



Global Aviation Conference

**Beyond the Horizon:
Trends Shaping
Tomorrow's Aviation
Industry**

White paper on the Global Aviation Industry

Preface

The aviation industry is at a pivotal moment, shaped by rapid technological advancements, evolving regulations, and shifting global dynamics.

Following the recent [Global Aviation Conference 2024](#) held in Montreal, where experts and specialists from around the world gathered to share insights and ideas on the future of aviation, it has become clear that the industry is not only resilient but also poised for transformative growth.

This white paper highlights the key trends shaping the global aviation market, drawing from discussions and presentations at the event. It covers topics ranging from the rise of sustainable aviation technologies and the increasing role of digitalization to the challenges posed by evolving passenger expectations. Together, these insights aim to provide a comprehensive overview of the forces driving change in the industry.

This annual and exclusive event, orchestrated by KPMG International, brings together industry leaders from around the world to connect and collaborate. The exchange of ideas witnessed serves as a catalyst for the continued growth and transformation of the industry.

We encourage everyone to take the insights gained from this conference back to your organizations to inspire new strategies that can drive growth and build trust in aviation.

We believe that understanding these trends can help stakeholders—from airlines and manufacturers to policymakers and investors—navigate the complexities of the current environment and make informed decisions that will shape the future of aviation.

We hope this white paper serves as a valuable resource for all those looking to remain at the forefront of this dynamic and evolving industry.

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Summary

The aviation industry is recovering strongly, with passenger traffic returning to pre-pandemic levels and a promising outlook for 2025. However, challenges such as geopolitical uncertainties, labor shortages, supply chain disruptions and high interest rates could impede growth. In response, airlines are increasingly turning to leasing solutions to manage fleet requirements and meet ongoing air travel demand, strategically navigating the current complexities. **This white paper delves into the changing dynamics of aviation finance, offering insights into various strategies that stakeholders can employ to overcome these obstacles. It emphasizes the importance of adapting to the evolving landscape in order to capitalize on growth opportunities that arise despite the challenges faced by the industry.**

As the aviation industry progresses, integrating Environmental, Social and Governance (ESG) strategies has become essential for both sustainable growth and compliance with changing regulatory standards. The sector is making progress in reducing its environmental impact through innovations such as Sustainable Aviation Fuel (SAF), taxiing solutions and addressing contrail emissions. Collaborative efforts are underway to implement cleaner technologies, enhance operational efficiencies and meet social and environmental responsibilities. However, progress is slow and to meet the ambitious targets set, it will likely require the industry, the whole of government and aviation fuel suppliers to come together more effectively. **A unified commitment to ESG principles can be crucial to help ensure the industry's resilience while meeting global sustainability targets.**

The rapidly changing tax landscape poses another challenge for the aviation industry, particularly with the implementation of new tax frameworks. With adjustments to Article 8 of the model tax convention and the OECD's BEPS initiatives on the horizon, airlines must adapt to evolving tax regulations that affect profit allocation and global minimum tax compliance. Additionally, the rise of Digital Services Taxes (DSTs) creates new compliance challenges for the sector. **By leveraging data-driven insights, airlines can optimize operations, stay informed about regulatory changes and make strategic decisions to ensure profitability while remaining compliant.**

Meanwhile, the industry is enhancing the traveler experience by embracing technology and data to provide a more personalized, seamless journey. Airlines are improving services from check-in to in-flight, fostering stronger connections with customers and building loyalty through empathy and personalized service. **The shift toward contactless, efficient service post-pandemic offers new opportunities for innovation and maintaining brand integrity, empowering employees and collaborating with airport services is critical to delivering a consistent and satisfying experience for travelers.**



Airports themselves face a critical juncture, navigating the challenges of post-pandemic demands, sustainability expectations and rapid technological advancements.

To stay competitive, airports are encouraged to modernize their infrastructure, embrace eco-friendly practices, and adopt innovative technologies to improve both operational efficiency and the passenger experience. Digital twin technology and fostering a data-driven performance culture can play a pivotal role in enabling this transformation.

Vancouver International Airport (YVR), for instance, is leveraging digital twin technology to optimize real-time monitoring and situational awareness, enabling the airport to track air traffic, passenger flow, and baggage handling systems. This technology also supports predictive maintenance by using IoT data to anticipate infrastructure and equipment needs, reducing downtime. Additionally, YVR employs digital twins to enhance passenger flow management, improving queue times and overall experience, and to model energy consumption, driving greater sustainability. Looking ahead, future capabilities, such as simulating scenarios for event planning or construction, are expected to be introduced in 2025, further positioning YVR as a leader in operational innovation and efficiency.

Generative AI (Gen AI) also holds transformative potential for the industry, enabling the conversion of unstructured data into actionable insights that improve decision-making and operational efficiency. By adopting controlled environments, rigorous prompt engineering and human review, aviation companies can more safely harness the power of Gen AI. **This technology streamlines data management, automates tasks and enhances predictive maintenance, driving innovation while mitigating risks and improving efficiency.**

Finally, cybersecurity remains a critical concern as the aviation industry integrates more digital solutions. Proactive strategies such as regular vulnerability assessments, stakeholder collaboration, comprehensive training and adherence to global standards are essential for fortifying the industry's cybersecurity posture. **With a focus on continuous improvement and alignment with regulatory bodies, the aviation sector is building a unified cybersecurity framework to safeguard its operations in a rapidly changing digital environment.**

Ultimately, the aviation industry stands at the intersection of recovery and transformation. By embracing technological innovations, adopting ESG practices, navigating evolving tax regulations and addressing cybersecurity concerns, stakeholders can ensure a resilient, sustainable and efficient future for aviation.

