in, date accessed: 10 April 2024 Fleet details are dynamic and subject to change this is as on 10 April 2024 as per above sources

[3] Source - pib.gov.in, date accessed: 10 April 2024

[4] Source – niti.gov.in, Cities as Engines of Growth May 2022, date accessed: 10 April 2024

3. Partnerships with airports and major airlines:

Partnering with mega carriers have been a successful business model for the regional carriers.

The largest regional airline in US (operating dedicated fleet of regional aircraft with less than 100 seats) runs its operations through a partnership arrangement with the mainstream or hub carriers. It connects the regional airports to the hub airports thereby providing feeder traffic to the hub carriers. To enable this feeder connectivity, it gets a fixed fee on majority of its flights irrespective of the passenger throughput.

Keeping in view the above scenarios, a few key takeaways for India to develop its regional traffic could be:

→ India's largest airline operates the fleet of 45 regional aircraft with only 5 aircraft pending for delivery. However, it has not purchased/ordered a new ATR for last 7 years leading to speculation that the airline has limited expansion plans in the regional space. Further, privatization of flag carrier of India has resulted in splitting of its regional arm (which is under Govt. control) from the main airline, limiting its ability to serve the regional routes. Regional airlines can develop or enhance their network at a hub/large airport in partnership to connect feeder traffic to the network of these main carriers'. Marketing the flights under this partnership will be key to its success. This will allow the regional airlines to diversify their revenue streams beyond the RCS scheme and profitable regional routes.

→ Development of domestic hub airports – In collaboration with the airlines, airports can develop themselves as a domestic or regional hub by connecting the regional airports in its catchment to the entire country. This will enhance transfers from the hub airport provided the current airport infrastructure supports airlines and passengers through optimized and minimum connect time. Key areas to focus would be syncing of the airline schedules, efficient terminal layouts, inter-terminal transportation, and dedicated transfer facilities.

4. Strategic Alliances:

The ongoing push for creating tourism opportunities in India, unlocks a new dimension for regional airlines. Regional airlines can identify the upcoming/developing tourist hotspots and partner with travel companies and other players in the hospitality sector to expand their base and revenue streams. Partnering through incentives with group of state governments with intra-travel movement for development of niche market routes between the airports and cities not covered under the RCS scheme can be helpful for airlines.

Further, MoCA with strategic stakeholders in the ecosystem is focused on development of hub airports in India to limit the erosion of Indian traffic to foreign hubs in middle east and Asia-Pacific. Regional airlines can develop its network to strengthen the hub ecosystem in India.

5. Focus on Niche Markets:

Given that a regional airline has a focused presence in a certain region, they can foster a much better understanding of the need of the travelers commuting to and from that region. Based on these insights, the regional airlines can deploy regional aircraft aligned to the market requirement and offer reasonable fares with value added services to these customers, thereby setting themselves apart from airlines which follow a standard national pattern. This will also allow these regional airlines to gain recognition and garner customer loyalty.

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[5] Source – www.aai.aero, date accessed: 10 April 2024

[6] Source – bts.gov, date accessed: 10 April 2024

[7] Source - en.wikipedia.org, date accessed: 10 April 2024

Challenges:

1. Unviable business model without RCS scheme:

The RCS Scheme was meant to function as a catalyst to start a new route. In line with the same, new routes were subsidized (VGF) for the first three years. After the period gets over and the subsidy stops, affordability has become a factor on multiple routes, leading to low traction and subsequently complete cancelation of the route. As per the reports, out of the 774 routes awarded under UDAN 1, 2 and 3, only 371 (~50%) routes had commenced operations. Due to low demand and operational challenges, only 112 routes completed the subsidy period of 3 years. Further, due to the ceasing of subsidy, only 54 routes connecting 17 RCS airports were still operational in March 2023. Further, the routes which continue operations, witness high cancellations. Due to low traction and subsequent cancelations, regional airlines are not able to develop its brand loyalty among the target passengers leading to further deterioration of operations.

2. Operational challenges:

Indian aviation sector lacks skilled manpower including pilots, technicians, etc. On account of their small scale of operations, it is difficult to hire/ retain skilled manpower, especially when the country is expected to face aviation manpower shortage in the next decade.

3. Airport infrastructure constraints:

Mega airports of the country such as Delhi and Mumbai Airport already face traffic congestion – leading to a shortage of slots at peak hours for regional airlines. Without the peak hour slots, regional airlines find it difficult to provide feeder traffic to the larger domestic network of the airport in reasonable connect time. The new regional airlines have started operations from Manohar International Airport, Goa, a greenfield airport where the airport has capacity during peak slots. Similarly, other regional airline is operating out of Kempegowda International Airport, Bengaluru which has recently undertaken significant capacity addition. With the addition of new greenfield airport in Mumbai and Delhi, regional airlines may get an opportunity to expand their operations.

4. Competition from other modes of transport:

Regional airlines serve destinations within a distance of less than 500 km from the operating airport. With the passenger waiting time at the airport, which sometimes exceeding the duration of the flight itself, makes flying less attractive as compared to other modes of transport such as highways and expressways.

Summary:

The Aviation Sector is one of the sunrise sectors in India in the next decade, courtesy to revolutionary government initiatives such as the RCS UDAN scheme. As per the latest estimates, the scheme is already responsible for activating more than 75 airports/ airfields and more than 500 routes[8]. RCS scheme needs to evolve itself after completing its first 10 years as the increase in the spending power of population in Tier 3 and Tier 4 cities will lead to stabilized regional air traffic demand. Further, the regional airlines need innovative strategies such as partnering with major airlines, airports, developing strategic alliances, etc. Each airline will need its tailor made strategy to operate in the challenging skies of India successfully.

Large home markets like US and China operates ~8x and ~4x aircrafts than India, and still shows potential for growth. This shows the potential of the aviation sector in India. Therefore, despite the challenges faced by the regional airlines, it is important for the industry to continue the work initiated in the recent years with more vigor and intent and continue connecting every part of India.

Logistics Plus India Finds the "Missing Link" for Global Supply Chains

By Sundresh Sarup , Managing Director, Logistics Plus India

Logistics Plus India Pvt. Ltd. (aka LP India) is a leading provider of freight forwarding, project cargo, warehousing, global logistics, and supply chain solutions. LP India, now with 9 offices across the country, is an important division of the U.S.-based Logistics Plus, Inc., which maintains its global headquarters at the historic train station in Erie, Pennsylvania. Logistics Plus, or simply LP as employees often call it, was founded by Jim Berlin, its current CEO, 26 years ago as a lead logistics provider for GE Transportation, a global manufacturer of equipment for the railroad, marine, mining, drilling and energy generation industries.

Jim Berlin, Founder & CEO of Logistics Plus Inc.

Logistics Plus now serves thousands of customers, including several prominent Fortune 500 companies, with over 1,000 employees operating in 45 countries around the world. Despite its growth and diversification,

GE Transportation, now known as Wabtec Corporation, is still a major client for the company. In fact, LP India has been playing a critical role in supporting the inbound, customs, and unloading aspects of importing these massive locomotives into the country as part of its well-publicized contract for 1,000 new units for Indian Railways.

LP India supports the import of Wabtec locomotives for Indian Railways.

Logistics Plus has been doing business in India for two decades now. Over the past 11 years, Mr. Sarup has overseen rapid growth and expansion that now includes branch offices in Ahmedabad, Bangalore, Chennai, Hyderabad, Thane, Mumbai, New Delhi, Patna, and Pune.

With years of expansion and growth also comes change. Logistics Plus India is no longer known as just a freight forwarder or project cargo provider. They are a complete supply chain management company with service offerings and clients across nearly every industry. One of those new offeringsInternational

Logistics Plus Global HQ in Erie, PA USA

Express service. LP India began an exclusive partnership with FedEx to handle express inbound and outbound loads. After engaging with them in February 2020, the express service became a survival tool for many customers. During the pandemic, LP India was responsible for transporting urgent shipments that included medicines, medical equipment, personal protective equipment (PPE), and more. As the pandemic subsides, the Logistics Plus India team looks forward to continuing this service and becoming a leader in the International Express space.

Another major growth area for the company is on the warehousing side of logistics. In the United States alone, Logistics Plus has over 5 million square feet of warehousing and fulfillment space that is strategically

Ankush Rajurkar, COO for LP India, Jim Berlin, and Sundreysh Sarup, Managing Director for LP India

located across the country. LP India has started to follow suit by implementing its own warehouse management solutions. Sundreysh and his team currently manage a warehouse in India that is dedicated to Whirlpool, a global appliance company.

As it has the past few years, LP India's growth in the aviation industry continues to shine. The company has dedicated aviation logistics specialists that handle consignments for airports, equipment suppliers, navigational support companies, and airlines and part manufacturers. In it's client base, LP India works with some of the most prominent airlines in the world to help develop customized logistics solutions that fit their needs.

Sundreysh Sarup says 'passion for excellence' is what sets LP India apart from other logistics companies

So, what's next for LP India?

According to Mr. Sarup, the goal is to continue to grow by providing the company's signature 'passion for excellence' service in all aspects of supply chain management. That includes full support of the ACP and its many member companies. Mr. Sarup adds "Many logistics companies say 'no' when someone goes to them with a major supply chain issue. Logistics Plus India won't do that. We find a way to say 'yes'. It's how the company was founded and how it will continue to operate."

L3Harris expands avionics and pilot training footprint in India as the region gears up for rapid growth

By Robin Glover-Faure, Vice President Sales & Marketing, L3Harris Commercial Aviation Solutions

According to the Economist, as of November 2023, India has 149 operational civil airports, twice the number of a decade ago, and opened four new airports and four new terminals in 2023. The rapid growth of India's aviation industry has been coupled with airlines, such as IndiGo and Air India, purchasing aircraft from Original Equipment Manufacturers (OEMs) in record numbers.

Passenger air travel in recent years paints a similar picture. According to Business Today, domestic traffic has grown from 105 million passengers in FY2021 to 270 million passengers in FY2023, equating to a 157% increase in air travellers.

These stats highlight the ambition and growth of a country establishing itself as a major player in the aviation world on a global scale. L3Harris Technologies recognizes India's growing significance and has been expanding its footprint in the region over the past several years to build and develop relationships with airlines, in support of their ambitious growth plans.

Supporting top-tier Indian customers

With an Avionics Repair Centre in Bangalore, L3Harris has been providing both military and civil aviation customers with mission critical Avionics since 2015. The Directorate General of Civil Aviation (DGCA) approved Repair Centre supports Flight Data Recorder (FDR) repairs for OEMs and major airlines in the region with plans to expand capabilities to support the latest generation of FDR and Cockpit Voice Recorder (CVR), the SRVIVR series.

Working in partnership on a Mission of innovation to create safer skies

L3Harris works closely with customers to offer solutions that are strategically aligned and extend across multiple facets of commercial aviation, with the objective of helping airlines mitigate risk and maximize operational efficiency. With a global footprint, L3Harris is uniquely positioned to deliver comprehensive, integrated solutions to customers ranging from cutting-edge Avionics to state-of-the-art Pilot Training. In fact, more than 50,000 aircraft worldwide have L3Harris avionics installed, including major Indian operators.

Flight Recorders

L3Harris flight recorders are on almost every commercial, regional, military and business aviation platform. Developed with customers high-level safety standards and processing requirements in mind, L3Harris FDRs and CVRs are installed on Air India, IndiGo, SpiceJet, Air Vistara, Fly91 and Akasa Air aircraft.

In February 2023, Air India announced a record-breaking order for 470 new aircraft, including 181 Boeing 737 MAX, for its Air India Express affiliate. L3Harris was selected as lead supplier of voice and data recorders for most of these aircraft. One hundred aircraft, due to begin roll-out in 2025, will be equipped with the pioneering SRVIVR25 Voice and Data Recorder with the possibility for an additional 40 aircraft in 2028.

Surveillance

Providing pilots with a precise forward field-of-view for surrounding aircraft up to 100 nautical miles away the Terrain Collision Avoidance System (TCAS) is another way L3Harris is helping Air Vistara (an affiliate of Air India) and IndiGo maximize flight safety for passengers in the region and across the globe.

Flight Data Intelligence

As a global leader in flight data services, L3Harris helps companies such as Reliance Commercial Dealers connect its data to an industry leading analytics service that accesses a global database of millions of flights. This enables them to accurately benchmark their data against similar (anonymized) aircraft operators. This comprehensive Software as a Service (SaaS) capability integrates into operator's Safety Management Systems (SMS) helping improve safety, efficiency and sustainability.

Pilot Training

Hardware and software onboard the aircraft is not the only way L3Harris is supporting the rapid growth in India, it's also leaning into its well-established heritage of pilot training. From state-of-the-art simulation devices to world-class tuition, L3Harris offers industry-leading training and technologies tailored to customers exact requirements.

As airlines such as Air India and IndiGo increase their fleet size it generates a need for more pilots, which, in turn, puts pressure on flight ops to recruit and train to the required level. With more than 30 years of experience and training locations on three continents, L3Harris offers several options to Indian airlines looking to upskill existing pilots or train new ones – and all configurable to specific Standard Operating Procedures (SOPs).

Upskilling the qualified pilot talent

In the past 12 months, L3Harris has supported both Air India's and IndiGo's expansion programs with A320 and ATR Type Rating training for newly qualified pilots at the London Training Centre (LTC) and Bangkok Training Centre (BTC), both conveniently located within, or just minutes from, an international airport.

Looking to the future: Airline Ready Pilots

Training, or re-training existing pilots and up-skilling newly qualified pilots, are just two ways of ensuring an airline has the capacity needed to fly the fleet. Air India and IndiGo are also joining forces with L3Harris to take a longer-term view, looking at ways to future proof capacity and ensure they have the required pipeline of highly skilled pilots ready to take to the flight deck.

From its Academy in Sanford, Florida, L3Harris has teamed up with Air India and IndiGo to provide ab initio pilot training for aspiring aviators with little or no previous experience. Students recruited onto these programs go through a rigorous selection process, devised with, and approved by airlines, to ensure successful applicants have what it takes to become a commercial airline pilot. These integrated training programs combine theoretical knowledge with hands-on flying experience. Partnerships between L3Harris and training providers in India, for Ground School and License Conversion, ensure a regular flow of Airline Ready Pilots from the Academy and onto the flight line.

High fidelity training technology

Not all pilot training must be outsourced, and Air India already recognizes the benefit in owning their own L3Harris high-fidelity full flight simulator (FFS). With two FFS devices located at Air India's Mumbai training centre, the airline has capacity to train its own 777 and 787 pilots as well as offer additional capacity to other operators. This provides both an ancillary revenue stream and increases training capacity in the region.

Cementing a robust future collaboration

In June 2023, Air India awarded L3Harris an order for two B737 MAX and one B787 full flight simulators to support its new pilot training centre in the National Capital Region of Delhi. This visionary Air India Aviation Academy training centre is planned to be a 24-bay

training center for Boeing and Airbus and will have the capacity to fulfil pilot training requirements for Air India and other regional operators, empowering the Indian aviation industry to meet the growing domestic and international demand for air travel.

The view from our President

"We are steadfast in our commitment to developing and nurturing long-term partnerships with top-tier customers in India. We take pride in our contribution to this rapidly growing aviation market, especially our developing relationship with Air India as they realise their vision to open India's largest crew training centre," said Alan Crawford, President, Commercial Aviation Solutions, L3Harris. "This project will not only bring much needed training capacity for the country's airlines, but also create deeper-rooted benefits to the region such as employment opportunities and the potential for further investment."
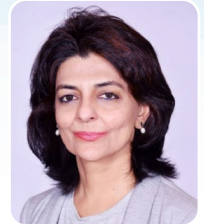
Pratt & Whitney: Committed to Harnessing India's Aviation Talent & Capabilities

By Ashmita Sethi, President & Country Head, Pratt & Whitney, India (UTCIPL)

As a world leader in the design, manufacture and service of aircraft and helicopter engines, and auxiliary power units, we have a proud history of supporting India's aviation growth for more than seven decades. Today, Pratt & Whitney's PW100/150 turboprop engines form the backbone of India's regional aviation growth – connecting people and growing economies and in military aviation, our F117 engines power Indian Air Force's (IAF) C-17 Globemaster IIIs, while its PC-7 trainers are powered by the iconic PT6A engine. We are proud of the fact that twin PW127Gs power IAF's 56 Airbus C295 aircraft.

