Commentary

Climate Change and the Global Airlines Sector: En Route to a Major Technological Transformation

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Near-Term Impact of Climate Change is Modest

Climate change presents both physical and transitional risks for airlines.[1] Being one of the most challenging sectors to achieve net zero emissions targets, the global airlines sector is preparing to undergo a major technological transformation in the medium and long term, which may result in rising transitional costs for the sector. Global air travel contributes 2.8% of global carbon emissions and around 12% of the total transportation sector emissions.[2]

We think decarbonization in the airlines sector will be a long and gradual process. The near-term focus is likely to remain on carbon offsets while Sustainable Aviation Fuel (SAF) is expected to contribute meaningfully in the medium to long term and, alternative propulsion technologies (such as battery-electric and hydrogen-powered aircraft) may take a long time to become viable. As a result, we do not expect the sector's ratings profile to be materially affected by transitional risks in the near term. However, over the longer term, transition towards alternative technologies would require heavy investments and will also be critical for airlines' survival as the regulatory environment is likely to tighten as technology develops. Companies that lag behind or fail to achieve this transition might see their ratings being negatively affected. When we apply our *Morningstar DBRS Criteria: Approach to Environmental, Social, and Governance Risk Factors in Credit Ratings* (ESG Criteria) to an airline credit rating, the environmental factor of Carbon and GHG costs is currently flagged as Relevant (i.e., the factor has some credit impact, but the impact is not sufficient to change the overall rating or trend in the rating).

In addition, physical climate risks also affect airlines as extreme weather events are increasingly affecting airlines' operational resilience. In the near term, the frequency and intensity of such events are not projected to be significantly above historical norms, and operational disruptions of various kinds have never been uncommon for airlines. Therefore, our credit ratings already consider such dynamics. However, the impact arising from an increase in the frequency and intensity of weather events may have a material negative impact over the longer term.

1 See our commentary titled ESG: Climate Risk and Credit for further details on our approach to the impacts of climate risk on credit analysis.
2 Mission Possible Partnership, *Making Net-zero Aviation Possible*, July 2022

Important Trends Affecting the Airlines Sector

Sector's decarbonization efforts have failed to keep pace with growing travel activity.

The global airlines sector has achieved significant fuel and carbon efficiency gains in the last few decades, with emissions intensity (carbon emissions per revenue passenger kilometers) now being around 50% less than in 1990.[3] Several factors have contributed to this, including more efficient aircraft designs (e.g., modern wing designs); the use of lighter-weight and often stronger carbon composite materials; and new engine designs, such as high-bypass turbofans that have materially improved fuel consumption efficiency. However, replacing an aircraft fleet is innately a very gradual process and the efficiency measures have failed to completely offset growing travel activity, resulting in continuous increases in total emissions. If business as usual continues, emissions are expected to double by 2050, contributing 22% of global emissions at that time.[4] This suggests that the global aviation sector needs to act much more aggressively than in the past to reduce its carbon footprint.

Path to achieve net zero requires significant progress in alternative technologies, particularly SAF.