Context

The global aviation industry is at a defining crossroads, where extraordinary opportunities intersect with complex challenges. As we explore the key trends reshaping this dynamic sector, it is essential to appreciate the rich diversity of perspectives driving innovation and growth. At the heart of this global transformation lies Canada, strategically poised to play an integral role in the future of aviation.

Canada's unique geographical position has established it as a vital gateway, connecting continents and facilitating the seamless flow of international travel and commerce. With leading carriers standing tall on the world stage and emerging airlines gaining significant momentum, Canada's aviation sector is primed for expansion. The country's impressive network currently serves 227 international destinations, linking Europe, Asia and the Americas through major hubs in Vancouver, Toronto and Montreal. Remarkably, Montreal ranks among the top five global hubs for air transportation and aerospace, hosting influential organizations such as IATA and ICAO and generating an annual revenue of over \$15 billion.

The economic impact of aviation in Canada is nothing short of substantial. Contributing 3.2% to the nation's GDP, the sector directly employs 241,000 people while indirectly supporting 392,000 more jobs through a vast ecosystem of supply chains, tourism and local spending. This robust economic engine sustains over 633,000 jobs in total, underscoring the sector's vital role in Canada's economic fabric. As we look to the future, forecasts predict a 51% increase in air travel demand by 2037, potentially adding 39.8 million passenger journeys and injecting over \$70 billion into the economy while creating close to 800,000 new jobs. It is in this context that KPMG held the 2024 edition of the Global Aviation Conference in Montreal.

The road ahead for aviation is paved with unprecedented opportunities for innovation and growth. The sector is undergoing a remarkable

evolution, characterized by advancements in sustainable aviation technologies, the reimagining of the passenger experience and significant potential for economic expansion. These factors will likely shape the industry's trajectory, driving its contributions to the global economy while setting new standards for air travel.

Yet, this bright future is not without its challenges. The industry must remain agile in navigating disruptions from unpredictable weather patterns, natural disasters, geopolitical tensions, infrastructure demands and network outages. A key to overcoming these obstacles lies in forward-thinking strategies and strong collaboration across industry players.

In an era defined by transformation, collaboration and innovation are more crucial than ever. The sharing of industry best practices, ideas and solutions across borders will likely be the driving force behind continued industry growth and resilience.

By fostering global partnerships, the aviation sector can harness collective insights to overcome challenges and seize new opportunities, ensuring long-term sustainability in an ever-changing landscape.

As the aviation industry stands on the brink of a new era, through a commitment to collaboration and cutting-edge innovation, the sector can fuel economic growth, enhance global connectivity and contribute to a more sustainable and resilient future for air travel.

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Demand & Disruption: Current State of Aviation Finance

Here are the latest shifts in market demand, disruptive technological trends and, most critically, the state of aviation finance amidst changing supply-demand dynamics. Discover how these factors are shaping the future of aviation and stay ahead with actionable strategies to navigate the evolving landscape.

The global aviation sector has undergone significant transformations in recent years, particularly following the COVID-19 pandemic. As the industry strives for recovery, various macroeconomic factors, operational challenges and evolving market dynamics shape its future. Here is an overview of key points focused on the current state and future outlook of the aviation industry.



Full Recovery in Passenger Traffic

The airline industry achieved a full recovery in total passenger traffic as of February 2024, according to IATA. This marks an important milestone, indicating that the sector is rebounding from the pandemic's impact. The expectation is that 2024 will see the first year-on-year air travel growth when compared to the baseline pre-COVID year of 2019. The total number of air travelers for 2024 is expected to be in the region of 5 billion, which would be a record number and compares to 4.5 billion in 2019.



Operational Headwinds

Despite this positive outlook, the industry faces headwinds on the operational side, relating to labor shortages and infrastructure constraints, both of which have slowed capacity growth. Labor disputes with pilots, in particular, have been both disruptive and costly, causing issues with airlines' ability to meet the increasing demand for air travel. The positive counterpoint is that fuel costs have remained relatively stable.



Minimal Airline Failures

Airline failures during the pandemic were, almost surprisingly, at an historical low point. This was driven by the level of government support provided to airlines and the ability of airlines to leverage their relationships with the aircraft leasing sector to receive deferrals on lease rentals. The report highlights that airline failures continue to be at relatively low level, and this can be attributed to significant balance sheet strength and the strategic importance of the sector for broader industries.



Supply Constraints and Demand Dynamics

The aviation sector is expected to experience supply constraints over the next 5-10 years, driven by aging fleets and the need for replacements. Approximately 10,000 to 12,000 aircraft will be required over the next decade to facilitate the return to the historic norms of GDP-driven traffic growth of 3-3.5% annually. This is against the backdrop of over 2,000 narrowbody and over 1,000 widebody aircraft that were not manufactured due to the challenges of the pandemic.