IndiGo operates A320neo family aircraft with Pratt & Whitney GTF™ engines, which deliver industry-leading environmental benefits, thanks to the unique geared fan architecture. Since 2016, the GTF has saved operators 5 billion liters of fuel, and 15 million metric tons of CO_2 globally. India was an early adopter in this technology, and Indian operators account for about 20% of these savings – that's more than a 1 billion liters of fuel and 2.5 million metric tons of CO_2 in India.

Powering Sustainable Aviation

The geared architecture, which is scalable, will be the foundation for next generation platforms. The next generation GTF Advantage will provide additional thrust, fuel savings, and durability. It is being tested to unprecedented levels and we expect the GTF Advantage engine to be attractive to the India market. Our work on the GTF Advantage is just the first step on the long road to future propulsion systems that will fulfil aviation's commitment to net-zero carbon emissions by 2050.

RTX business units Pratt & Whitney and Collins Aerospace are also developing sustainable solutions for regional aircraft that operate in the UDAN segment like the hybrid-electric propulsion technology and flight demonstrator program. The program achieved a critical milestone last year, successfully completing a rated power test of the demonstrator's 1 megawatt (MW) electric motor, developed by Collins Aerospace (Collins). The 1MW motor will be combined with a highly efficient thermal engine, developed by Pratt & Whitney, as part of a hybrid-electric propulsion system that aims to demonstrate a 30 percent improvement in fuel efficiency and CO_2 emissions compared to today's most advanced regional turboprops.

While we are still in early days of developing technologies like the hybrid electric, we are also

looking to demonstrate its potential on larger scale GTF engines for single-aisle aircraft. As battery technology continues to advance, efficiency benefits of hybrid-electric systems will only increase.

Pratt & Whitney's legacy in India, goes beyond just powering 600+ aircraft that we do today. Pratt & Whitney has been advancing aerospace and defense growth in India through its investments in engineering, training, supply chain, digital capabilities, and innovation.

Investing in Aerospace Training

Our flagship investment was the India Customer Training Center in Hyderabad in 2015. Established in 2015, Pratt & Whitney India Customer Training Center represents one of our first major investments in-country. It is only the third such Pratt & Whitney training facility in the world. Successful entry-in-service (EIS) for aircraft powered by Pratt & Whitney advanced engines, depends heavily on the availability of trained technicians and engineers who can maintain them and that makes the India Customer Training Center (ICTC) critical to aviation. Approved by aviation regulators such as Directorate General

of Civil Aviation and European Aviation Safety Agency – it provides specialized training on our engines powering advanced aircraft to our customers' airline engineers and technicians. So far, the ICTC has completed more than 15,000 student days of training and has imparted training to over 60 operators.

Investing in Engineering & Training

In January 2023, we officially opened the doors to our new India Engineering Center (IEC) in Bengaluru, India. The facility is co-located with Pratt & Whitney's India Capabilities Center (ICC) and Collins Aerospace engineering and global operations centers. We have made a $40M+ financial investment in both the IEC and co-located India Capability Center. The meaningful

work conducted at Pratt & Whitney's IEC – by some of India's best and brightest minds – will support cutting edge technology that is poised to drive the future of commercial flight.

Investing in Supply Chain

Pratt & Whitney is continuously developing its supply chain in India. We have been working with Indian suppliers for over a decade in machining and assembly, and our network includes leading aerospace suppliers such as Indo-MIM Pvt. Ltd., KUN Aerospace Pvt. Ltd., Titan Engineering & Automation Pvt. Ltd., Lakshmi Machine Works Ltd., PMI Engineering Exports Pvt. Ltd. and Magellan Aerospace Pvt. Ltd.

We have sourced nearly $55 million in the past 10 years from India from leading aerospace suppliers. We have also sourced over $500M in Engineering Services into India over the past two decades. We aim to expand our sourcing in India to reach nearly $150M annually by 2030.

Investing in Innovation

As makers of some of the most advanced, and sustainable aircraft engines in the world – we are constantly innovating and advancing our aftermarket services, and using data, computer vision, Artificial Intelligence, Machine Learning and Augmented Reality to deliver efficiencies to our customers. Last year, we announced the launch of Percept – an advanced AI-based Aircraft Engine Analysis Tool. Percept Computer Vision Product" or "PCVP" is a Pratt & Whitney specific computer vision product designed by Awiros, an Indian start-up. Percept can identify missing components from aircraft engines by analyzing images of different engine sections. This tool can help in reducing the time as well as the effort involved in the pre-and post-lease inspection of aircraft engines.

Investing in Communities

Our community outreach programs focus on inspiring the next generation, empowering employees to positively impact their communities and emphasizing innovation and technology. In India, our community outreach includes STEM labs in partnership with United Way Bengaluru, providing STEM scholarships to deserving engineering students from underprivileged backgrounds, and supporting Indian nonprofits for E-STEM education programs.

Pratt & Whitney's over 600 direct employees across the country are committed to building capabilities and delivering high value services to our customers and we are committed to harnessing more of the talent inherent to India, growing our business while investing in the local industry – as part of our broader RTX vision for India.

Pratt & Whitney
An **RTX** Business

A SOLUTION FOR EVERY SKY.

With the world's most diversified jet portfolio, the Cessna® Citation®
jet family carries you and your business forward. Pushing the limits
of engineering and design, and restlessly thinking of new ways to
innovate and challenge the status quo. Choose from a full range of
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M2 GEN2

CJ3 GEN2

CJ4 GEN2

ASCEND

LATITUDE

LONGITUDE

Cessna | Beechcraft
BY TEXTRON AVIATION

ACP Members roundtable with Ministry of Civil Aviation on "Shared Best Practices for Future Needs" on July 24, 2023

A meeting between U.S. TSA delegation led by Gary Renfrow, Assistant Administrator for International Operations, US TSA and Govt of India delegation led by Rajiv Bansal, Secretary, Ministry of Civil Aviation on 31st July 2023

Congratulations to Minister Counselor Drew, Phil, DJ and team for receiving Mission Honor and a Econ section Meritorious Honor Award from Amb. Garcetti on 18th August 2023

Celebrating 10 years of logistics plus in India !! Congratulations Sundresh and team

Principal Commercial Officer Raghavan Srinivasan attended the inauguration of FedEx's first Advanced Capability Community on 9th December 2023 in Hyderabad, leveraging high-end talent and pioneering innovation. Raj Subramaniam, President and CEO of FedEx Corporation, Richard Smith, President and CEO of FedEx Airline and International, and the Consul General of Hyderabad were among the Guests of Honor

Memorable lunch with outgoing Jt. Secretary S.K. Mishra on 20th December 2023. We applaud his valuable contributions to the industry during his tenure and wish him the very best in all his future endeavours

An interesting discussion with GMR leadership on their huge growth plans for airport developments and focus on skills and training on 17th January 2024

Mehnaz Ansari, Sr. Regional Representative - South Asia, Indo Pacific Region - USTDA during U.S. – India Biofuels Summit on the best practices and technology adoption for producing Biofuels as shared with India by US on 23rd April 2024

ACP Executive Program Director Sandeep Bahl moderated USTDA's Climate Technologies Action Group Forum on 27th March 2024

FedEx team meeting with Dr. Sharad Kumar, Member (Ops.) & In-Charge Member (Plg.), AAI
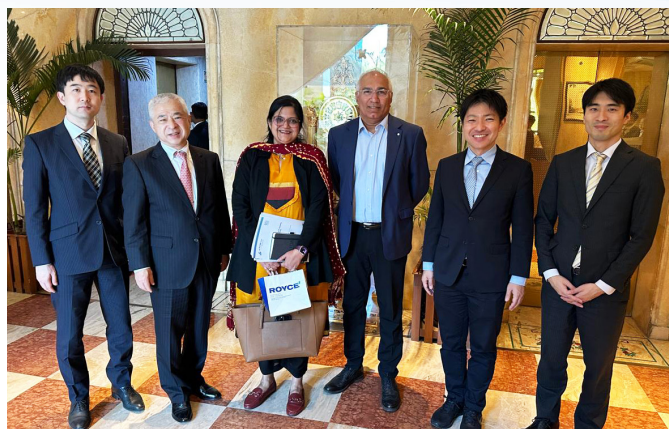
ACP – USTDA team meeting with Japan Delegation (JTTRI - AIRO)

(L-R) Sandeep Bahl, Executive Program Director-ACP; Ashish Modi, President, Honeywell – India & Ankur Malhotra, Director – Government Relations, Honeywell India

ACP Members at panel discussion on International collaborations and investments in Indian MRO

(L-R) Sundresh Sarup, Chairman – ACP; Massimo Morin, Head – Amazon (AWS) Travel and Hospitality; Prof. Hamsa Balakrishnan, MIT; Sandeep Bahl, Executive Program Director – ACP

Jonathan Heimer, Minister Counselor for Commercial Affairs with Sreedhara Panicker Somanath. Chairman – ISRO during Blue Origin reception

MOOG – The leader in Aircraft Flight Control Actuation Systems

By D. Krishna Mohan, Director, Customer Support – Aerospace & Marketing Group (Middle East, Africa & India), MOOG

launch vehicles, missiles, and marine systems. We are world leaders in flight control systems and critical control products for the aircraft industry. We provide premier motion and flow control solutions provider for the space and defense industries. Moog has over 13000 employees globally with sales over $3.0B.

Our engineers have developed the capability to design and manufacture the most advanced motion control products for aerospace, defense, industrial, and medical applications – where precise control of velocity, force, acceleration, and fluid flow are critical. Our motion control portfolio has expanded to include all forms of actuation technology, sophisticated control electronics, and system software. We are positioned today on virtually every aircraft in the marketplace.

Moog is a designer, manufacturer, and integrator of precision motion control products and solutions. Our high-performance systems control military and commercial aircraft, satellites, and space vehicles,
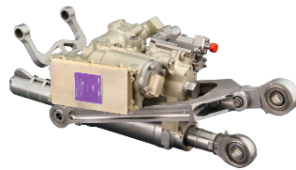
Credit: U.S. Army
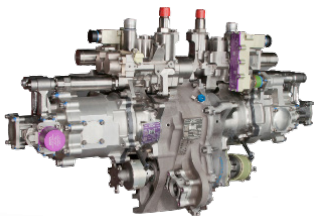
We are a leading integrator of precision motion control systems, and our products reflect the culture that our people embrace – a culture where the opportunity to solve a challenging control problem is always welcomed.

Innovation is how we grow as a company. We are investing in future technologies that we believe will have a great impact in industries from space, defense, aircraft, industrial, medical, and more. We're leveraging new technologies with our amazing employees to come up with groundbreaking ideas.

Moog India Technology center

Moog India was established in 1990. With the impetus from the Aircraft Group, Moog India Technology Center (MITC) was pioneered in 2008 in Bengaluru, India with a focus on research & design on Aerospace. It has witnessed strong growth since then in the areas of design, development, and integration of precision motion control systems for commercial & military aircrafts, business jets and avionics HW & SW. Our facility is equipped with state-of-the-art, best-in-class infrastructure to bolster our services and delivery capabilities.

Moog India Technology center is spread across 4 acres in Electronics city, Bengaluru. The facility houses more than 250 professionals with leading-edge engineering expertise. With significant capital investment, company is surging ahead to create further opportunities for professionals in the field of aerospace and defense.

Being one of the major design centers for Moog Aircraft Group, we are focusing on investing our talent pool on research and development of aerospace and defense technologies. Be it development of sensors, or Actuators or composite materials or Flight worthy electronic components, the India technology center is partnering with various suppliers in the region to be ahead in the market.

Moog India has Federal Aviation Administration (FAA) conformity inspection delegation for aircraft LRU qualification programs of major Aircraft OEMs. This is a significant cost savings in terms of resources and time.

Supplier/ Partners footprint & collaboration with MSME

Moog believes in connected and sustainable ecosystem for the industry as well as for the society. Moog has

established robust supplier base and continues to develop new partners in India and surrounding regions. Moog has closely worked with these suppliers and has brought them up in speed and quality over the period of time. Notably, these suppliers are part of the supply bases in local region and are serving the wider industry needs.

Moog is partnered with nearly 40 Aerospace suppliers in the region for Machining, Special Process, Calibration, Test Equipment, Cable Harness, PCBs, and other commodities. We are associated with nearly 50 MSME suppliers as on date. We are continuously exploring options to develop suppliers for other commodities of the Aircraft. This has created more than 200 indirect employments from Moog. With an intention to further bolster the growth of Aerospace and defence segments in the region, Moog continuously works with suppliers and partners to improve their skill which in turn helps the society.

In collaboration with our Aerospace suppliers, Moog is developing complex actuation components for aerospace & defense applications. These components are used on various aircraft platforms.

Value creation

Moog is part of various Industry bodies, such as, InAQG, SAE, AMCHAM & ACP. Through these associations, Moog is closely connected with Indian Government officials, industry and academia for knowledge dissemination and wider values creation. Moog has been part of the various Standards bodies; creating Standards for the global Aerospace Industry.

In 2016, Moog India took the initiative to establish an Indian chapter of the International Aerospace Quality Group (IAQG) under the Asia-Pacific Aerospace Quality Group (APAQG), called as InAQG. The aim of InAQG is to enable the Indian Aerospace and Defense industries to align with and contribute to Global Aerospace Quality Standards and the membership has now grown to over 120 companies, which includes both Indian and global OEMs.

A significant number of Moog experts have been associated with the national level events as organizers, speakers, Juries, and mentors. Moog has been sponsoring multiple events every year to support the eco-system of the aerospace and defense industry. Moog has been associated with various universities in designing curriculum for technical courses. Moog has developed and built various types of science equipment and donated to the technical institutes in local region to assist students in practical learning of Science and Technology.

On social front, Moog has been deploying its CSR funds in various areas, such as, education, medical infra-structure, support to the special needs for physically and mentally challenged citizens, elevating life standards of the destitute and underprivileged citizens, etc.

Skill development / Industry Academia

Moog India has actively partnered with many local institutes/universities and support in skill development of young engineers by giving opportunity to learn on the job through our short term and long-term internship programs for graduate and post-graduate students. We support industry visits that helps students to understand aerospace industry, Moog's contribution and they get to see our actual working set-up, labs and overall facility tour.

Our subject matter experts visit various institutes/universities as jury for events and deliver guest lectures to share industry experience and expectations to connect academic subjects to industry application. We participate as jury/guest in special events (such as Aerothon, Aerocon, etc.) that encourages budding engineers to showcase their technical talent and learn from expert mentors.

Co-development

Moog has collaborations with several Indian partners to provide solutions for Indian Aerospace & Defense market needs. Genesys Aerosystems, a Moog

company, is working on many of the Indian Defense programs furthering the relationship between India and US on Aerospace and defense technology. Moog is working closely with Indian MSMEs, HAL, NAL, and other establishments since 2018, to have local development & service of state-of-the-art Avionics.

Working with HAL on new and upgrade of the glass cockpit for Dornier 228 aircraft

Working with NAL on development of complete Avionics system for SARAS MKII

Moog is proud to have associated with the prestigious LCA program since its very early days. Moog Actuation system on LCA has performed with great reliability. Moog has supplied multiple ground equipment's and simulators for various programs of HAL and other defence bodies. Moog has worked with some of the domestic aerospace companies for testing services. Apart from this, Moog India has established

Credit: Genesys Aerosystems

capabilities for MROs globally and can support similar initiatives in India.

With our decades lasting relationship with Indian military programs and our expanding engagements in the Asian regions, Moog see tremendous opportunities to engage in the newer areas. If need be, Moog will be open to explore engagements in local region either directly or through any suitable partners.

Moog Headquarters - East Aurora, New York

Bell's Bright Future in India's Helicopter Industry

By Wg. Cdr. Shriram Ghatpande (Retd.), Business Development Director India & Nepal, Bell

Bell Textron Inc., a Textron Inc. company, is a leading manufacturer of commercial and military helicopters around the globe. Bell has a reputation for excellence in customer service, innovation, and quality, and Bell supports customers in over 120 countries.

Bell has equipped Indian customers for over six decades. The iconic Bell 47 first visited India in 1956, transporting Sir Edmund Hillary and Tenzing Norgay, and served as the Indian Armed Forces' initial trainer helicopter.