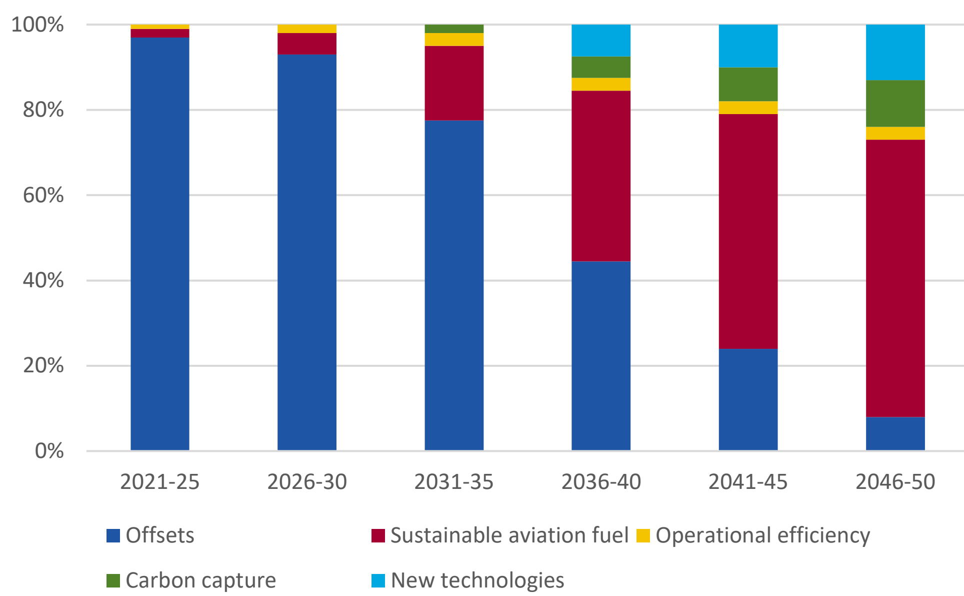
The International Air Transport Association (IATA) expects more than 90% of emissions reductions in the near term are likely to be achieved through carbon offsets, which entails purchasing carbon credits to offset emissions.[5] However, a transition to SAF is likely to be the major driver in the long term. IATA expects that 65% of net emissions reductions by 2050 would be achieved from SAF, while another 13% is expected from new-generation aircraft models, such as electric, hybrid, and hydrogen-powered aircraft.[5] Currently, both technologies are in the early developmental stages. SAF production at scale, and at a low cost, is challenging due to technological challenges and limited availability of feedstock. Major technological hurdles for electric aircraft model designers are battery capacity and weight, while the low volumetric energy density of liquid hydrogen (requiring large storage at extremely low temperatures) is a key challenge for hydrogen-powered planes. However, given the high stakes, the aviation sector is undertaking the necessary research and development investments to determine whether these new technologies can be made viable on a global scale.

3 Air Transport Action Group (ATAG), *Waypoint 2050*, September 2021.

4 Mission Possible Partnership, *Making Net-Zero Aviation Possible*, July 2022.

5 IATA, *Net Zero Carbon 2050 Resolution*, June 2023.

Exhibit 1 Pathway to Achieve Net Zero by 2050



Sources: IATA, Morningstar DBRS

Air travel to become more expensive as industry decarbonizes.

Achieving decarbonization in the airlines sector is expensive. SAF is currently 2 times (x) to 9x more expensive than jet fuel.[6] While the costs are likely to come down as the technology improves, this will be a gradual process. Hydrogen is also more expensive than jet fuel and would also require heavy investments in development, infrastructure, and fleet upgrades. Assuming no change in government decarbonization targets, the pace of technological change may be insufficient to keep costs down, and the industry may be compelled to pass these costs on to customers. A rapid transition to these alternative technologies may ultimately make air travel more expensive in the future.

Climate Change in Our Approach to ESG Factors in Credit Ratings

Within the ESG Criteria, climate and climate change considerations are included in several of our ESG risk factors. We apply the ESG Criteria to every credit rating.

The consequences of climate change could result in an increase in an issuer's risk of default. The ESG factors associated with climate change that could affect a company's ratings are highlighted in with bold lettering in Exhibit 2. See our commentary titled *ESG: Climate Risk and Credit* for further details on our approach to the impacts of climate risk on credit analysis.

6 Mission Possible Partnership, *Making Net-Zero Aviation Possible,* July 2022.

Exhibit 2 Morningstar DBRS ESG Factors That Consider Climate Change

Environmental	Social	Governance
• Emissions, Effluents, and Waste (G/F/C/S)	**• Social Impact of Products and Services (F/C/S)**	• Bribery, Corruption, and Political Risks (G/F/C)
• Carbon and Greenhouse Gas (GHG) Costs (G/F/C/S)	• Human Capital and Human Rights (G/F/C/S)	**• Business Ethics (F/C)**
• Resource and Energy Management (G/C)	**• Product Governance (F/C/S)**	**• Corporate/Transaction Governance (F/C/S)**
• Land Impact and Biodiversity (G/C)	• Data Privacy and Security (F/C/S)	• Institutional Strength, Governance, and Transparency (G)
• Climate and Weather Risks (G/F/C/S)	**• Occupational Health and Safety (C)**	**• Peace and Security (G)**
	• Community Relations (F/C)	
	• Access to Basic Services (G/F/C)	

G = Governments, F = Financial Institutions, C = Corporate Finance, S = Structured Finance: These denote the applicability of each factor to particular rating groups.
Source: Morningstar DBRS.