Strong Financial Forecast for 2025

The financial forecast for airlines in 2024 is robust, driven by expectations of 11.6% growth in Revenue Passenger Kilometers (RPK). An airline operating profit of \$59.9 billion is anticipated, which would represent one of the best recorded results. This highlights the strength of the recovery and the ability of airlines to maximize returns in this strong demand environment.

Demand & Disruption: Current State of Aviation Finance



Manufacturing and Supply Chain Challenges

The supply-demand imbalance is exacerbated by the ongoing significant challenges facing airframe and engine OEMs. Both Airbus and Boeing have been unable to ramp their production schedules back to 2018 levels due to supply chain challenges. Additionally, Boeing has faced significant safety concerns that have further hindered its production rate. On the engine side, the new technology engines have encountered entry into service issues, which have caused further delays and increased the requirement for MRO visits.



Leasing Sector Growth

The leasing sector continues to grow in importance. Over the last 20 years, there has been a consistent increase in the proportion of aircraft that are leased, with the number now greater than 50% (compared to 30% two decades ago). We have also seen lessors fund more than 75% of new deliveries in the last five years, as airlines have struggled with their liquidity positions during COVID. The supply-demand imbalance has also been a net positive for larger leasing groups, as reflected in materially increased lease rates and significantly rising aircraft values.



Interest Rate Implications

The aviation financing environment is being impacted by rising interest rates, which complicate the determination of relative value in aviation debt and leasing markets. This environment has made it more challenging for investment in aviation finance and important markets such as Aviation Asset-Backed Securitizations have been relatively dormant because of this. The hope and expectation are that as rates stabilize and lease rates rise, these types of transactions will return to the market.

The global aviation industry is on a path to recovery, marked by a resurgence in passenger traffic and a strong forecast for 2025. However, challenges such as labor shortages, supply chain disruptions and rising interest rates pose significant hurdles.

The resilience of the sector, evidenced by minimal airline failures and the growing importance of leasing, will be crucial as the industry adapts to these evolving dynamics. Stakeholders must remain vigilant and proactive in addressing these challenges to ensure sustainable growth in the years to come.

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Sustainability in Aviation

Navigating the Future: The Evolution of ESG Strategies in Aviation

The aviation industry stands at a pivotal crossroads, where the integration of Environmental, Social and Governance (ESG) strategies is not merely an option but a necessity for sustainable growth. As global awareness of environmental stewardship intensifies, the aviation sector must evolve to meet the challenges of reducing carbon emissions and enhancing social responsibility. This white paper explores the critical evolution of ESG strategies within aviation, emphasizing the need for cleaner technologies, improved operational efficiencies and robust governance practices.

The Imperative for Change

The aviation sector is uniquely positioned to deliver significant social and economic benefits. However, it also bears a substantial environmental cost that is often misunderstood by the public. Discrepancies exist within the industry regarding which sustainability initiatives should be prioritized. To address these challenges, our recent conference convened industry stakeholders to discuss the multifaceted nature of ESG in aviation. The dialogue focused on long-term projections, self-sustaining operational efficiencies and the quantification of both CO2 and non-CO2 emissions in light of impending regulatory requirements.

Strategic Insights into Sustainable Aviation Solutions



Sustainable Aviation Fuel (SAF) Scale-Up:

A central theme of our discussions was the debate surrounding the long-term viability of e-fuels versus biofuels. As the industry seeks to scale up SAF production, understanding the implications of each fuel type on emissions and sustainability is crucial.



Taxiing Emissions:

Another significant area of concern is the emissions generated during aircraft taxiing at airports. Our panelists examined various technologies, including motorized nosewheels, that could reduce taxi emissions and enhance operational efficiency. The potential for immediate impact in this area underscores the importance of innovative solutions.



Non-CO2 Emissions and Contrails:

The role of non-CO2 emissions, particularly contrails, was highlighted as a critical factor in aviation's warming impact. Scientific estimates suggest that the warming effects of contrails could be mitigated within this decade, presenting an urgent opportunity for the industry to act swiftly.



Stakeholder Engagement

Throughout the process of constructing this analysis, we engaged with a diverse array of stakeholders, each addressing different facets of the ESG challenge within their organizations. These conversations revealed a shared commitment to developing sustainable practices while navigating the complexities of regulatory compliance and stakeholder expectations.

Sustainability in Aviation

In conclusion, the aviation industry stands at a pivotal juncture where the integration of Environmental, Social and Governance (ESG) strategies is not just a regulatory requirement but a moral imperative. As we look to the future, the commitment to cleaner technologies and enhanced operational efficiencies will be crucial in addressing the pressing challenges of climate change and environmental degradation. The ongoing discussions surrounding sustainable aviation fuels and the management of taxiing emissions highlight the industry's proactive approach to reducing its carbon footprint.

Moreover, the recognition of non-CO2 emissions, such as contrails, underscores the complexity of aviation's environmental impact and the need for comprehensive strategies that encompass all facets of emissions. The engagement with various stakeholders reflects a collective commitment to sustainable practices, fostering a culture of collaboration that is essential for achieving long-term sustainability goals.