Since introducing the first helicopter to India in 1956, Bell's Indian fleet has grown from two aircraft in 1994 to over 90 currently. Today, Bell helicopters are featured prominently across multiple sectors in India, including tourism, corporate transport, emergency response, and government applications. Particularly widespread are the Bell 407 commercial helicopter and Bell 412, renowned for performance and cost-effectiveness.

The Indian commercial helicopter market outlook remains vibrant with Bell aircraft engaged in diverse national operations. Several high-potential sectors present expansion opportunities:

Helicopter Emergency Medical Services (HEMS)

Emergency response demand arises from India's vast terrain and population. Bell helicopters like the Bell 429 and Bell 412 suit air ambulance, firefighting and search/rescue needs with speed, range, and payload. The Bell 429 especially addresses Indian air ambulance needs with twin-engine power and a spacious cabin for medical crews and advanced life support equipment.

Besides the twin engine Bell 429, the Bell 505 is the only HEMS-capable short light single aircraft in the market with the speed and range to aid global communities and save lives. A range of cabin configurations from a quick-change casualty evacuation system to a complete HEMS interior, provide the flexibility to meet specific mission requirements.

In the long light single segment, the Bell 407GXi is a proven IFR-capable platform for HEMS operators across the globe. With patient care as paramount, the widest door opening in its class and ease of configurability provides medical staff a capable and reliable solution.

For operators requiring a medium twin helicopter for HEMS, the Subaru Bell 412 EPX provides an open and flexible cabin with room for crew and specialty medical equipment. Driven by a legacy of upgrades and modernization over four decades, the 412EPX delivers improved transmission and power in hover.

Looking ahead, the Bell 525 will set the standard for the future of vertical lift and in the HEMS segment. With its expansive and easily customizable cabin, it provides HEMS operations the flexibility and the space for complex missions and specialty equipment.

Tourism

India's natural beauty and cultural attractions drive a booming tourism industry amenable to aerial sightseeing. Destinations in the Himalayas, Kerala and Rajasthan showcase India from the air. The Bell 505 offers panoramic views and spacious cabins ideal for helicopter tours.

Oil & Gas

Oil, gas and mining rely on helicopters to access remote worksites. Bell aircraft have a proven track record worldwide transporting crews and cargo in energy production via power, performance, and high-altitude capability. Models like the Bell 412, Bell 429 and Bell 525 are go-to solutions.

As India's economy and middle class expand, emergency services, tourism, and energy sectors will surge in demand. Well-positioned to support this growth, Bell will provide high-quality, reliable helicopters and a leading global aftermarket support and service network augmented by Bell customer service and product support engineers across the globe.

Bell established operations in India in 1995 via a liaison office in New Delhi. Today, with over 130 employees across offices in New Delhi, Bangalore and Mumbai, Bell and Textron maintain a substantial India presence, with a local sales and aftermarket team to support our customers in India.

Essential Skills for India's New-Age Leaders

By Harvinder Singh, Director - Business Services & Head - Middle East & India, United Airlines

India's dynamic landscape demands a breed of leaders who can navigate complexity, inspire teams, and achieve success without compromising on ethics or the company's well-being. Here are some key skills to cultivate for aspiring leaders in India:

Create the right balance

Confidence is crucial, but unchecked ego can be destructive. New leaders must find the sweet spot – believing in their abilities while remaining empathetic to the needs and perspectives of their team. This develops trust, open communication, and a collaborative environment.

Sound Judgement

Understanding your team's struggles and aspirations is essential. By actively listening, showing compassion, and celebrating successes, you create a sense of belonging and motivate your team to go the extra mile. However, empathy shouldn't cloud judgment. Difficult decisions may be necessary, but ensure they are made ethically and with the company's best interests at heart.

Localizing Global Goals

India's diverse workforce thrives with a leader who understands the local context. Take global goals and adapt them to the Indian market. This means considering cultural nuances, regulations, and employee mindsets.

Sense of Belonging

New leaders must create a space where individuals feel valued, respected, and safe to contribute their ideas. Invest in team-building activities, celebrate diversity, and recognize achievements to cultivate a sense of belonging and camaraderie within the team.

Seeing Clearly, decoding the vision

Articulate a compelling vision that outlines the company's goals and inspires your team to be part of something bigger. This vision should be ambitious yet achievable, keeping everyone motivated and focused on the long-term objective.

Empowering Your Team

New-age leaders empower their team by trusting them with ownership of tasks and providing opportunities for growth. Offer guidance and support, but allow space for independent decision-making.

Collaborative Decision Making

Leverage the collective wisdom of your team. Encourage open discussions, solicit diverse perspectives, and involve your team members in the decision-making process. This will create a sense of ownership and leads to well-rounded, informed decisions.

By honing these essential skills, India's new generation of leaders can navigate the complexities of the modern world and lead their teams towards achieving success.
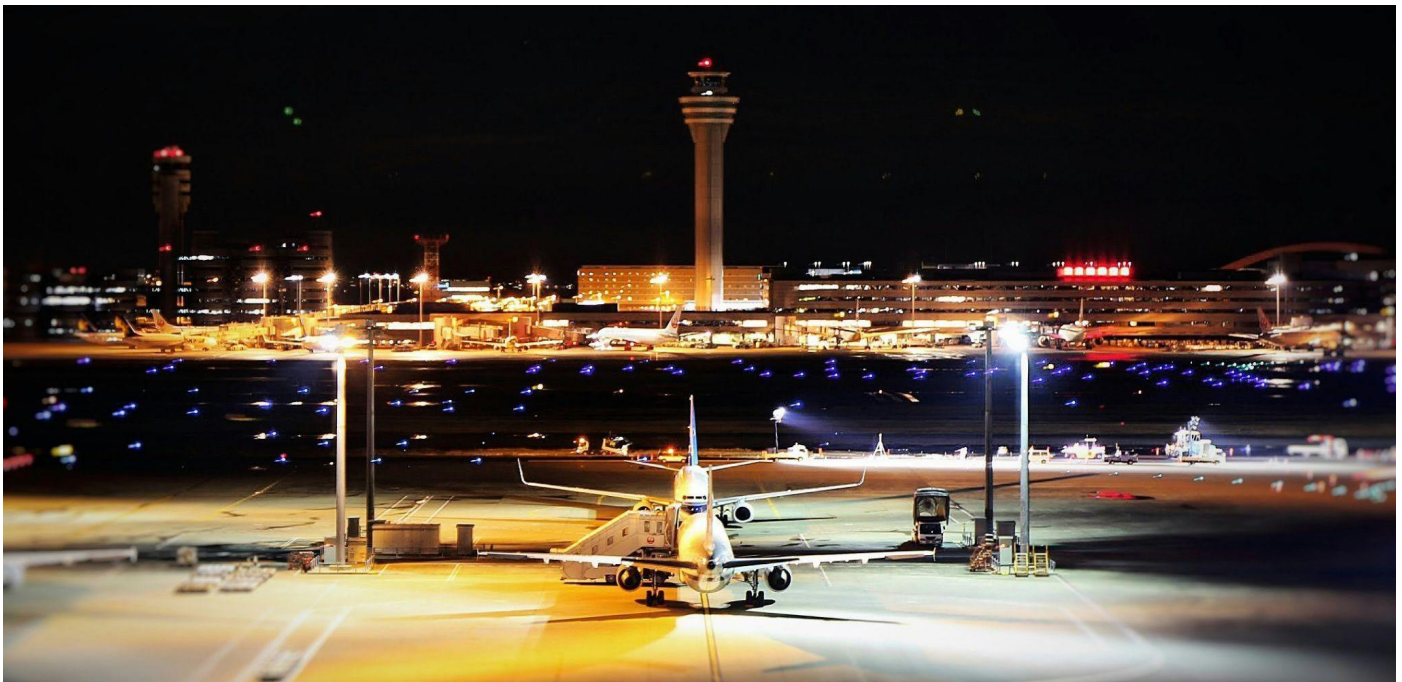
Note: Above views and opinions are personal

Navigating the Digital Sky: Digital Trends and Transformation

A view from Veoci: Pioneers in Digitizing Solutions for Airside Operations and Airlines Crisis Management

By Maninder Singh Grewal, CEO - iPrime Services Pvt. Ltd. and Authorized Partner of Veoci in India/Africa/Asia

India is the fastest-growing aviation market in the world. With a clear upward trajectory, projections by Statista suggest that India will emerge as one of the globe's top aviation markets by 2034.

The numbers tell the story. Latest data estimates India GDP growth to be more than 7% per annum. Passenger numbers crossed 188 million passengers. In fiscal 2023, Indigo, Akasa & others placed firm orders for over 1000 aircraft. Indigo, with a 54.7% of the marker share is the dominant player in the commercial passenger segment. With more airports coming up, smaller aircrafts are leading the way into developing more routes and making air travel accessible across India.

A number of major greenfield airports are already under construction. One is the large greenfield airport coming up in Jhewar, in the National Capital region, and will be the second major airport after DEL. The upcoming greenfield airport at Navi Mumbai will be the second major airport supporting the already congested airport at Sahar (BOM) . In Chennai, a similar airport is in the proposal stage and will serve as the second airport to MAA. More than 100 airports in India have come online in the last 10 years, and with

AIRPORT LAYOUT PLAN PHASE- 3
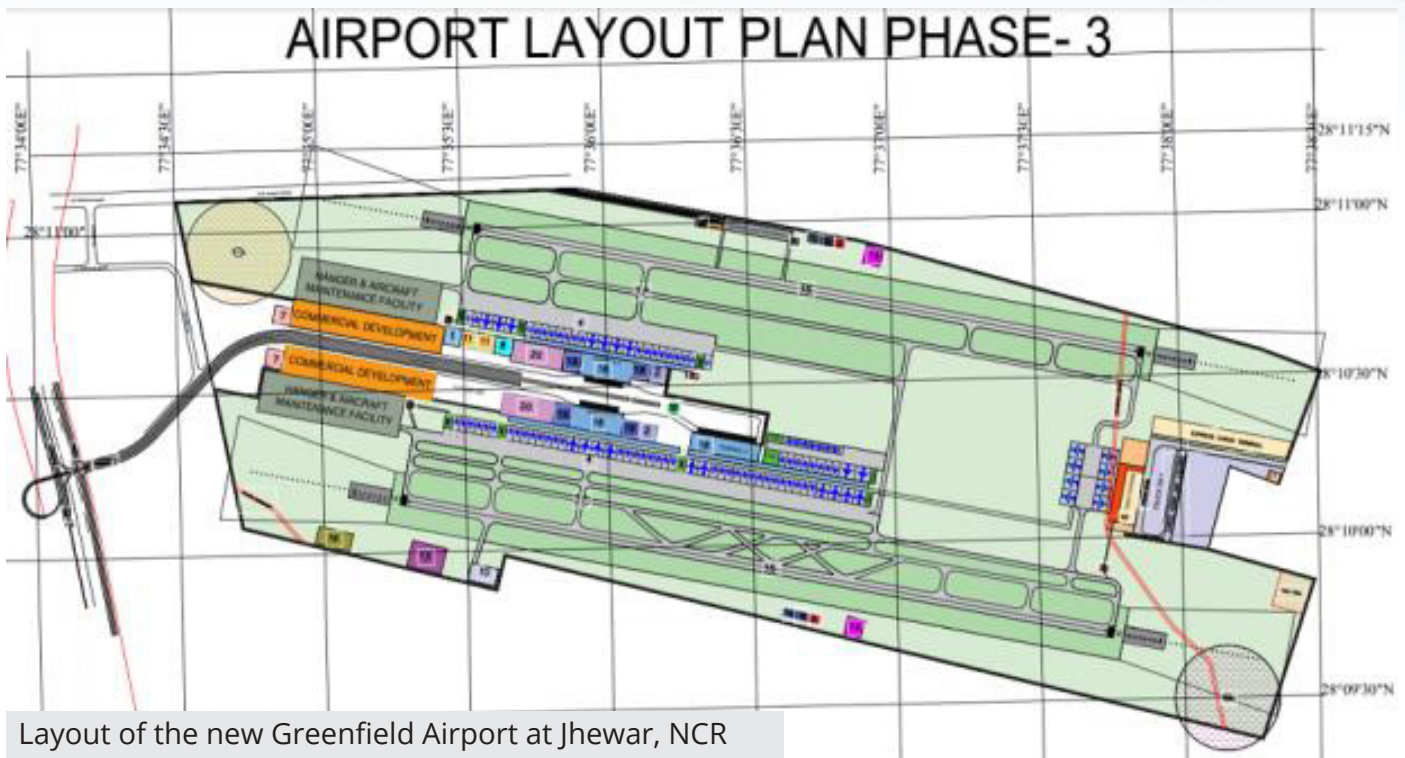
Layout of the new Greenfield Airport at Jhewar, NCR

smaller planes and more direct flights, new routes are creating opportunities for hubs and carriers.

Cargo is seeing similar growth, propelled by a new cargo ecosystem. India's megacities have welcomed new warehouses, and these need to be serviced. The National Capital region with a population of over 20 million is expected to be serviced majorly by the new greenfield airport coming up in Hissar.

Rapidly Changing Paradigms

These shifting paradigms are leading to new challenges. People with the appropriate skills and training are becoming invaluable. As India skips regular growth stages, it's also moving into an AI-driven world of Gen AI and mainstream business-oriented AI. Aviation, as an industry, is embracing this new operational landscape, already employing AI and digitization. Machine learning (ML) has driven maintenance

schedules and iterations across the industry for as long as we can remember, just branded as computer simulation. Its use cases ranged from aircraft engine maintenance to designing ILS landing systems.

Several key trends and transformations of the digital era are reshaping the aviation sector, each carrying deep implications for business strategies and operational frameworks. The integration of digitization and artificial intelligence (AI) will be a major catalyst for progress that can solve common airside operational problems while making for a smarter and safer future for airlines and airports.

Data-Driven Decision Making/DCS

Data is the new currency. All aviation managers know the power of data analytics and harnessing it as a strong tool for growth. A case in point is a major American airline that utilized advanced data

analytics to optimize its flight scheduling and improve operational efficiency. By analyzing historical flight data, passenger demand patterns, and external factors such as weather conditions, the airline was able to identify opportunities to streamline its flight schedules, reduce turnaround times, and minimize delays. As a result, the airline achieved significant cost savings and enhanced customer satisfaction, demonstrating the transformative potential of data-driven decision-making in aviation management.

Data-driven decision-making not only adds to operational efficiency, but also enables predictive maintenance strategies, reducing downtime and improving aircraft reliability. Another example is a leading international carrier that implemented a predictive maintenance solution powered by machine learning algorithms. By analyzing sensor data from aircraft engines and other critical systems, the airline was able to identify potential maintenance issues and

head off costly breakdowns or flight disruptions. This proactive approach improved fleet reliability, reduced maintenance costs, and resulted in better safety outcomes for passengers and crew.

Data analytics as an innovative solution is reshaping air travel, creating new understandings of passenger behavior and preferences, insights which help airlines tailor their services and offerings.