Physical Risk

Extreme weather events are increasingly posing challenges to airlines' operational reliability. Physical risks arising from extreme weather events are primarily captured by the Climate and Weather Risks under Environmental factors. The Southwest Airlines operational meltdown during the 2022 holiday season attracted huge public attention as it caused significant trouble for air travelers and cost the airline more than USD 1.0 billion (in reimbursements, lost revenues, and fines). Weather is also one of the leading contributors to aircraft accidents. As a result, extreme weather events could result in increased safety concerns. In addition, adverse weather may hurt tourism activity on occasion and therefore might indirectly affect airlines' activity. That said, we currently do not consider increased physical climate risks arising from climate change as either Relevant (i.e., the factor has some credit impact, but the impact is not sufficient to change the overall rating or trend in the rating) or Significant (i.e., the factor triggers a change in the rating or the rating trend) in our credit ratings. This is because these events have been limited so far, and the frequency and intensity of such events are not projected to be significantly above historical norms in the near term. In addition, some of these weather-related costs can be covered by insurance, partly mitigating the impact, and operational disruptions are not uncommon for the airlines sector, and we already incorporate such operational challenges as part of our credit ratings analysis.

Transitional Risk

We consider transitional risks as more impactful for the airlines sector in the near term compared with physical risks. The aviation sector's net zero strategy will rely on industry participants to take aggressive measures to reach its long-term net zero goals.

Transitional risks within the airlines sector primarily refers to:

1. A changing regulatory environment pushing for decarbonization. For example, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) requires airlines to offset emissions such that net emissions do not increase beyond 2019 levels. France has banned certain short-haul flights that can be accommodated via rail alternatives. There are also various SAF-related regulatory initiatives with the EU introducing SAF-blending mandates for airports[7] and also taxing traditional fuel sources,[8] while the UK and U.S. are promoting SAF usage through blending mandates, funding, and tax credits.[9]
2. Costs incurred by airlines to offset emissions or transition to alternative technologies. In the near term, airlines would likely need to rely on carbon offsets to cut net emissions. The International Civil Aviation Organization estimates the cost of offsets under CORSIA to be around 0.4% to 1.4% of total revenues by 2035. In the medium to long term, heavy investments, including research and development for commercialization, are required to increase SAF production and usage, as well as the purchase of next-generation aircraft. The total investments required by the aviation sector for SAF and alternative propulsion technologies is estimated at USD175 billion annually until 2050 (around USD 5.0 trillion in total); airlines are estimated to directly incur 4% to 8% of these investments.[10]

As a result of these considerations, when we apply our ESG Criteria to a credit rating, the environmental factor of Carbon and GHG costs is currently flagged as Relevant (i.e., the factor has some credit impact, but the impact is not sufficient to change the overall rating or trend in the rating) for airlines.

Credit Ratings Impact

Over the long term, the carbon and GHG cost factors could become Significant in our ratings processes, resulting in changes to credit ratings or trends, compared with the impact of their current Relevant status. This change would be predicated upon (1) a change in legislation resulting in significant costs for airlines to comply with decarbonization targets and/or a significant increase in the cost of carbon offsets and (2) the pace of progress and cost incurred by airlines to adopt alternative technologies like SAF and new generation aircraft.

Climate and Weather Risks-related costs, which currently do not affect airlines ratings, might change in the medium term and be flagged as Relevant. This change would depend on (1) the frequency and intensity of extreme weather events hurting airlines' operations and (2) the aviation sector's ability to improve the infrastructure to deal with such events without material disruption.

7 European Union. ReFuelEU Aviation Regulation. October 9, 2023.

8 European Union. Energy Taxation Directive Updated July 2021.

9 UK Department for Transport. *Pathway to net zero aviation: developing the UK sustainable aviation fuel mandate*, 2023, and U.S. Office of Energy Efficiency and Renewable Energy. *SAF Grand Challenge*.

10 Mission Possible Partnership, *Making Net-Zero Aviation Possible*, July 2022.

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