As we move forward, it is imperative that the aviation sector continues to innovate and adapt, leveraging advancements in technology and operational practices to meet the evolving expectations of regulators, consumers and society at large.

The path to a sustainable future will require not only individual efforts but also a unified approach that aligns with global sustainability objectives. By working together, the aviation industry can ensure its resilience and success in a rapidly changing world, ultimately contributing to a healthier planet for future generations.

Navigating the Future of Tax in the Aviation Industry

As the digital economy evolves at an unprecedented pace and global tax regulations undergo transformative shifts, the airline industry stands at a pivotal moment. The taxation of profits from international aircraft operations, as stipulated in Article 8 of the Model Tax Convention, is just one of the key considerations. In parallel, the OECD’s Base Erosion and Profit Shifting (BEPS) initiative and the rise of Digital Services Taxes (DSTs) are reshaping the global tax framework. These developments extend far beyond taxation; they influence airlines’ strategic decisions, operational efficiencies and customer engagement. In this discussion, we explore how airlines can successfully navigate this complex tax landscape and harness data-driven insights for more informed decision-making.

Article 8	Article 8 of the Model Tax Convention pertains to the taxation of profits from the operation of aircraft in international traffic. This has been the cornerstone of the aviation industry’s tax structure. Currently, Article 8 allows for the taxation of such profits from international air transport only in the country of effective management of the enterprise. Recently, there have been discussions about potentially changing Article 8 in such a way that the primary option for this Article would involve an allocation of profits between the different source states, with the current option serving as a potential alternative. This would fundamentally change the way in which profits from international air transport are taxed between jurisdictions. If this change were to be realized, the data, processes and technology required for taxation purposes would be significant, as it would become necessary to identify and calculate the revenue allocations between the various jurisdictions.	
	BEPS	The Organization for Economic Co-operation and Development’s (OECD) BEPS project introduces two transformative pillars designed to ensure that multinational enterprises (MNEs), including airlines, pay taxes where their profits are generated and meet a minimum tax threshold. BEPS Pillar 1 focuses on the taxation of MNEs with substantial consumer-facing activities. For airlines, this could bring significant changes to how they structure their global operations and where profits are reported, potentially reshaping their entire business model. BEPS Pillar 2 ensures that all multinational enterprises (MNEs) pay a minimum level of tax, regardless of where their headquarters or operations are based. For airlines, this could lead to increased tax liabilities, impacting overall profitability, particularly on certain key routes. With over 300 new data points required for global minimum tax calculations, many of which are unprecedented, compliance is becoming more complex. Even if an airline’s home jurisdiction does not implement Pillar 2 or a Domestic Minimum Top-up Tax, it is highly likely that they will still be subject to these requirements somewhere globally.
	DST	In parallel, Digital Services Taxes (DST)—originally an interim measure before the implementation of BEPS Pillar 1—represent another major development. Though primarily targeting revenue from digital services, airlines could be indirectly impacted, especially if they rely heavily on digital platforms for operations or sales. Unlike BEPS Pillar 1, DST does not account for the specific characteristics of the aviation industry, resulting in complex compliance challenges and higher tax obligations. These evolving tax regulations could have a profound impact on airlines’ tax liabilities, profitability and business strategies. In particular, certain routes may become less viable due to heightened tax burdens, prompting airlines to reconsider their route networks and strategic planning. In this shifting tax landscape, data is a critical asset for airlines. Leveraging data effectively can help them better understand their tax obligations, optimize operations and navigate compliance more efficiently. For instance, detailed data on profit margins across routes can offer valuable insights into where airlines may face increased tax liabilities due to these regulatory changes, enabling them to adapt proactively.

In conclusion, it is crucial for the aviation industry to stay informed and responsive to evolving tax regulations. By harnessing data-driven insights, airlines can effectively navigate the potential challenges that lie ahead. Although the journey may encounter turbulence, strategic planning and informed decision-making will empower the industry to soar smoothly through shifting tax landscapes.

A New Altitude: Revolutionizing the Traveler Experience from End-to-End

The aviation industry is embarking on an exciting journey toward enhanced personalization, which is set to significantly elevate the traveler experience. Airlines are investing in technology to create seamless digital interactions throughout the customer journey, from check-in to in-flight services. This gradual transformation enables airlines to reinforce their brand promise and connect more deeply with customers.

By leveraging technology and data, airlines can tailor interactions similarly to what is seen in the hotel industry. Hiring, training and empowering employees are crucial for delivering personalized service, as satisfied employees contribute to higher customer satisfaction.

Empathy is becoming essential in customer experience. Airlines are recognizing the importance of understanding and addressing customers' feelings and needs at every stage. Dedicated teams can demonstrate empathy during critical moments, enhancing customer satisfaction and fostering loyalty. Passenger data collected via loyalty programs (among other sources) is vital for enriching the omni-channel experience, helping airlines transform negative experiences into positive ones.