A major hub airport leveraged passenger data analytics to deliver a more personalized and engaging airport experience for travelers. With the right lens on passenger demographics, spending habits, and dwell times, the airport was able to identify opportunities to enhance its retail mix and improve the layout of its terminal facilities. The new approach increased non-aeronautical revenue for the airport and boosted its reputation as a preferred travel hub among passengers.
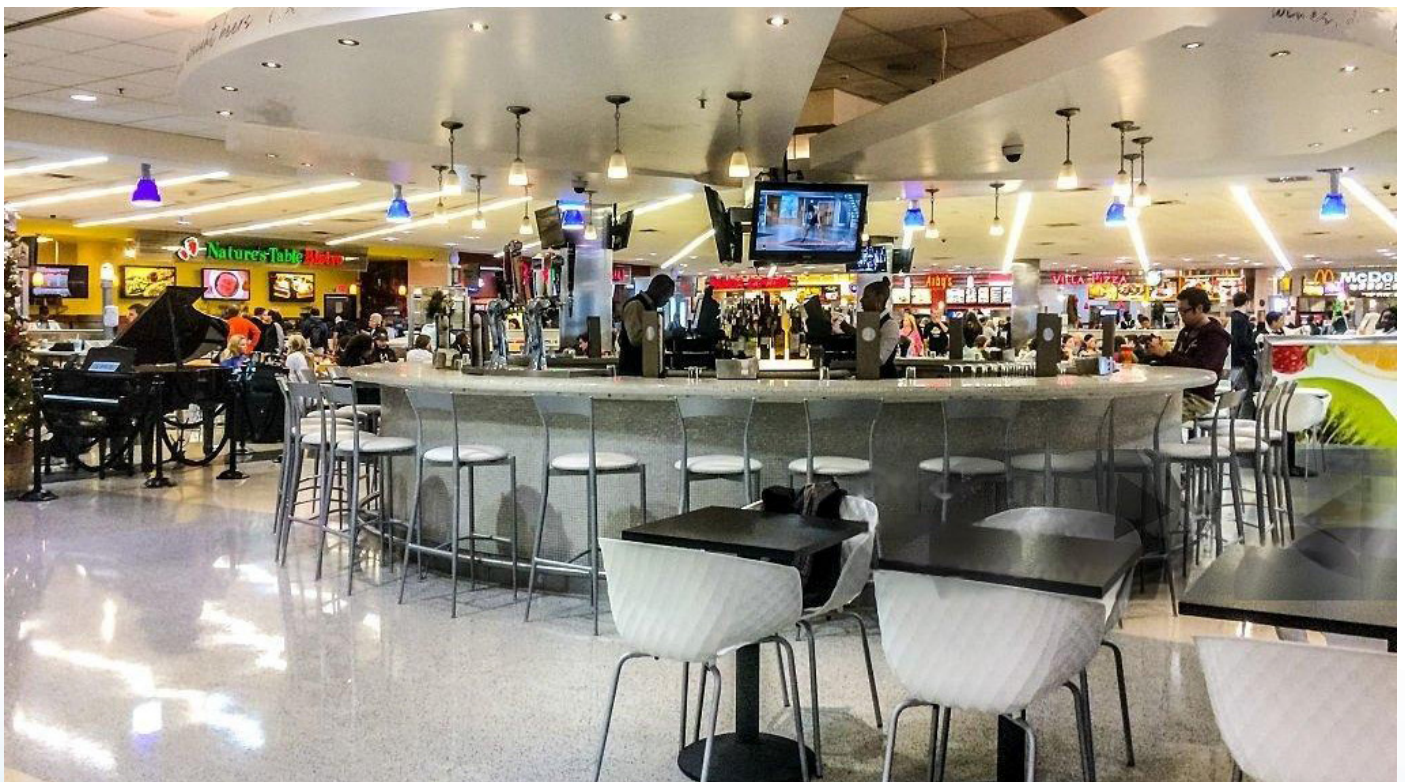
AI and Machine Learning

Artificial Intelligence (AI) and Machine Learning (ML) are two factors forcing change in the aviation ecosystem. From predictive maintenance and flight planning to personalized passenger services, these digital trends are injecting innovation into aviation. With AI and ML technologies, aviation professionals can automate routine tasks, enhance safety measures, and deliver hyper-personalized experiences that cater to the evolving needs of travelers.

Predictive maintenance, where machine learning algorithms analyze sensor data from aircraft components to identify potential issues before they occur, is one notable application of AI with aviation. An AI-based predictive maintenance system deployed by a major U.S. airline analyzed data from thousands of sensors installed on its aircraft fleet. System alerts, spurred by detected anomalies indicative of impending equipment failures, enabled maintenance crews to take preemptive action, thus reducing unscheduled maintenance events and improving fleet reliability. As mentioned, this is a common practice in aircraft manufacturing and maintenance and is extending into the more complicated portions of an airport system like ILS systems.

AI-powered algorithms are also making the jump to flight operations. Flight planning and route selection have become beneficiaries of AI, which crunches factors like weather conditions, airspace congestion, and better fuel efficiency to save airlines time and money. A leading economy airline has started to lead the charge. By plugging historical flight data into ML algorithms, the airline uncovered more efficient flight paths and altitudes for its aircraft, which generated significant savings in fuel and associated operational costs.

Digital Twin Technology

Digital twin technology is another emerging tool available to airlines and airports. The technology centers around virtual replicas of physical assets, which practitioners can use to mimic real-life situations and forecast results. Where digital twin technology

Source- Nasscom community | 2023

makes a more significant impact in aviation is spotting potential hazards, improving operational efficiency, and optimizing fuel usage.

Predictive maintenance is largely impacted by new technology, and digital twin virtual replicas of aircraft components are used to monitor their health and performance in real-time. Operators can run simulations using the replicas, continuously monitor key performance metrics, find issues, and intercept unplanned maintenance events. A major aircraft manufacturer did what was just described, and further optimized maintenance schedules, extended components life cycles, and minimized costly aircraft downtime.

Digital twins also facilitate optimization of fuel consumption and flight operations by modeling aircraft performance under different conditions. A case study from a leading European airline demonstrates the benefits of using digital twins to optimize flight

planning and reducing fuel burn. After creating virtual replicas of its aircraft fleet and simulating various flight scenarios, the airline was able to identify opportunities to improve fuel efficiency, reduce emissions, and optimize flight trajectories. The airline was able to significantly reduce cost also reduced its environmental footprint.

Cybersecurity Resilience with Veoci Ransomware Solution

With the increasing digitization of aviation systems, cybersecurity emerges as a critical concern. Cybersecurity threats in aviation encompass a wide range of potential risks, including data breaches, ransomware attacks, and sabotage attempts. To mitigate these risks, organizations in the aviation industry must adopt a multi-layered approach to cybersecurity, incorporating technologies such as firewalls, intrusion detection systems, and encryption mechanisms to protect against unauthorized access and malicious activities.

Cybersecurity awareness training programs are just one step in staying ahead. Cybersecurity Education is one of the best tools for any organization, and will make employees aware of common threats and best practices for safeguarding sensitive information. By raising awareness and instilling a culture of cybersecurity hygiene, organizations can empower employees to recognize and respond effectively to security incidents, reducing the likelihood of successful cyber attacks.

Furthermore, collaboration and information sharing among industry stakeholders are critical for enhancing cybersecurity resilience in aviation. By sharing threat intelligence and best practices, airlines, airports, and regulatory authorities can collectively strengthen their defenses against cyber threats and mitigate the impact of potential incidents on the broader aviation ecosystem. Veoci provides all the elements necessary to keep a business running. Once a ransomware attack is detected, trigger a Veoci plan activating alerts and sends messages via SMS, voice, or email directly from the Veoci platform, creating a secure alternative communication structure . Veoci acts like a dark site ready to be activated at will.
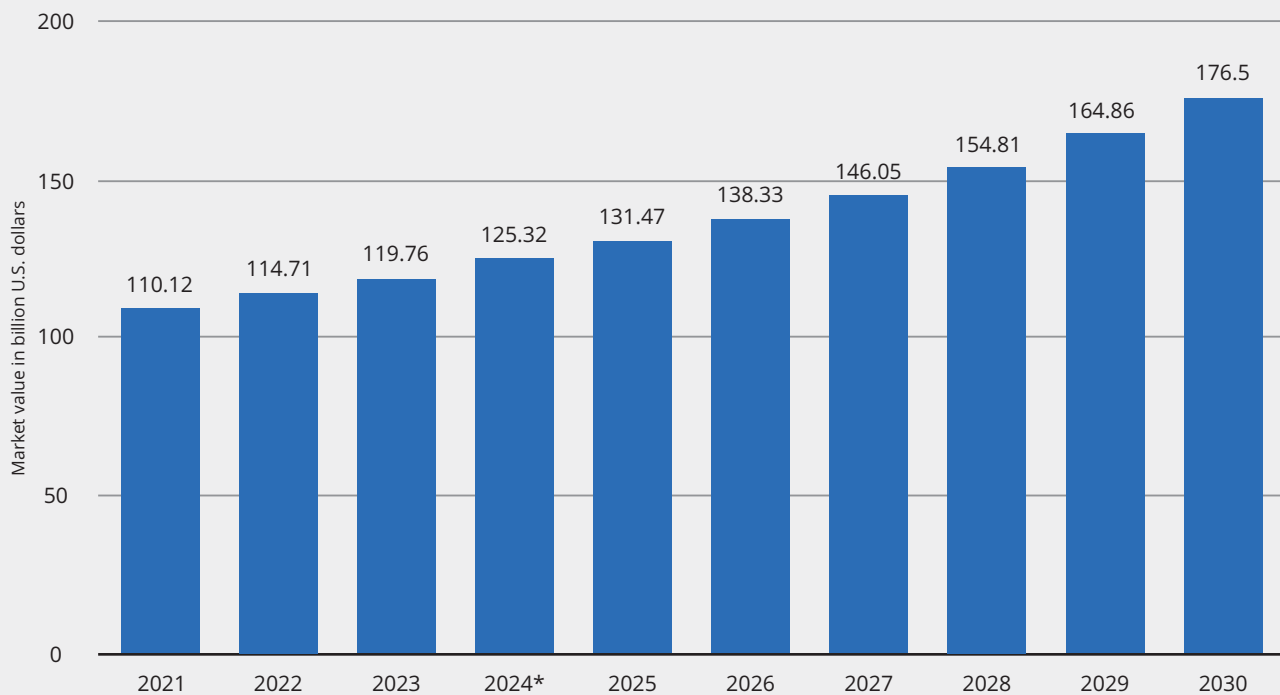
Sustainable Aviation Avenues

Amid growing environmental concerns, sustainable aviation initiatives are gaining momentum. From electric aircraft and biofuels to carbon offset programs, the aviation industry is actively pursuing eco-friendly solutions to reduce its carbon footprint. Championing sustainability efforts, investing in green technologies and adopting environmentally responsible practices can mitigate the industry's impact on the planet. The aviation industry is a significant contributor to greenhouse gas emissions, accounting for approximately 2% of global CO_2 emissions.

As concerns about climate change continue to escalate, airlines are under increasing pressure to reduce their environmental footprint and transition to more sustainable operating practices.

Market value of biofuels production worldwide from 2021 to 2023, with a forecast until 2030 (in billion U.S. dollars)

Market value in billion U.S. dollars

Year	Value
2021	110.12
2022	114.71
2023	119.76
2024*	125.32
2025	131.47
2026	138.33
2027	146.05
2028	154.81
2029	164.86
2030	176.5

Source
Extrapolate
© Statista 2024

Additional Information:
Worldwide; 2021 to 2023; * Data from 2024 onward is a forecast.

One promising avenue for reducing aviation emissions is the development and adoption of electric aircraft powered by renewable energy sources.

Electric propulsion technologies offer the potential to significantly reduce emissions and noise pollution compared to traditional aircraft powered by fossil fuels. Several aerospace companies are investing in the development of electric propulsion systems for commercial aircraft, with the goal of bringing zero-emission air travel to the market in the near future.

In addition to electrification, the aviation industry is exploring alternative fuels derived from sustainable sources such as biofuels and hydrogen. Biofuels, which are produced from organic materials such as agricultural crops, algae, and waste oils, offer a promising pathway to decarbonizing aviation. These sustainable fuels can be blended with conventional jet fuel and used in existing aircraft engines without requiring modifications to infrastructure or aircraft designs, making them a viable short-term solution for reducing emissions.

Your Flight to the Future—Harnessing Digitization and AI for Aviation Safety and Excellence

Integrating Commercial infrastructures and AI, including wireless technologies, sensor networks, and communication satellite constellations, will enhance the resilience, cost-efficiency, and adaptability of current systems. This integration is expected to shape the aviation industry and facilitate the coordination of safety and security management systems. Moreover, as per IEA, the major challenge in the Aviation industry is that, "despite planned efforts to increase the production capacity for sustainable aviation fuels, the amount generated will only represent a small portion of the total demand for jet fuel by the year 2027."

The impact on aviation extends beyond automation and optimization. AI facilitates thought leadership and pushes the convergence of disparate solutions into a cohesive whole. From creating Standard Operating Procedures (SOPs) to optimizing airside operations, AI empowers aviation professionals to navigate complex challenges with precision and foresight.

One area where AI demonstrates significant potential is in predictive analysis. By harnessing vast datasets and advanced algorithms, AI enables stakeholders to anticipate trends, identify potential risks, and make informed decisions in real time. This proactive approach enhances safety and optimizes resource allocation, driving efficiency and cost-effectiveness across the board.

Consider the example of runway inspections conducted using drones. While traditional methods are time-consuming and labor-intensive, drones offer a quick and efficient solution for assessing runway conditions with unparalleled accuracy. By leveraging AI-powered analytics, airlines and airports can detect potential hazards and prioritize maintenance activities, ensuring the highest safety and operational reliability standards. All of this depends on very narrow and restricted airspace for the drones and would be tightly controlled and visible across the system, which is possible by integrating GIS directly with Veoci.

Summing Up

In conclusion, digital transformation sweeping through the aviation industry presents both challenges and opportunities for top-level managers. By embracing digital trends, leveraging transformative technologies, and fostering a culture of innovation, aviation professional can steer their organizations towards sustainable growth and competitive advantage in an increasingly digitized world. Now is the perfect time for aviation professionals to kickstart those necessary transitions and lead the way on the intersection between aviation operations and AI and ML technologies.

Veoci's forward-looking capabilities are poised to revolutionize the future of aviation sustainability and safety management. Our platform can assist by providing tools and solutions that facilitate digitization of data and efficient management of resources and operations within the aviation industry.

As aviation embraces a greener future, Veoci stands ready to partner with Airports and Airlines by providing innovative solutions that meet current needs and anticipate and adapt to the industry's evolving landscape. With Veoci, the future of aviation is not just about flying- it is about flying safely sustainably and digitally towards a bigger and brighter tomorrow.

About Veoci Inc.

Often Imitated, Never Duplicated.

Veoci Inc., based in New Haven, Connecticut, is a Gartner Cool Vendor and a Gartner Magic Quadrant entrant for Emergency Response Management. Solutions on the Veoci Platform power large organizations as well as small companies. Continuously evolving and ensuring

customer satisfaction at the highest levels, Veoci has a strong customer base, including world leaders in many industry and service segments.

Veoci has been conceptualized and built by pioneers, tracing roots to the very beginnings of the no-code transformation. We offer the most straightforward, easy-to-use platform for you and your teams, and we know what it takes to ensure your applications never stop running.

Veoci is a platform designed for developing applications, from simple approval forms to coordinated response plans, to highly complex continuity management programs–anything is possible with Veoci.

Veoci works with a large number of aviation customers across the U.S., Canada, and India, delivering the full range of solutions required to run airside operations at an airport. Veoci' s airport solutions are comprehensive, easy to use, and quick to deploy. It is as equally suited to single airports as it is too large for multi-airport operators. Customers use the Veoci Platform to manage day-to-day operations, including part 139, and respond to crises and emergencies.

Two of the world's largest airlines use our Airline Crisis Management Solution. Our experience and background from GE Aircraft Engines means we build everything to be secure, reliable, and safe. The Veoci Presence in Aviation is vast and growing.

About iPrime Services

Based in Noida, India (in the National Capital Region around New Delhi, iPrime Services is Veoci Inc's Authorized Partner in APAC and EMEA since 2016.

As a Technology provider, over the last 25 years, iPrime has enabled companies, institutions, and government agencies to use technology to achieve concrete business and institutional goals. Our customer list includes large companies, enterprises,

and two teaching hospitals with a capacity of more than 1500 beds. Many of our clients have been with us over these long years, reaffirming our core goal of delivering value and maintaining the highest levels of customer satisfaction.

Since 2016, iPrime has been representing Veoci in the Asia-Pacific, Middle East, and Africa and has been tasked with bringing the newest technology on this 'No-Code Platform' to meet customer requirements and deliver lasting value.

In 2022, iPrime helped secure a game-changing order in the Aviation sector in India to digitize and transform airside operations for a large Airport operator. This lays down a highly scalable and reliable digital framework for airside operations that can easily expand to over 50+ airports (large and small). Iprime has led this project on behalf of our Principles and is in the final stages of completion.

In the airline sector, we delivered an Emergency Response Management (ERM) solution to one of the largest airlines in Asia – a project managed and delivered from the Noida location. The project covers 75+ locations served by the airline, is configured with multi-layered crisis scenarios, and was released into production, replacing a legacy product after over 9 months of rigorous testing. The success has led to subsequent orders for Crisis Response Management (CRM) scenarios and a total Business Continuity Plan (BCP).

We have ambitious plans to build futuristic and Ai driven models for Aviation both for Airports as well as Airlines and use our base in India to engage with customers and provide the highest levels of customer satisfaction to our clients.

Sky's the Limit: Revolutionizing Aviation Facility Facade Assessment with Drones and AI

By Amey Bapat, Principal | Head – Diagnostics Group (India), WALTER P MOORE

INTRODUCTION

The aviation industry in India has been experiencing significant growth and is poised for further expansion. The Indian Aviation Market size is estimated at USD 13.89 billion in 2024 and is expected to reach USD 26.08 billion by 2030[1]. To meet the growing demand for air travel in India, the government aims to develop 100 airports under the UDAN Scheme[2].

As aviation industry expands, it is crucial to maintain and repair aviation facilities for seamless air travel. Facade access and maintenance are often integral to aspects of aviation facilities operations. Utilized by a variety of services for tasks such as cleaning, repair, and glass replacement, these access systems are critical to the long-term health and performance of the building. However, these access methods are not always fully considered when developing the initial design of buildings and can result in challenging access scenarios that lead to undue risk of injury and death.

While new facilities can begin to incorporate further coordination of access systems into their design, existing facilities still require service, and every hour that workers are in an elevated condition can lead to additional fall-hazard risks. To help mitigate these risks, drones and uncrewed aerial vehicles (UAVs) are being used to survey the built environment, particularly within the scope of reviewing and documenting conditions on existing facades and structures.

TRADITIONAL ACCESS METHODS AND RISKS

Methods of access have become varied and evolved to accommodate many unique scenarios; however, two methodologies, suspended scaffolding and aerial lifts, constitute the majority of access methods for temporary access and repair work.

Suspended scaffolding consists of one or more platforms suspended by ropes or other non-rigid means from an overhead structure(s) and includes swing stages, boatswain's chairs, and hung platforms. While suspended scaffolding is a proven and adaptable method of access, this approach still involves strict spatial requirements and other associated risks.

Aerial lifts are often economically beneficial in comparison to the cost of temporary suspended scaffold systems. These lifts are typically driven from the basket and then extend out. However, there are some direct limitations associated with these lifts such as open aerial space to deploy the lift, maximum vertical access and risks such as overturning of the lifts due to the wheelbase not being set on stable ground and coming in contact with power lines.

COMPUTER VISION AND DATA CAPTURE WITH DRONES

Computer vision is a field of artificial intelligence that uses computer algorithms to mimic the way

human vision derives meaningful information from digital images, videos and other visual inputs. There continues to be technological advances in the field of data collection with high resolution images, 360 cameras, and 3D point clouds collected using unmanned aerial (UAV) and ground vehicles (UGV). When combined with data processing and interpretation using artificial intelligence, computer vision provides a systematic methodology not only to capture snapshots of the condition of an asset but also allows to track progression and prediction of distress over time. Computer vision is a powerful tool to advise asset owners in developing maintenance and repair plans with repair budgets and planned shutdown timeframes in mind.

✈ Augmented Inspection

Computer vision can be utilized to detect façade and structural distress that are not readily accessible by inspectors due to safety or access constraints. UAV (drone) technology can be deployed to photograph an entire exterior, and interior where feasible. Computer vision provides an augmentation of the inspection process, assisting inspectors in seeing more than what is readily visible or apparent at the time of inspection. Drones with autonomous flight can be utilized for a more comprehensive and repeatable assessment.

✈ Distress Identification and Quantification

Computer vision can be utilized to detect and quantify facade distress. If imagery is captured in an overlapping fashion and from different viewing angles, these images can be stitched using a process called photogrammetry to create a digital twin. Images or the digital twin can be analyzed using machine learning algorithms to categorize and quantify façade and structural distress. This information is particularly useful in determining repair budgets and repair phasing.

✈ Distress Visualization and Forecasting

Computer vision can not only be utilized for capturing a snapshot of distress during an inspection, but can also aid in forecasting distress. Assuming similar flight paths and imaging during inspection cycles, the distress results can be compared to previous inspections and mapped over time to analyze trends and make predictions about future distress. This analysis and comparison to previous years provides better insight into how the façade and structure is performing and if something needs replaced or just managed. Computer vision enables owners to remain informed about past, current, and future conditions before impact to operations.

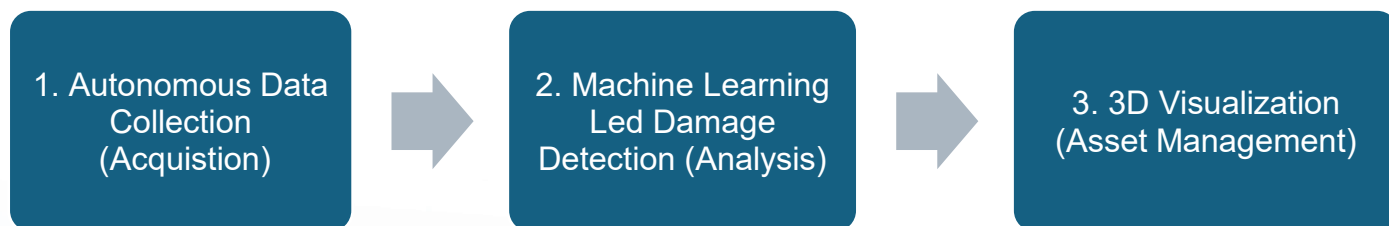| 1. Autonomous Data Collection (Acquistion) | → | 2. Machine Learning Led Damage Detection (Analysis) | → | 3. 3D Visualization (Asset Management) |

Figure 1. 3-Step process to automate inspection

Considering these three benefits of computer vision in a more general context, automation in façade and structure inspection can be achieved with a 3-step process (Figure 1). A discussion of each step follows.

STEP 1: AUTONOMOUS DATA COLLECTION (ACQUISITION)

UAVs and UGVs enable rapid and high-fidelity aerial review of building, including inaccessible areas. Autonomous drones rely on onboard software to
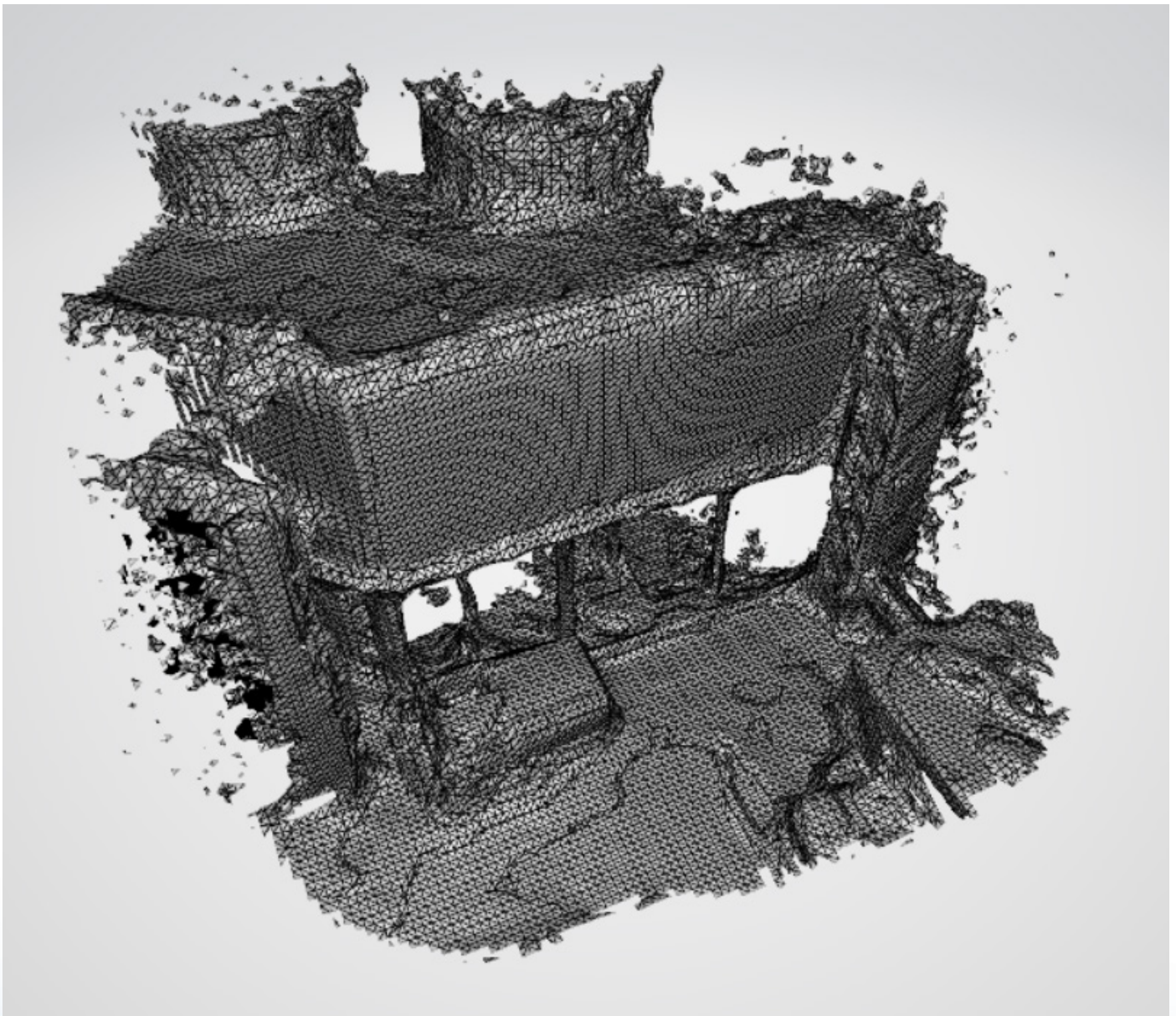

Figure 2. Drone pre-scan mapping prior to automated flight.

navigate and visually capture a predefined object. Autonomous drones utilize a pre-scan mapping process to discover the surfaces of the object to be visually scanned and then create an optimal flight path for photographic imaging of the object (Figure 2).

Autonomous flight paths are saved allowing for recreation of the same flight path for future inspections. This feature is particularly important when capturing and comparing existing conditions over time to determine if distress conditions have worsened as discussed further in Step 3. Such information also enables predictions about the future progression of damage conditions on the tower based on periodic inspections.

STEP 2: MACHINE LEARNING LEAD DAMAGE DETECTION (ANALYSIS)

Pattern recognition is one of the most common applications of machine learning, whereby algorithms are utilized to study and recognize patterns from an image training set. Once each image is analyzed using machine learning, images can be viewed and sorted by occurrence and type of defect (Figure 3). Damage detected by machine learning can be overlaid on an image for closer review or projected on a 3D model for visualization and quantification.
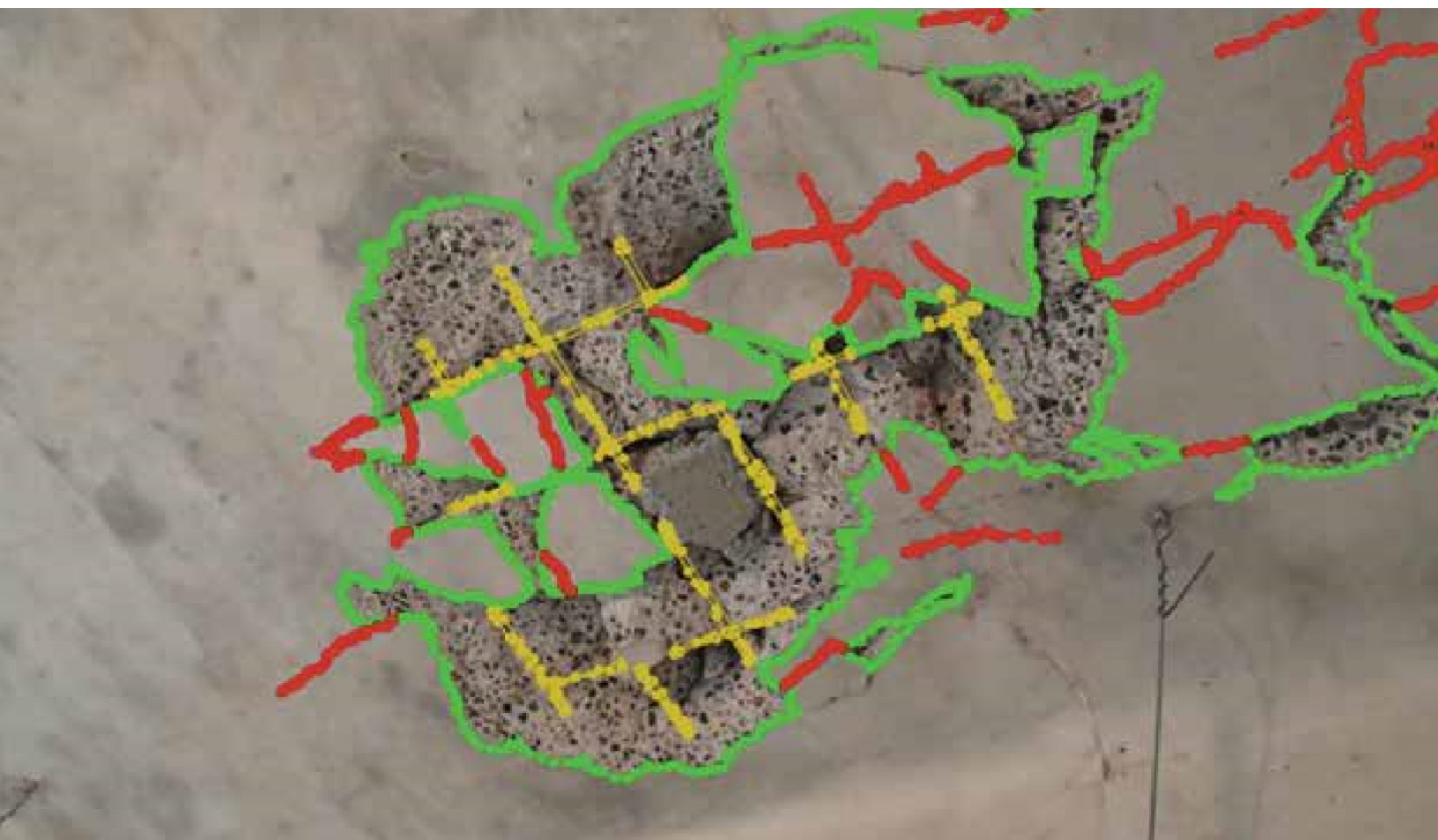
Figure 3. Automatic edge detection of spalling, cracking, and exposed reinforcement in concrete.

STEP 3: 3D VISUALIZATION (ASSET MANAGEMENT)

Images captured can also be used in creating a 3D model or digital twin of the asset with an overlay of distress conditions using Photogrammetry (Figure 4). A 3D model or digital twin can be used for visualizing and understanding the overall condition of structure and facade. This information can be utilized by licensed design professionals as well as asset owners and operators. Access to this detailed and timely information is vital in planning a future course of action for monitoring and repair, which is preferably scheduled as part of an on-going maintenance program.

Figure 4. Digital twin with damage overlay.

CONCLUSION

A three-part process utilizing remote sensing for data acquisition, machine learning for damage detection and analysis, and visualization combined with traditional access methods engineers can document, evaluate, and present data to asset owners in days rather than months, allowing engineers to spend more time focusing on building performance and root cause analysis instead of active site documentation. This increased efficiency is also coupled with increased safety. As drones are flown to identify visually evident distress and used in tandem with arm's-length visual reviews, workers spend less time at heights and less time on suspended scaffolds or aerial lifts, and therefore less time in high-risk environments. By automating inspection process, observations can be performed at higher frequency and fidelity allowing tracking of deterioration progress and development of customized maintenance and repairs while minimizing impact on operations.

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Cessna Caravan "Workhorse" Enhances Possibilities For Inspiring, Life-Saving Missions

By Kulvinder S. Reehal, Regional Sales Director, Textron Aviation

Focusing on the needs of others sits at the core of Mission Aviation Fellowship International (MAFI). Designed to deliver hope and support through aviation, MAFI is a faith-based international organization to provide assistance through medical care and other necessities to less populated parts of the world. The initiative, rooted in reaching those who may otherwise be isolated, has turned into a life-changing mission for all involved.