Post-pandemic, travelers expect seamless, contactless services similar to e-commerce. This shift offers airlines the chance to innovate and exceed expectations. Tailoring airport experiences to align with client needs while improving operational efficiency is key. By fostering collaboration among customs, security and immigration, airlines can enhance service delivery and reduce operational challenges, aiming for a seamless customer experience.



Personalization

Technology & data are the means to focus on the traveler's needs.



Integrity

Actions must align with the brand promise and commitment to travelers.



Empathy

Ensure employees genuinely understand travelers' feelings & needs, especially during stressful situations.



Resolution

It's not just fixing problems but transforming experiences into positive ones, to reinforce customer relationships.



Expectations

Innovate and adapt to meet travelers' evolving demands, and consistently aim to exceed their expectations.



Time & Effort

Cross-functional collaboration can streamline processes and the customer journey for travelers.

By embracing these pillars, airlines can significantly enhance the traveler experience and foster loyalty in an increasingly competitive landscape. Leaders should also focus on maintaining brand integrity throughout the transformation process, ensuring that their commitments to customers are fulfilled.

The future of aviation hinges on the ability to adapt and innovate. Business leaders are urged to take decisive action now to embrace these principles, paving the way for a more connected and satisfying travel experience for everyone.

Transforming Airports in the Midst of Soaring Expectations

Airports are at a critical juncture, facing significant challenges shaped by the lingering effects of the pandemic, evolving societal expectations regarding sustainability and rapid technological advancements. To thrive, they must embrace innovation, enhance health and safety protocols and integrate eco-friendly practices while adopting cutting-edge technologies to improve operational efficiency and passenger experience. By proactively addressing these challenges, airports can transform obstacles into opportunities for growth and position themselves as leaders in the transportation sector.



Airport Challenges

As airports strive to maintain their role as essential economic drivers and gateways to the world, they must address three primary areas of concern:



1. Infrastructure Deficit

The post-pandemic era has created a significant backlog of deferred maintenance and strategic projects. North American airports alone require a staggering \$151 billion USD investment over the next five years for infrastructure improvements. This investment includes not only physical upgrades but also the redesign of digital infrastructure to meet the needs of increasingly connected consumers.



2. Community Engagement and Environmental Responsibility

Airports must position themselves as responsible community partners and economic drivers in their regions. This involves going beyond legal requirements to engage in meaningful community initiatives and environmental programs. Establishing a 'license to grow' requires demonstrating a commitment to being good neighbors and contributors to local economies.



3. Stakeholder Management

Airports must navigate a complex ecosystem of stakeholders, including travelers, airlines, and governments. Each group has evolving expectations for service, efficiency and safety. Meeting and exceeding these diverse needs presents a significant challenge for airport management and operations.

Transforming Airports in the Midst of Soaring Expectations

Strategic Enabler

As the aviation industry continues to evolve rapidly, airports must adapt to remain competitive, sustainable and resilient. To navigate this complex landscape and position themselves for future success, forward-thinking airport managers and executives are focusing on a set of key strategic enablers. These strategic enablers serve as foundational pillars upon which airports can build their long-term plans, enhance operational efficiency and meet the evolving needs of passengers, airlines and other stakeholders. By leveraging these enablers, airports can not only address current challenges but also proactively prepare for future opportunities and disruptions in the aviation sector.

01

Designing & Delivering Major Projects

Airports are embracing innovative approaches to address development needs and enhance efficiency during periods of rapid growth and change. By focusing on timely project completion, budget adherence, and minimizing disruptions, airports can effectively modernize their infrastructure while maintaining smooth operations. Performance indicators for this enabler include on-time project delivery, budget compliance and achieving zero or minimal operational disruptions.

02

Preparing for Special Events

Airports put significant effort into supporting major events like the Olympics or FIFA 2026, which require robust ground support and logistics. This annual focus demands meticulous planning and coordination with various stakeholders. Airports must develop comprehensive budgets, detailed plans and secure approvals from all relevant parties. Success in this area is measured through adherence to event budgets, completion of planning milestones and positive stakeholder feedback.

03

Exceeding Regulatory Safety Expectations

Aviation quality is measured by safety and security. Updates are crucial for enhancing safety and security standards, reflecting new industry guidelines. This commitment to excellence is evaluated through rigorous assurance and compliance checklists. Regular audits, safety drills and continuous improvement initiatives ensure that airports not only meet but exceed regulatory expectations.

04

Addressing Climate & Community Obligations

Airports play a crucial role in ensuring a responsible and prosperous future. This involves actively reducing environmental impacts, enhancing sustainability practices and building strong community relationships. Progress in this area is tracked through a roadmap of milestone deliveries, which may include implementing green technologies, reducing carbon emissions and engaging in community outreach programs.

05

Meeting Sustainable Financial Approvals

To support high service standards and necessary capital investments, airports must maintain a strong financial position. This requires a delicate balance of service quality, pricing strategies and diverse revenue streams. Key performance indicators for financial sustainability include high total revenue, EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) and the Internal Rate of Return (IRR) on investments.

06

Empowering People

In today's rapidly evolving technological landscape, airport staff and stakeholders expect better communication and the adoption of advanced tools. This includes incorporating and managing the impact of artificial intelligence in airport operations. Success in empowering people is measured through employee engagement scores, rates of technology adoption and the effective integration of AI solutions into airport processes.