As a group, MAFl has served millions with the vision to reach even more. Targeting remote or isolated areas, MAFI seeks opportunity to help those in need. Textron Aviation aircraft have been the vehicles of choice to get there.

Featuring different aircraft in its fleet, MAFI has come to know the importance of a product versatile enough to handle the rigor of their mission. While pursuing these critical efforts, MAFI has chosen to utilize the Cessna® Caravan® turboprop as the mainstay in its fleet. David Pearce, Manager of Flight Standards for MAFI has seen it first-hand.

"People are very isolated and cut off, and often there's no opportunity for development. We're very blessed to be born in countries that give us such boundless opportunities," shared Pearce. "The aircraft can help to bring such opportunities and hope for the future."

MAFI owns several Textron Aviation products, each capable of helping them meet the rigorous tasks of their mission. Often traveling to locations with unpaved runways or makeshift airstrips, the need for an aircraft that can handle different challenges is present. Sporting the ability to transport large quantities of cargo with abundant power is only the beginning of what makes the Caravan® turboprop the ideal aircraft for MAFI.

"It handles a variety of airstrips, from 450 meters on the side of a mountain in Papua New Guinea, through to the desert plains of the Sahara Desert," noted Pearce. "It handles the soft and rough surface, it handles the short runways. It has been a pleasure to be able to play a small part over the years using the versatile Caravan, an incredible workhorse, and impacting the lives of many."

Phil Sproul, Director of Technical Operations agreed, noting the Cessna® Caravan® turboprop meets their needs through its resourcefulness.

"The Caravans are really versatile airplanes that we can quickly configure to the mission we need to fly, whether it is flying passengers to help with development and health care or moving seats out and putting stretchers in or using the aircraft for cargo. It's an ambulance, it's a truck and it's a bus all at the same time," he explained. "The power that is available means it can operate hot and high on the short trips, so you have sufficient power."

Earning trust through service has built MAFI for decades. Its work with Textron Aviation continues to extend its reach through reliable products and support. The pair says the quality of aircraft and the people from Textron Aviation stand out most.

"Textron Aviation has a level of expertise in the field and their responsiveness with a large network we can tap into. The access to parts and support is worldwide, even in the remote places we fly, which is sometimes difficult, but always obtainable," shared Sproul.

Pearce would agree with the assessment saying, "Textron Aviation offers support centers around the world so that we can get aftermarket modifications done from approved facilities if required," he stated. "They're able to find us the aircraft that suits our needs.

The willingness to do that shows that they believe in the product for the long term, and they are invested in seeing it perform and not just selling any aircraft."

For more information about the Cessna Caravan family of turboprops, please visit https://cessna.txtav.com/en/turboprop/grand-caravan-ex. To learn more and support MAF International, please visit https://mafint.org/

Advanced Air Mobility

By Amit Ganjoo, CEO/Founder, ANRA Technologies

Launching Advanced Air Mobility

Revolutionizing Urban Transportation and Infrastructure

The aviation industry is on the cusp of a transformative era with the advent of Advanced Air Mobility (AAM). Central to this revolution are electric vertical takeoff and landing (eVTOL) aircraft, which promise to reshape urban and regional transportation. The integration of eVTOL into the existing airspace infrastructure requires innovative solutions and collaborative efforts. ANRA Technologies, as a Provider of Services (PSU) and with its Vertiport Management System, is at the forefront of enabling this transition.

The Promise of eVTOL

Imagine a city where traffic congestion is a thing of the past, where commuting across town takes minutes rather than hours, and where our environment breathes a little easier thanks to reduced emissions. This is the vision that eVTOL aircraft aim to realize. Designed to alleviate urban congestion, these aircraft offer vertical takeoff and landing capabilities, making them perfect for densely populated cities where space is at a premium.

One of the most compelling advantages of eVTOL technology is its potential to drastically cut down travel times. By moving transportation from the ground to the air, eVTOLs can bypass the snarling traffic that plagues most urban centers. This means quicker commutes, more efficient business operations, and enhanced productivity across the board.

Beyond the obvious convenience, eVTOL aircraft also promise significant environmental benefits. Unlike traditional aircraft and ground vehicles that rely on fossil fuels, eVTOLs are electrically powered, resulting in zero emissions during flight. This aligns perfectly with global efforts to combat climate change and move towards more sustainable urban transportation solutions.

Moreover, the financial aspects of eVTOL technology are promising. Electric propulsion systems are inherently more efficient and require less maintenance than their combustion engine counterparts. This translates to lower operational costs, making eVTOL a financially viable option not just for operators, but for passengers as well.

eVTOLs also hold the potential to improve accessibility in both urban and rural areas. They can provide rapid, point-to-point transportation, connecting underserved regions to major urban centers and facilitating economic growth. In essence, eVTOL aircraft are poised to democratize access to fast and efficient travel, benefiting a wide demographic.

Challenges

While AAM holds tremendous promise, it also faces significant challenges and concerns that need to be

addressed for successful implementation. One of the primary challenges is the integration of eVTOL aircraft into already crowded urban airspaces. Managing air traffic to ensure safety and efficiency requires sophisticated airspace management systems and regulatory frameworks. Additionally, the development of infrastructure, such as vertiports, demands substantial investment and strategic urban planning. Public acceptance is another hurdle, as concerns over noise pollution, safety, and privacy need to be mitigated through robust community engagement and transparent communication. Furthermore, the reliability of electric propulsion systems and the availability of battery technology capable of supporting long-duration flights remain technical challenges that researchers are actively working to overcome. Lastly, ensuring cybersecurity in an increasingly connected air mobility ecosystem is paramount to prevent potential vulnerabilities. Addressing these multifaceted issues requires collaboration between governments, industry stakeholders, and the public, ensuring that AAM can deliver on its promise while maintaining

safety and trust. Thankfully, these issues are getting much needed attention and with the help and support from industry, academia, and government entities.

Enabling AAM with ANRA Technologies

Enabling AAM requires a seamless integration of both digital and physical infrastructure to support the efficient and safe operation of eVTOL aircraft within urban environments. On the digital front, advanced air traffic management systems are essential. These systems must provide real-time monitoring, dynamic airspace allocation, and conflict resolution to ensure safe coexistence with traditional aircraft and other unmanned systems. High-speed, reliable communication networks are crucial to maintaining constant connectivity between eVTOLs, vertiports, and control centers. Data analytics further enhance this ecosystem by optimizing flight paths, managing vertiport operations, and predicting maintenance needs, all while ensuring the highest levels of cybersecurity to protect against potential threats.
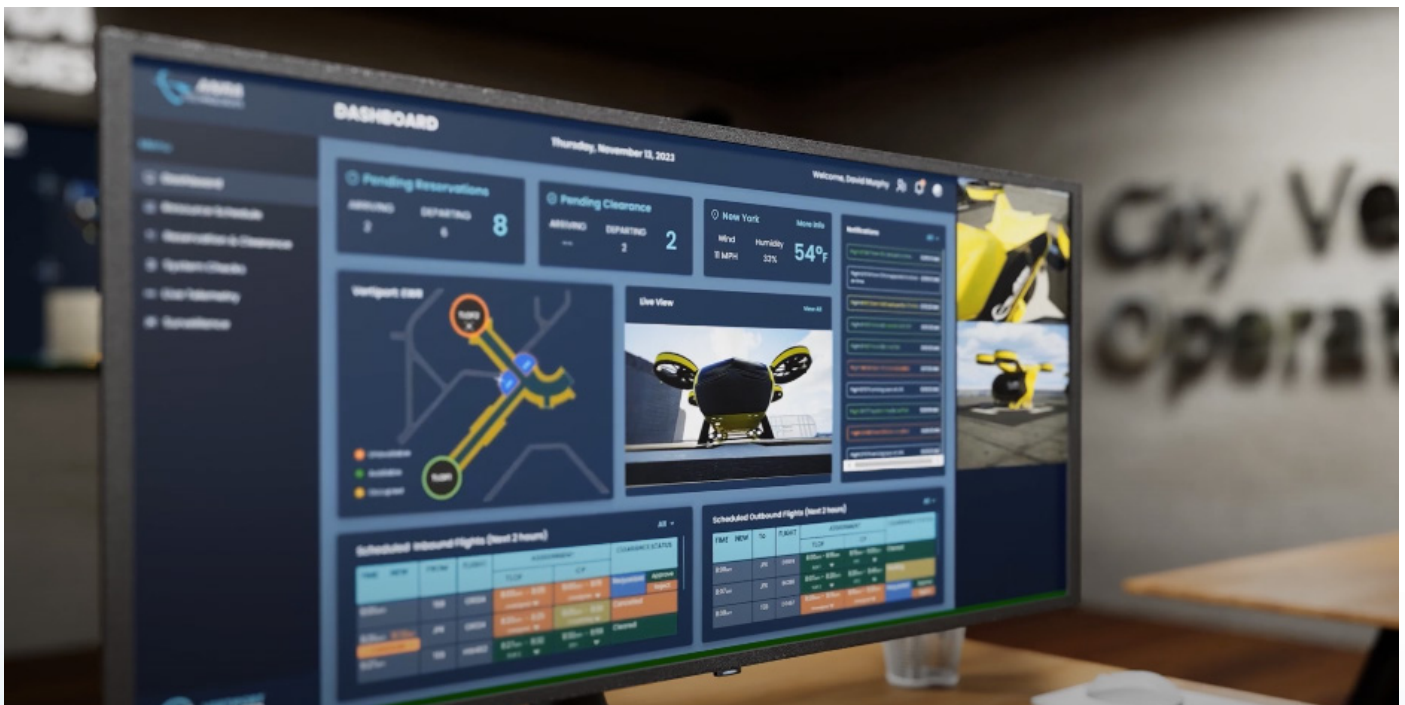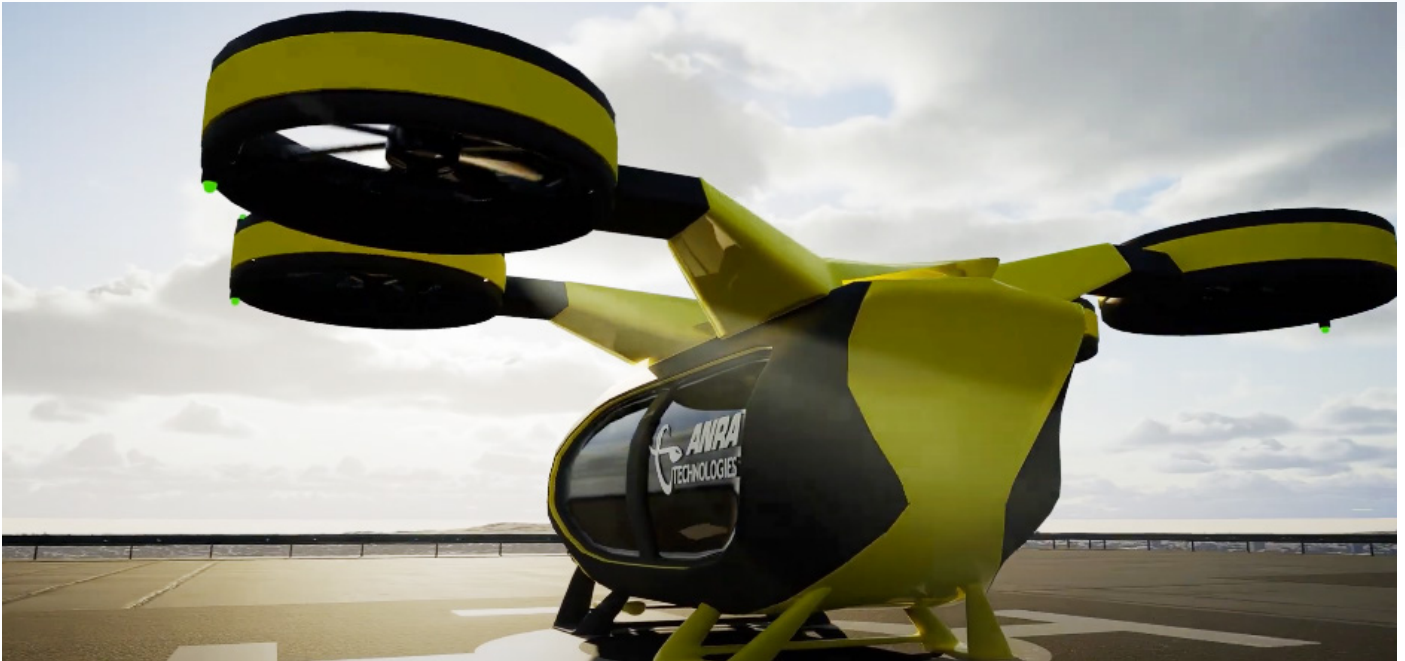
Complementing this digital framework is the physical infrastructure, which includes the development of vertiports and supporting facilities to expand operations to and fron existing airports. These vertiports need to be strategically located to maximize accessibility while minimizing urban congestion. They must be equipped with charging stations, maintenance facilities, and passenger handling areas to ensure smooth operations. The construction of these vertiports involves significant urban planning and investment, ensuring they are integrated into existing transportation networks and can handle the anticipated volume of eVTOL traffic. Moreover, physical infrastructure must also include emergency response systems and safety protocols to handle potential incidents.

The synergy between digital and physical infrastructure is vital for the successful implementation of AAM. Robust digital systems enable real-time data exchange and operational efficiency, while wellplanned physical infrastructure ensures that eVTOL aircraft can take off, land, and service passengers effectively. Together, these elements form the backbone of a future-oriented urban air mobility network, poised to revolutionize the way we move within and between cities.

This is where ANRA Technologies comes into play. As a leading provider of airspace management solutions, ANRA is addressing these challenges head-on with its innovative platforms and services. ANRA is recognized as a Provider of Services to UAS (PSU), playing a critical role in the ecosystem of unmanned and urban air mobility. In this capacity, ANRA offers comprehensive airspace management solutions that ensure the safe and efficient operation of eVTOL aircraft. Their systems provide real-time situational awareness, dynamic airspace allocation, and conflict management. This means that eVTOL aircraft can operate safely alongside traditional aviation and other unmanned systems, avoiding potential conflicts and ensuring smooth operations.

Flight planning and management is another area where ANRA supports safe operations. By leveraging advanced algorithms and data analytics, ANRA enables precise flight planning and management, optimizing routes to avoid congestion and adverse

weather. This enhances the efficiency and reliability of eVTOL operations, making them a more viable option for everyday transportation.

Navigating the regulatory landscape is crucial for the successful deployment of eVTOL aircraft. ANRA's solutions are designed to ensure compliance with aviation regulations, providing operators with the necessary tools to meet safety and regulatory requirements. This regulatory support is essential for building trust and ensuring the safe integration of eVTOL into the airspace.

A critical component of the eVTOL ecosystem is the infrastructure to support takeoff, landing, and passenger services. Vertiports—specialized facilities for eVTOL operations—are essential for the scalability of urban air mobility. ANRA's Vertiport Management System (VMS) is a state-of-the-art solution that addresses the unique needs of these facilities.

ANRA's system optimizes the scheduling and coordination of eVTOL arrivals and departures, minimizing turnaround times and maximizing the utilization of vertiport resources. This operational efficiency is crucial for maintaining high-frequency operations and meeting passenger demand, ensuring that vertiports can handle the flow of traffic smoothly and efficiently.

Safety is paramount in the operation of vertiports, and ANRA's system integrates advanced surveillance and security features to ensure the safe movement of aircraft and passengers within the vertiport. This includes access control, real-time monitoring, and emergency response coordination, creating a secure environment for all operations.

As the eVTOL market evolves, the demand for vertiport facilities will grow. ANRA's system is designed to be scalable and flexible, capable of supporting a range of vertiport configurations and operational models. This adaptability ensures that the infrastructure can evolve in tandem with the expanding eVTOL market, future-proofing investments in vertiport infrastructure.

Collaborative Innovation for the Future

Potential collaboration between India and the USA in the realm of AAM is a testament to the shared vision of fostering innovation and sustainable urban transportation. This partnership leverages the strengths of both nations—India's burgeoning technology sector and rapid urbanization, and the USA's leadership in aerospace and regulatory frameworks. Together, they are working on developing robust airspace management systems, regulatory harmonization, and infrastructure for eVTOL operations. Initiatives such as joint research programs, pilot projects, and knowledge exchange are paving the way for the seamless integration of eVTOL technology. This collaboration not only aims to revolutionize urban mobility but also seeks to create a model for international cooperation in advancing nextgeneration aviation technologies, thereby setting a precedent for global AAM advancements.

ANRA is at the forefront of this collaborative innovation, working with partners to develop standards, conduct trials, and advance the state of the art in urban air mobility. In the United States, ANRA works closely with the FAA and NASA on several UAM related projects, South Korea for the K-UAM Grand Challenge, Europe with SESAR (Single European Sky ATM Research) Joint Undertaking, and research in the United Kingdom related to AAM.

Conclusion

Through innovative airspace management solutions, regulatory compliance support, and optimized vertiport operations, ANRA is ensuring that eVTOL aircraft can operate safely and efficiently. As the AAM ecosystem continues to evolve, ANRA's collaborative approach and commitment to innovation will be instrumental in shaping the future of urban air mobility. The sky is no longer the limit, but the next frontier, and with ANRA Technologies at the helm, the journey towards a new era of aviation has well and truly begun.

An ALL-IN-ONE AIRPORT MANAGEMENT PLATFORM

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United Airlines

By Harvinder Singh, Director - Business Services & Head - Middle East & India, United Airlines

United Airlines, Inc. (United) is the only U.S. airline to consistently serve India for nearly two decades. Currently, United is operating a daily flight between Delhi and Newark/New York City, which it has operated since 2005. United's India flights are conveniently timed to connect to the airline's extensive network of destinations throughout the Americas beyond Newark and to points across India such as Mumbai, Bengaluru, Chennai, and many others via United's partner Vistara Airlines beyond Delhi. At United, "Good Leads The Way". With U.S. hubs in Chicago, Denver, Houston, Los Angeles, New York/Newark, San Francisco and Washington, D.C., United operates the most comprehensive global route network among

North American carriers and is now the largest airline in the world as measured by available seat miles.

From Delhi fly nonstop to New York/Newark and explore 270 destinations across the Americas. The flights are operated on a state of-the-art Boeing 777-200ER featuring up to 48 United PolarisSM business class lie-flat seats, 21 United Premium PlusSM seats, 39 Economy PlusSM seats and 149 United EconomySM seats.

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→ Cooling gel memory foam pillows and Saks Fifth Avenue luxury bedding — including pillows, blankets and duvets

→ Dedicated check-in counters and security lanes, priority baggage handling and priority boarding with Premier AccessSM

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→ Adjustable leg and footrests for additional comfort

→ Upgraded dining options on dinnerware with

flatware, a cloth napkin and complimentary alcoholic beverages

➤ A feature-rich seatback entertainment system and personal entertainment device with noise-reducing headphones

➤ Saks Fifth Avenue luxury bedding, including a pillow and blanket

United Economy®

➤ Ergonomically designed seats with up to 81cm of legroom

➤ Blankets, pillows and earphones

➤ Complimentary meal service, featuring a 3-course meal, house beer and wines, soft drinks, tea and freshly brewed illy coffee

➤ A feature-rich seatback entertainment system and personal entertainment device
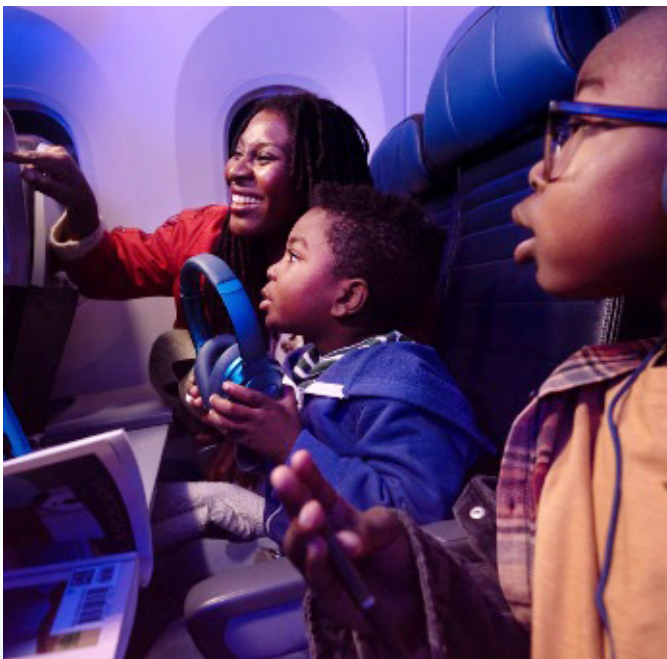
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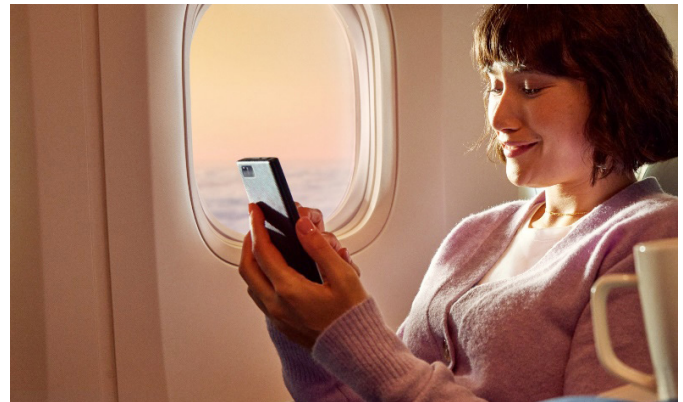
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Establishing an airline network based on HUB

By Sandeep Bahl, Executive Director US-India Aviation Cooperation

The word "hub" is derived from the structure of a wheel, where the hub is the central point from which spokes radiate forth to the edge. An airline hub, also known as a hub airport, is a city or airport where the airline has a larger presence. These cities frequently serve as regional gateway towns or host the airline's corporate headquarters and administrative offices. It is typically referred to as a focus city or a secondary hub if an airline has a sizable presence in a city without offices.

Inbound and outgoing flight prices from airlines with hubs in particular locations are frequently among the most affordable for that city and nation.

Since travellers can be directed into a few hubs rather than serving their whole itinerary with direct flights from every airport, the hub-and-spoke system enables airlines to serve more cities with fewer aircraft. In USA large airlines have multiple hub airports and each of these hubs serve a distinct purpose in the overall network of airline. United Airlines' hub in Chicago has approximately 792 flights (738 domestic destinations and 54 international) and another hub in Denver has 625 flights (25 international destinations and 600 domestic). United runs multiple daily flights between

these hubs. Along with hubs, airlines occasionally increase service in "focus cities." Focus cities are best understood as smaller hubs that often serve more constrained routes within an area.

As air transportation systems are hierarchical in structure, there are various categories of aviation hubs that are currently in use. Federal Aviation Administration (FAA) classifies commercial air-transportation hubs as large, medium, and small hubs based solely on the percentage of annual passenger enplanements. Hub categories for Primary Airports are defined as a percentage of total passenger boardings within the United States in the most current calendar year ending before the start of the current fiscal year. The categories are as follows: Airport Categories | Federal Aviation Administration (faa.gov)

→ Small hub primary - airports with 0.05–0.25% of the country's annual passenger boardings

→ Medium hub primary - airports handling 0.25–1% of the country's annual passenger boardings

→ Large Hub Primary - airports handling over 1% of the country's annual passenger boardings

These straightforward divisions provide a challenge for two reasons. The first is that, depending on the criterion used, hub network systems may include numerous levels in a hierarchy, meaning that airport classifications are likely to go deeper than two or three categories. For instance, based on geographic coverage, hubs may be divided into national hubs, regional hubs, tiny nodes, or central hubs, hubs, and non-hub nodes. The second argument is that the FAA classification based solely on passengers ignores how hubs are run, the consequent relationships among
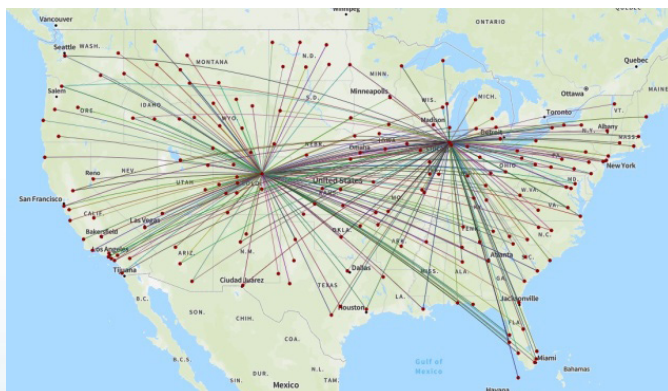
hubs, as well as those factors that are related to how hubs are operated.

Airlines can transfer flows while lowering operating costs thanks to hub network structure's economies of scale, which in turn increases profitability. As a result, the hub sites and linkage assignments are strategically chosen taking into account operational regional coverage and rivalry with other carriers.

Several things must be in place for an airport to become a major airline hub. Here are some typical concerns, while specific requirements may vary depending on area rules and industry dynamics:

1. **Geographical Location:** For an airport to function as a hub, its location is essential. The ideal location would be at a convenient geographic halfway point between two important cities, allowing for quick connections and shorter travel times.

2. **Air Traffic Demand:** There should be a sizable amount of passenger traffic at the airport, with passengers travelling to and from different local and international places. Strong local economic activity, a thriving tourism sector, and a sizable local population can all support long-term passenger demand.

3. **Infrastructure and Capacity:** An airline hub needs sufficient infrastructure, including runways, taxiways, terminal buildings, and parking lots, to support increasing flight operations. To avoid traffic and guarantee efficient operations, there must be enough room for extra planes and passengers.

4. **Connectivity:** It's important to have excellent transportation connections to the hub airport. Passengers from nearby regions may readily access the airport because to the availability of adequate road and rail networks. Accessibility can be further improved by intermodal connections like high-speed rail or specialised airport express services.

5. **Runway Length and Configuration:** The runway(s) at the airport should have sufficient length to support a variety of aircraft types, including long-haul wide-body jets. Additionally significant considerations include the layout and number of runways, which have an impact on the airport's capacity and capability to manage simultaneous takeoffs and landings.

6. **Airline Partnerships:** A successful hub must have the capacity to draw in and forge alliances with significant airlines. The hub airport can provide a wide range of destination alternatives and effortlessly link travellers to various regions thanks to partnerships with numerous carriers.

7. **Facilities for Customs and Immigration:** To handle international passenger traffic, adequate facilities for Customs and Immigration are required. Passport checkpoints, designated customs areas, and facilities for luggage handling and security screening should all be present at the hub airport.

8. **Passenger facilities:** An airline hub should provide a variety of facilities for passengers, including pleasant waiting rooms, dining and shopping options, lounges, and effective security and baggage handling procedures, in order to ensure a favourable travel experience.

9. **Airline Support Services:** For airlines using the hub as their base of operations, the presence of maintenance, repair, and overhaul (MRO) facilities, cargo handling capabilities, and ground handling services is essential. These services guarantee the effective handling of cargo and baggage as well as the smooth operation and maintenance of aeroplanes.

10. **Government cooperation:** The establishment of an airline hub is significantly aided by government cooperation. Attracting airlines, fostering competition, and investing in infrastructure development can all be made easier by supportive laws, incentives, and regulations.

It's crucial to keep in mind that converting an airport into an airline hub is a challenging and intricate process that frequently calls for extensive forethought, funding, and cooperation between airport officials, airlines, and numerous stakeholders.

The growth of an airline hub is significanty influenced by an airport's geographic location for a number of reasons.

1. A hub airport serves as a hub for connecting flights, which leads to efficient connections. The airport can reduce the distance travelled by passengers during their connections by being situated at a convenient geographic midway between important destinations. This shortens trip times and improves the hub's general effectiveness.

2. **Geographical Reach:** A well placed hub can act as a doorway to numerous areas or continents. It enables airlines to streamline their operations and provide connectivity to several locations. Regardless of the direction they are travelling, passengers can converge at the hub and quickly connect to their intended destinations.

3. **Lower Fuel Consumption:** By situating themselves at a midpoint, airlines are able to optimise their flight paths and lower fuel usage. More direct flight paths can be utilised by aircraft, reducing detours and conserving fuel. This helps airlines cut costs while simultaneously lessening the impact of air travel on the environment.

4. **Time Zone Considerations:** Strategically placed airline hubs that span many time zones can ease connections between flights that operate in various regions. Airlines are able to offer convenient departure and arrival times as a result, accommodating customers who are travelling across time zones. Additionally, it lessens the effects of jet lag for those taking lengthy flights.

5. **Market Demand and Catchment Area:** An airline hub's location should take into account both the market's needs and the catchment area it intends to service. The airport can access a sizable pool of potential customers and entice airlines to commence operations there by carefully placing the hub in a location with a high population density, vibrant commercial activity, or well-liked tourist destinations.

6. **Competitive Advantage:** In terms of accessibility and travel ease, a strategically placed airline hub can provide competitive benefits over other airports. The hub's lower travel distances and more effective connections may be preferred by passengers, making the airport a desirable option for airlines trying to increase their market share.

At their hubs, airlines may run banks of flights, where numerous flights arrive and depart quickly. The non-banks could be thought of as the "valleys" and the banks as the "peaks" of activity at the hubs. Passengers benefit from quick connections because of banking. Although having multiple planes on the ground at once might cause congestion and delays, an airline must combine a lot of resources to handle the surge in flight requests during a bank. Additionally, banking could lead to wasteful aircraft usage, with aircraft waiting for the next bank in spoke cities.

As a substitute, some airlines such as Southwest have de-banked their hubs and implemented a "rolling hub" where flight arrivals and departures are spaced out throughout the day and hence doesn't use the conventional hub-and-spoke network used by other significant airlines.
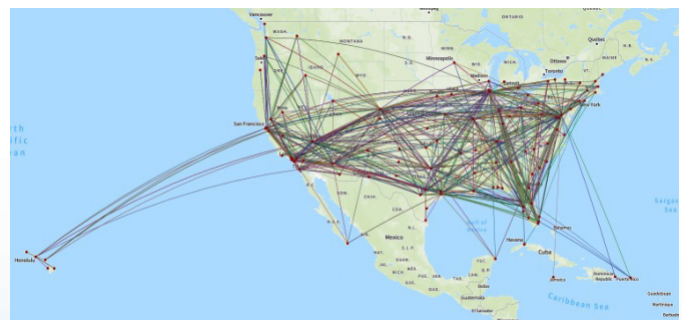
In its base cities, Southwest Airlines favours a point-to-point system along with a rolling-hub model. Southwest does not have hubs and does not want its operational sites to be referred to as hubs. By extension, this means that Southwest serves major airports in Atlanta (ATL), Baltimore (BWI), Chicago (MDW), Dallas (DAL), Denver (DEN), Houston (HOU), Las Vegas (LAS), Los Angeles (LAX), Oakland (OAK), Orlando (MCO), and Phoenix (PHX).

Airlines can transfer flows while lowering operating costs thanks to hub network structure's economies of scale, which in turn increases profitability. As a result, the hub sites and linkage assignments are strategically chosen taking into account operational regional coverage and rivalry with other carriers. Overall, the effectiveness, convenience, and market reach of an airline hub are influenced by the location of the airport. It enables airlines to provide better connections, enhance aircraft routes, and take advantage of market demand, increasing passenger flow and fostering hub expansion.

Airline Hubs vs Point to Point Flying

AIRLINE HUBS

Airline hubs are airports that serve as a central connecting point for multiple airlines and flights.

POINT TO POINT FLYING

Point to point flying is a type of air travel where passengers fly directly from one destination to another without having to change planes.

PROS AND CONS

The pros and cons of airline hubs versus point to point flying include cost, convenience, and time.