Path forward

The Rise of 'Hybrid' Infrastructure: Digital Twins

In the evolving landscape of airport management, digital twin technology is emerging as a transformative solution, offering real-time monitoring, predictive analytics, and operational optimization. Leading airports worldwide are leveraging this innovation to create virtual replicas of their physical assets and processes, enabling smarter decision-making.

Vancouver International Airport (YVR) exemplifies the potential of digital twins in aviation. Through its strategic alliance with KPMG Canada, YVR has developed a comprehensive 3D digital representation of its terminal and airfield, integrating historical and real-time data to enhance situational awareness and operational efficiency. Current use cases include real-time monitoring of passenger flow, baggage systems, and airfield activities; predictive maintenance to reduce downtime; and optimizing energy consumption to lower costs and emissions.

Future capabilities, such as scenario simulation for event planning and construction, are planned for 2025. While these features are not yet operational, YVR's ongoing efforts demonstrate its commitment to innovation and sustainability, including its goal to achieve net-zero emissions by 2030.

For airports seeking to remain competitive in an increasingly complex industry, the integration of digital twin technology offers significant benefits: improved operational efficiency, enhanced passenger experience, and scalability to meet future growth demands. As shown by YVR, digital twins are a key enabler of smarter, more sustainable airport operations.

Building a Performance-driven Culture: Data Transformation

Building a Performance-Driven Culture through Data Transformation is a critical strategic initiative for airports seeking to optimize their operations and achieve sustainable success in today's competitive aviation landscape. This approach, founded on the principle that performance is driven by measurement, emphasizes the importance of data-driven decision-making and performance tracking across all levels of airport operations. By implementing a robust data analytics framework, airports can align operational activities with strategic objectives, enhance decision-making processes through real-time insights, identify and address performance gaps proactively and foster a culture of continuous improvement and accountability.

In the context of airport operations, this data-driven performance culture can significantly impact key areas such as operational efficiency, customer experience, safety and security and financial performance. By leveraging data analytics, airports can optimize resource allocation, improve passenger flow, enhance predictive maintenance and drive revenue growth through informed strategic initiatives. Ultimately, airports that embrace this performance-driven culture will be better positioned to navigate the complex challenges of the aviation industry, deliver superior passenger experiences and achieve long-term success in an increasingly competitive global market.

Gen AI's Ascent in the Aviation Sector

The aviation industry operates within an intricate network of complex processes and interdependencies, managing significant risks daily. Amidst this complexity, vast amounts of unstructured data—from legal documents to operational records—remain underutilized. Generative Artificial Intelligence offers a transformative opportunity to convert this data into actionable insights, enhancing efficiency and decision-making across the industry.

Beyond Conversational AI: Leveraging LLMs for Workflow Automation

As airports strive to maintain their role as essential economic drivers and gateways to the world, they must address three primary areas of concern:



1 Transforming Unstructured Data into Actionable Insights

Gen AI excels at processing and interpreting unstructured data, extracting key information from documents such as leasing agreements, maintenance contracts and procurement records. By converting this data into structured formats, Gen AI enables more efficient data retrieval and analysis, supporting various operational needs without the necessity for distinct categorization. This transformation empowers aviation professionals to make informed decisions quickly, based on comprehensive and accurate data.



2 Navigating Risks with Safe Implementation

It's perfectly understandable for companies overseeing high-stakes operations to approach the adoption of Gen AI with caution. The technology's potential pitfalls, such as hallucinations and inaccuracies, are well-documented, making a measured approach not just wise but necessary.

Here are effective strategies that exist to help implement Gen AI safely:

Controlled Environments and Quality

Data: Utilizing Gen AI in secure settings with accurate, relevant data minimizes the risk of errors.

Rigorous Prompt Engineering:

Developing and thoroughly testing prompts ensures more reliable and consistent outputs, tailoring the AI's responses to specific needs.

Proportionate Human Review:

Depending on the risk level, a human-in-the-loop approach allows for active review of Gen AI outputs. In some cases, statistical verification may suffice as the system matures.

Advancements in Performance Analysis:

A burgeoning field of data science is emerging to systematically analyze and improve the performance of Gen AI applications, further enhancing their reliability.

By adopting these measures, companies can mitigate risks while harnessing the benefits of Gen AI.

Gen AI's Ascent in the Aviation Sector

3

Broad Applications Across the Industry

The potential applications of Gen AI in aviation are extensive. Beyond legal and operational functions, Gen AI-powered tools can automate data entry, monitor systems for anomalies and facilitate predictive maintenance by analyzing patterns in equipment performance data. By integrating Gen AI solutions, aviation stakeholders can streamline processes, reduce manual workloads and focus on strategic initiatives that drive innovation.

The integration of Gen AI into the aviation industry holds significant promise for transforming data management and operational efficiency. As demonstrated at our recent global aviation conference—where we showcased a Gen AI application capable of extracting data from documents to support multiple processes—this technology can convert unstructured information into actionable data. By expanding the use of LLMs beyond conversational interfaces and carefully navigating associated risks, the industry can capitalize on new opportunities, automate complex workflows and drive innovation in a rapidly evolving landscape.



Cybersecurity in the Aviation Ecosystem

Enhancing Cybersecurity Resilience in the Aviation Industry

The aviation industry is increasingly cognizant of the cybersecurity threats that accompany the growing digital integration of its operations.

As the sector evolves, the potential for cyber incidents escalates, necessitating a proactive and comprehensive approach to cybersecurity. To address these challenges, various initiatives are being undertaken, focusing on the development of robust guidelines and best practices tailored specifically to the aviation context.

A pivotal strategy involves conducting regular assessments of existing cybersecurity measures to identify vulnerabilities within systems. This proactive stance enables stakeholders to understand their current security posture and implement necessary improvements. By systematically evaluating potential risks, the industry can better prepare for and mitigate the impacts of cyber threats.

Collaboration among industry stakeholders is another cornerstone of enhancing cybersecurity resilience. By fostering partnerships between airlines, airports and technology providers, the aviation sector can leverage shared insights and strategies. This collaborative approach not only enhances the overall cybersecurity framework but also cultivates a culture of collective defense. Stakeholders are encouraged to engage in open dialogue, sharing experiences and best practices to fortify their defenses against cyber threats.

Training and awareness programs play a crucial role in this collaborative effort. Ensuring that personnel at all levels understand the significance of cybersecurity is essential for effective threat response. These programs equip employees with the knowledge and skills necessary to recognize and address potential threats, thereby fostering a more security-conscious workforce.

In terms of organizational structure, the aviation industry adopts a systematic approach to delineate roles and responsibilities related to cybersecurity. Dedicated teams are established to focus on critical areas such as cybersecurity strategy, risk management and incident response. These teams work in close coordination with IT departments to ensure that cybersecurity measures are seamlessly integrated into all technological developments. This structured approach ensures comprehensive coverage of cybersecurity aspects, minimizing the risk of oversight.

Moreover, a commitment to continuous improvement is integral to the industry's cybersecurity strategy. Regular updates to policies and procedures are essential to reflect the evolving nature of cyber threats. By remaining agile and responsive to new challenges, the aviation sector can maintain a robust cybersecurity posture that adapts to the dynamic threat landscape.

Collaboration with global regulatory bodies is also vital in the development and implementation of cybersecurity standards. The aviation industry actively engages with these organizations to ensure that the standards established are not only comprehensive but also practical for implementation across diverse regions and operational contexts. This alignment with global standards fosters a unified approach to cybersecurity, enhancing safety and security across the board.

In conclusion, the aviation industry's proactive stance on cybersecurity is characterized by the development of tailored guidelines, collaborative partnerships, structured roles, continuous improvement and engagement with regulatory bodies. By embracing these initiatives, the sector can effectively navigate the complexities of cybersecurity threats, ensuring the safety and security of its operations in an increasingly digital world.

Cybersecurity in the Aviation Ecosystem

Overcoming Cybersecurity Challenges in Aviation's Transformation

Several key challenges and aspects highlighted generate significant cybersecurity impacts within the industry.



Automation technologies

As the aviation sector integrates advanced automation and AI, it faces an evolving cybersecurity landscape with significant challenges. While these technologies enhance operational efficiency, they simultaneously introduce new vulnerabilities, making cybersecurity an urgent priority. Addressing these vulnerabilities requires a 'security by design' approach, embedding security into the development phase of systems to withstand sophisticated threats. The interconnected nature of aviation systems means that a breach in one area can ripple through others, highlighting the importance of a comprehensive cybersecurity strategy that includes technical defenses, organizational policies and awareness programs. Investment in advanced threat detection and incident response capabilities is essential to protect these new technologies and ensure the sector can adapt to emerging threats.



Funding Requirements

As the need for sophisticated cybersecurity in aviation grows, so does the requirement for substantial investment. Adequate financing is critical to protect operations from evolving threats and must cover not only advanced detection and response systems but also training programs to equip personnel with the skills needed to manage these risks. Given the global nature of aviation, stakeholder collaboration among governments, regulators and industry players is vital to pool resources and create a unified, secure framework that addresses these financial needs and cybersecurity goals.



Third Party Risk Management

The challenges posed by automation and underfunded cybersecurity efforts are further complicated by third-party risk management (TPRM). The supply chain, encompassing manufacturers and service providers, may generate critical vulnerabilities due to limited visibility into third parties' security practices. Strengthening TPRM frameworks is essential to mitigate these risks, requiring aviation organizations to ensure that all partners adhere to robust cybersecurity standards. This proactive stance is critical in a sector as interconnected as aviation, where varying regulatory demands and technological choices must be aligned to maintain secure operations across all supply chain layers.



Interconnectivity

The global interconnectivity of aviation heightens cybersecurity challenges. With systems and networks linked across borders, the sector benefits from mobility and streamlined operations but faces amplified risk exposure. This interconnectedness is complicated by differing regulatory requirements across jurisdictions, requiring aviation entities to maintain compliance while ensuring a unified cybersecurity approach. By prioritizing interconnectivity considerations and cross-border compliance efforts, the aviation sector can work towards a resilient cybersecurity framework that effectively addresses the complexity of its global network.