Maximizing Efficiency: Airline Hubs Serve More O&Ds With Fewer Assets
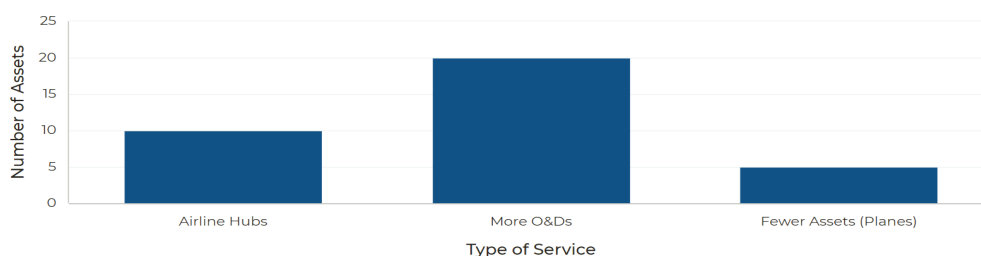
Airline hubs serve more O&Ds with fewer assets (planes)

*Data from the International Air Transport Association

## Several Factors Contribute To A Sustainable Hub

1 Local Demand — Sizeable local demand with high propensity to travel *(large city such as Delhi or Mumbai)*

2 Hub Geography — Geography conducive to connecting passengers in an efficient manner with access to a large number of markets *(low circuitry and high coverage – Nagpur, Hyderabad or Bangalore)*

3 Management & Operations — Hub structure and management consistent with hub's mission relative to other hubs in the network

4 Infrastructure — Scaleable landside and airside infrastructure with relatively low operating costs

5 Hub Strategy — Strategy to defend hub over the long-term

Hubs Serve More O&Ds With Fewer Assets

- Hubs allow airlines to connect more cities with fewer flights, aircraft and equipment than a point-to-point model
- New spokes produce geometric increases in number of markets served
- Adding new spokes to a hub is less expensive than a new point-to-point market, however unit costs may be higher due to decreased utilization

Hub and Spoke (Demand collection)
- A hub connects the same six cities with only five round-trip flights
- Adding one spoke (7) increases the number of markets served from 15 to 21
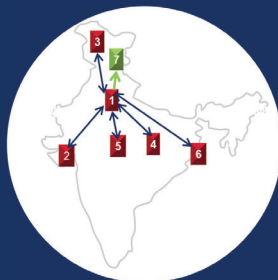
Point-to-Point (Random collection)
- Connecting six cities on a point-to-point basis requires 15 round-trip flights
- Only a few large cities have a population base sizable enough to enable point-to-point service

Successful Hubs Are Supported By Strong Demand

Key Factors For Hub Development	Important Attributes To Consider	Optimal Conditions For Success
1. Local Demand	• Current regional population and predicted growth • High propensity to consume air travel • Alternative airports	• Large local populations with significant growth projected • Affluent, strong economic center with limited alternatives to air travel • No competing airports
2. Connecting Demand	• O&D circuitry • O&D coverage	• Geographic location with the most direct line-of-flight for the highest number of O&Ds • Service to large number of spoke cities reaching a high percentage of connecting O&D passengers

Demand identifies which hubs are the most desirable, the most scalable and have the potential for the greatest revenue production

Sufficient Capacity Required To Support A Major Hub

	Key Factors For Hub Development	Important Attributes To Consider	Optimal Conditions For Success
Airside	1. Current airspace capacity 2. Future airspace capacity	• Arrival / departure flow rates under different weather conditions, airport delays, utilization of current infrastructure • Long-term runway construction	• High-traffic handling capability, both airside and landside with existing infrastructure and minimal delays • Below maximum capacity to provide operational buffer and room for future growth
Landside	3. Gate capacity 4. Gate utilization	• Total number of gates and availability • Departures per gate	• High number of gates with near-term availability to support growth • Lower utilization of existing gates to support growth within existing facility

Hubs with limited capacity for growth present revenue and operational challenges

How are minimum connection times determined?

According to Airlines for America the trade association that represents most carriers in the U.S., airlines consider factors including airport layout, average boarding time and flight duration when considering their own minimum connection policies. Carriers have internal rules that are specific to each airport depending on terminal layout, concourses for inbound and connecting flights, and whether itinerary is domestic to international, international to domestic, international to international or domestic to domestic. Factors such as deplaning duration of an inbound flight and average time needed to board the connecting flight are considered as well. Carriers' reservation systems will not build an itinerary that violates its minimum connection times.

Multiple Hubs Provide Balance And Options

- A network of hubs has several benefits versus a single hub
  - Improved passenger convenience and additional itinerary options
  - Increased number of O&Ds served on single connections
  - Reduced circuitry on a larger number of markets
  - Increased efficiency of passenger routings and deployment of aircraft

- Geographically diverse hubs with complementary hub missions will increase system coverage while minimizing displacement

- Specialty hubs and focus cities serve unique purposes
  - Delhi's large local market offers point-to-point flying to domestic cities combined with connections to all across globe
  - Indigo's Istanbul operation enables connections throughout Europe with partner Turkish Airline

- Partner hubs offer a cost-efficient manner to increase presence in additional geographic regions

Final Thoughts on the Model and Economic Importance of Airline Hubs

1. Preferred hubs will benefit structurally in the long run.

2. Location and demand: a solid local foundation strengthened by connecting traffic

3. Income premium: Gains from leadership role at hub for presence

4. Operations: the ability to expand airside and landside capacity to accommodate development at a cost that is comparably lower than that of comparable airports

5. Hubs are dynamic and need a lot of management attention to run profitably.

6. The foundation of hub economics is the generation of revenue premiums to pay for the costs of maintaining a hub operation.

7. By creating new O&D flows and raising RASM, effective revenue and yield management can increase revenue.

8. It's important to balance inbound and outgoing capacity with clearly defined connection possibilities.

Strong Hubs In India Can Be Connected To Network Of U.S. Hubs

- More connecting options in India and U.S. hubs increases likelihood of developing sustainable flights between India and U.S.

- Potential for new service to secondary India hubs and focus cities via North Asia or Europe. Indigo's Delhi hub connects to vast network of Turkish Airlines hub in Istanbul.
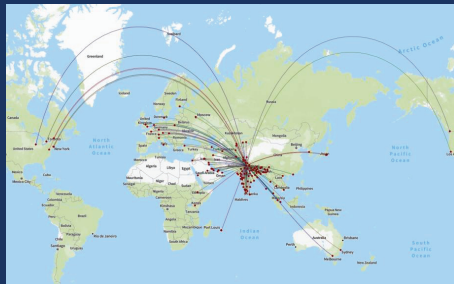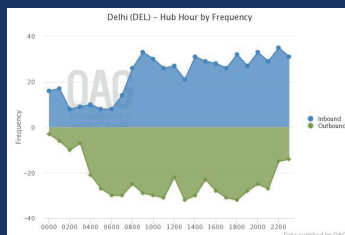

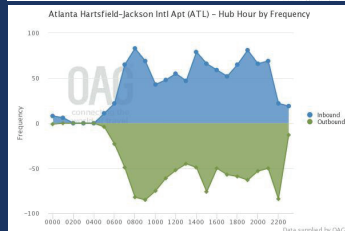DELHI Airport total destinations served 123, domestic 69, International 54
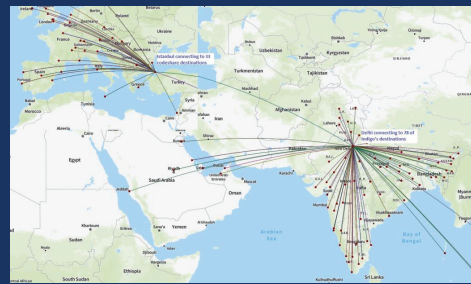
6E DEL-IST flight codeshare on 83 flights beyond IST connecting 40 destinations in Europe and USA.
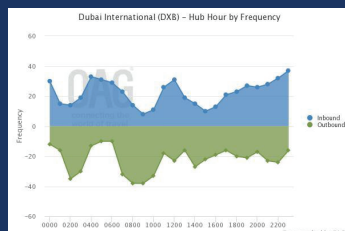
Content sourced from OAG ; Date 15th June 2023

Delhi (DEL) – Hub Hour by Frequency

Flights	DELHI
DOM	440
INT	138
Daily Total	578

Atlanta Hartsfield–Jackson Intl Apt (ATL) – Hub Hour by Frequency

Flights	ATLANTA
DOM	1324
INT	131
Daily Total	1455

Dubai International (DXB) – Hub Hour by Frequency

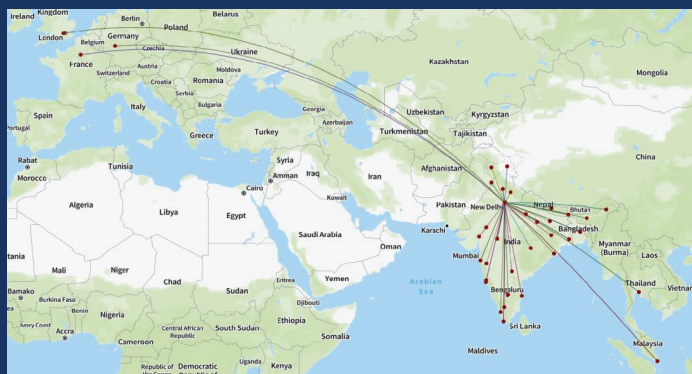| Flights	DUBAI
DOM	
INT	537
Daily Total	537

Content sourced from OAG ; Date 15th March 2023

The Benefits of a Multi-Hub Airline Network

Airline networks often have multiple hubs to help facilitate efficient travel. These hubs are strategically located to provide the most efficient routes for passengers.

Vistara's flight from Delhi to Frankfurt, a codeshare partner Lufthansa's hub connects to 11 destinations in Europe. Arriving from Europe to Delhi on Vistara there are connections to India and to Vistara's South Asia network.

Content sourced from OAG ; Date 15th June 2023

MOOG

Moog India was established in 1990. With the impetus from the Aircraft Group, Moog India Technology Center (MITC) was pioneered in 2008 in Bengaluru, India with a focus on research & design on Aerospace. It has witnessed strong growth since then in the areas of design, development, and integration of precision motion control systems for commercial & military aircrafts, business jets and avionics HW & SW. Our facility is equipped with state-of-the-art, best-in-class infrastructure to bolster our services and delivery capabilities. Being one of the major design centers for Moog Aircraft Group, we are focusing on investing our talent pool on research and development of aerospace and defense technologies.


Moog India Technology Center, Bangalore

MITC Provides Software, Electronics, Mechanical Design, Test Equipment Support and Qualification Testing for Commercial & Business Jets

Moog provided lateral control electronics (LCE) for Boeing 747-8, Level A software for flight control systems on the Gulfstream G280/G650 business jets, system analysis and independent verification and validation (IV&V) to support the overall system certification. MITC was also engaged in supporting Boeing B787-9, Airbus A350-900, A350-1000, Embraer E190/E175, COMAC C919, Gulfstream G500/G600/G650 aircraft programs in mechanical detailed design and electronics system design activities. Moog is also supporting expansion of MRO facilities for Wide Body Commercial Aircraft ATA Chapter 27 LRUs in Middle East & Asia Pacific regions.

Boeing 787-9 Test Rigs

Design of Moog Components for Commercial and Business Jets
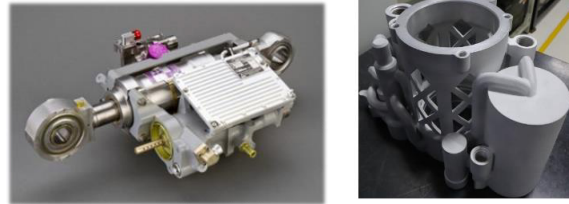
Hydraulic Flight Control Actuator & Additive Manufactured Manifold

MITC team extensively supports design and analysis of commercial flight control actuation system hardware consisting of primary flight surfaces on the airplane, as well as the spoilers and horizontal stabilizer, and includes a mix of electrohydraulic (EH) and electromechanical (EM) servoactuators and all associated control electronics. The team also supports design and realization of 3D printed prototype manifolds and actuators using Additive Manufacturing Technology. Presently, extensive testing, process certification of these products is in progress. Moog India has FAA conformity inspection delegation for Boeing, Gulfstream, and Embraer clients.

Industry – Academia Partnership

Moog India has actively partnered with many local institutes/universities and support in skill development of young engineers by giving opportunity to learn on the job through our short term and long-term internship programs for graduate and post-graduate students. We support industry visits that helps students to understand aerospace industry, Moog's contribution and they get to see our actual working set-up, labs and overall facility tour.

Value Creation

Moog is part of various Industry bodies, such as, InAQG, SAE, ACP, AMCHAM, etc. Through these associations, Moog is closely connected with the industry and academia for knowledge dissemination and wider values creation. Moog has been part of the various Standards bodies; creating Standards for the global Aerospace Industry. Moog India took the initiative to establish an Indian chapter of the International Aerospace Quality Group (IAQG) under the Asia-Pacific Aerospace Quality Group (APAQG), called as InAQG. The aim of InAQG is to enable the Indian Aerospace and Defense industries to align with and contribute to Global Aerospace Quality Standards and the membership has now grown to over 120 companies, which includes both Indian and global OEMs

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US – INDIA AVIATION COOPERATION PROGRAM (ACP)

PUBLIC MEMBERS

CORPORATE MEMBERS

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United Rotor Craft EMS Interior

United Rotor Craft EMS Interior

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- Air Conditioning
- Emergency Locator Transmitter (ELT)
- Radar Altimeter
- Terrain Awareness (HTAWS)
- Traffic Avoidance System (TAS)
- Synthetic Vision (SVT)

EMS INTERIOR OPTIONS

CASUALTY EVAC INTERIOR
MED- PAC, INC.

- Litter (72" x 19.25")
- Litter Deck w/ Pilot Isolation Barrier
- Litter Interface Mount
- Fluid Containment Pan
- Rear Equipment Mount
- Medical Bag with Supplies

HELICOPTER EMS INTERIOR
UNITED ROTOR CRAFT

- Litter (72" x 18")
- Clear Lexan Patient/Pilot Isolation Barrier (Does not Compromise Visibility)
- Litter Bracket
- Litter Pallet w Blood Pan
- Equipment Rack

OPTIONAL EMS EQUIPMENT

- Oxygen Bottle w/ Mounting Bag
- URC Medical Device and Removable Mounts
  Examples: Oxylog 3000 Ventilator | ProPaq MD Monitor | Braun Infusion Pumps | Portable Vacuum System

Speak with a Sales Representative for full list of recommended equipment and options.

INDUSTRY-LEADING SUPPORT

CUSTOMER ADVANTAGE PLAN (CAP)
CAP provides a holistic coverage solution with predictable maintenance cost, priority access to parts and assemblies, and enhanced part forecasting capabilities among, other benefits.

GLOBAL SUPPORT NETWORK
Available 24/7/365 to provide technical assistance to our customers.

BELL TRAINING ACADEMY
We provide industry-leading training combined with state-of-the-art resources for both pilots and maintenance technicians.

REPAIR SERVICES
Offering post-delivery and spares fulfillment assistance, our in-region service professionals are committed to helping you maintain the operational readiness of your aircraft.

CUSTOMIZATION
Working with our sister brand, Aeronautical Accessories, we can design a tailored solution for your needs.
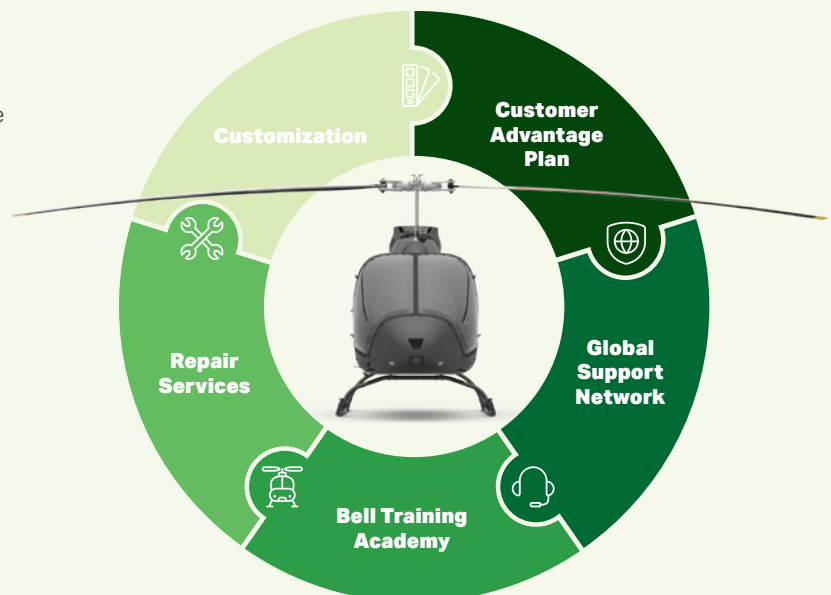
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INFRASTRUCTURE

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