Cybersecurity in the Aviation Ecosystem

The International Civil Aviation Organization (ICAO) Cybersecurity strategy is built on the following seven key pillars that collectively aim to foster a secure and resilient aviation environment:

1

International Cooperation: The first pillar emphasizes the importance of collaboration among nations and international organizations. By sharing knowledge, resources and best practices, countries can strengthen their collective defenses against cyber threats. This cooperation is vital for addressing the transnational nature of cybercrime, as threats often transcend borders.

2

Governance: Effective governance structures are essential for overseeing cybersecurity initiatives within the aviation sector. This pillar focuses on establishing clear roles and responsibilities among stakeholders, including government agencies, aviation authorities and private sector entities. Strong governance ensures that cybersecurity policies are implemented effectively and that there is accountability for maintaining security standards.

3

Effective Legislation and Regulations: The third pillar highlights the need for robust legal frameworks that support cybersecurity efforts. Effective legislation and regulations provide the necessary authority to enforce compliance and protect critical aviation infrastructure. This includes establishing penalties for non-compliance and ensuring that regulations keep pace with the evolving cyber threat landscape.

4

Cybersecurity Policy: A well-defined cybersecurity policy is crucial for guiding the actions of all stakeholders in the aviation sector. This pillar involves the development of comprehensive policies that outline the strategic objectives, risk management approaches and operational procedures for addressing cybersecurity challenges. A strong policy framework helps align efforts across the industry and ensures a unified response to threats.

5

Information Sharing: The fifth pillar underscores the significance of sharing information about cyber threats and vulnerabilities among stakeholders. Timely and relevant information sharing can enhance situational awareness and enable proactive measures to mitigate risks. Establishing trusted channels for communication and collaboration is essential for fostering a culture of transparency and collective defense.

6

Incident Management and Emergency Planning: Preparedness for cyber incidents is critical for minimizing the impact of potential attacks. This pillar focuses on developing incident management protocols and emergency response plans that outline the steps to be taken in the event of a cyber incident. Regular drills and simulations can help ensure that all stakeholders are familiar with their roles and responsibilities during a crisis.

7

Capacity Building, Training and Cybersecurity Culture: The final pillar emphasizes the importance of building capacity within the aviation sector through training and education. Developing a strong cybersecurity culture is essential for ensuring that all personnel are aware of the risks and equipped to respond effectively. Continuous training programs can enhance skills and knowledge, fostering a proactive approach to cybersecurity.

By focusing on international cooperation, governance, effective legislation, cybersecurity policy, information sharing, incident management and capacity building, the strategy aims to create a resilient aviation environment that can effectively withstand and respond to cyber threats.

Conclusion

The aviation industry finds itself at a critical turning point as it recovers from the profound disruptions of the COVID-19 pandemic. There are many areas to be optimistic about, with global traffic returning to pre-pandemic levels and Revenue Passenger Kilometers/Miles projected to grow by approximately 10%. The sector is experiencing a strong rebound in passenger demand. However, this recovery brings with it a shift in connectivity patterns, urging airlines to adapt to evolving consumer expectations and market dynamics.

While revenue growth, estimated at 9%, reflects this resurgence, rising operational costs—driven by elevated fuel prices and labor expenses—pose significant challenges to profitability. Persistent high crude oil prices further complicate the financial outlook, demanding strategic and innovative responses from industry stakeholders.

Demand for new aircraft is strong; however, aviation manufacturing supply chains have not recovered since the pandemic, resulting in a structural short supply of newer and more efficient aircraft. Lessors have the capacity to grow their market share in aircraft financing and airlines' balance sheets are recovering, allowing them to purchase aircraft outright with the support of financiers. However, supply appears constrained for the foreseeable future.

In addressing the ESG commitments of the sector, the path to a sustainable future will require not only individual efforts but also a unified approach. The ability of fuel producers to produce significant quantities of eSAF by 2030 and beyond is key to the decarbonization of the industry, along with efficiency and other technological advancements. This will likely require the entire aviation ecosystem, including government and fuel supply, to come together to address this need. By working collaboratively, the aviation industry can ensure its resilience and success in a rapidly changing world, ultimately contributing to a healthier planet for future generations.

Finally, adding to these pressures, the aviation sector operates within an increasingly volatile global landscape shaped by geopolitical tensions and economic fluctuations. These external forces not only impact operational strategies but also underscore the industry's deep interconnection with the global economy.

Our recent conference addressed these challenges head-on, exploring critical issues such as customer experience enhancement, infrastructure deficits, cybersecurity and aviation finance. The discussions highlighted the central role of innovation and collaboration in driving future opportunities and resilience.

Ultimately, while the recovery in passenger traffic signals optimism, the aviation industry must remain agile in navigating cost pressures and external uncertainties. By leveraging the insights and strategies discussed, the sector is well-positioned to transition towards a sustainable and profitable future—one defined not only by recovery but by growth and transformation.

ATA. (2018). Aviation Benefits Beyond Borders 2018 report.



Malcolm Ramsay
Partner, KPMG
Singapore
Global Head of Aviation
KPMG International



Michael Tsaprailis
Partner
Management Consulting
KPMG Canada

kpmg.com

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