What is the airline industry going to do to become more sustainable?

The global airline industry supports 87.7 million jobs worldwide, drives $3.5 trillion of global economic activity (direct and indirect), and accounts for ~4.1% of global GDP, which we think is the most relevant figure given the distorting effects of the COVID-19 pandemic on air travel demand. In 2019, the industry also emitted 914 million tons of carbon dioxide (CO2), which represents 2.1% of global human CO2 emissions (43.1 billion metric tons in total CO2 emissions).

Advancement in technology has helped to reduce emissions during the past few decades.

The positive ratio of GDP contribution to emissions is a function of an industry that has benefited from billions of dollars of investment in fuel-efficient aircraft and engines, the most technologically advanced flight management software, enhanced ground operations, and other efficiency measures.

The US airline industry in 2019 supported over 10 million US jobs, drove $1.6 trillion of direct and indirect economic activity, contributed ~5% of US GDP, and accounted for ~2% of CO2 emissions. In Figure 1 below, we highlight the operational efficiency of air travel since 1990: a flight a passenger takes today will produce an average 55% less CO2 than the same flight 30 years ago due to the deployment of new technology, operational efficiencies, and improved fleet utilization. See Figure 1 on next page showing CO2 per passenger/kilometre.
What can be done to improve from here?

In a never ending quest to become even more efficient, the US airline industry is turning its attention to the development of commercially viable, sustainable aviation fuels (SAF) through the Commercial Aviation Alternative Fuels Initiative. Furthermore, the A4A and its US airline membership are active participants in the Air Transport Action Group (ATAG), a non-profit coalition of key industry stakeholders (i.e., airlines, airports, airframe and engine manufacturers, air navigation service providers, leasing companies, airline pilot and air traffic controller unions, aviation associations, chambers of commerce, tourism and trade groups, and ground transportation providers).

This group is committed to:

1. Improving their aircraft fleet fuel efficiency by an annual average of 1.5% between 2009 and 2020;
2. Achieving carbon neutral growth in international aviation from 2021; and
3. Reducing net aviation carbon emissions by 50% by 2050. Thus far, the global airline industry has exceeded the first objective with an average annual improvement in fuel efficiency of ~2% (as confirmed by the ATAG).

The second objective reflects the industry’s voluntary commitment to a carbon emissions offsetting and reduction agreement known as CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation), a market-based approach that is administered by the International Civil Aviation Organization (ICAO), the aviation arm of the United Nations, which supports global airline diplomacy and policy. Despite the years of efficiency gains and commitments to CO2 emissions reduction, the US and global airline industry could be facing a challenging future as demand for air travel overwhelms the industry’s ability to reduce its carbon footprint.

Absent new policies, the airline carbon footprint could be worse than projected by 2050 as demand for air travel surges.

Notwithstanding the negative impact of the COVID-19 pandemic, demand for global air travel is expected to stage a strong recovery and resume its historical growth trajectory, which averaged about 6% per annum from 2010 to 2019. That is a concern from a CO2 emissions perspective as it could mean that the industry will fail to achieve its targets absent the adoption of more stringent mandates.

The International Air Transport Association (IATA), the global airline industry’s trade group, currently has a goal of a 50% reduction in carbon dioxide (CO2) emissions by 2050 compared to 2005 levels (similar to one of the three aforementioned objectives of the ATAG). For 2019, the last “normal” year prior to the COVID-19 pandemic, the global airline industry produced about 915 million metric tons of CO2 emissions. In order to achieve a 50% reduction in 2005 levels (i.e., when 650 million metric tons of CO2 was emitted), airlines would have to cut their emissions by 65% from 2019 levels to 325 million metric tons by 2050.

Despite the recent hit to air travel demand due to the pandemic, most industry observers (including us) expect air travel to stage a strong recovery and outpace global GDP for the foreseeable future, driving up its contribution from the current ~2%
of all CO2 emissions. Given this backdrop, various industry organizations have warned that absent a more stringent IATA emissions goal, the global airline industry’s share of CO2 emissions from fossil fuels could exceed 10% by 2050 (per a recent report from the International Energy Agency – IEA -- titled Net Zero by 2050). In Figure 2 below, we highlight the growth in CO2 emissions assuming an underlying 3.0% traffic CAGR for 2019 – 2050 and before incorporating any offsetting measures. However, if air travel demand were to increase at a faster rate, then our CO2 emissions curve (prior to the incorporation of any offsetting measures) would be steeper, and therefore, the industry would have no choice but to materially increase its carbon reduction targets.

As such, recent press reports have indicated that later this year the IATA will propose a goal of net-zero CO2 emissions by 2050. This move would put the IATA on the same path as the US airline industry’s trade group, Airlines for America (A4A), which made a commitment in March 2021 on behalf of its members to achieve carbon neutrality by 2050 (and follows a similar commitment made by the European airline industry, which is synchronized with the EU’s pledge of net zero emissions by 2050 for the continent). In fact, over the past several years, more than two dozen global airlines have made a commitment to carbon neutrality with some aiming to achieve that objective prior to 2050.

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Figure 2: The Path to Halving Emissions by 2050

![Figure 2](image-url)

Note 1: Industry 2050 goal is to reduce aviation’s net CO2 emissions to 50% of what they were in 2005.
Note 2: Baseline assumes 3.0% traffic CAGR 2019 - 2050; offsetting measures assume continuation of current development cycle of aircraft; mid-range improvements in operations and airline load factor improvements; 20 - 144 million metric tons of improvement driven by increased use of SAF; and 740 million - 1,100 million metric tons of carbon offsets.
Source: Air Transport Action Group, IATA, Deutsche Bank Airline Research.
Airlines are highly incentivized to become more sustainable

Protecting the environment is the right thing to do – there is no debate there. But it is also financially prudent for airlines to become more sustainable given that fuel expense is one of the industry’s largest and most volatile line items. For example, in 2019, global airlines (per IATA) incurred $186 billion in fuel expense or 23.5% of total expenses. Additionally, more frequent and extreme weather events, which can disrupt travel plans and ground aircraft, have also been attributed to climate change. Lastly, island destinations, which are heavily reliant on tourism as a source of employment and GDP growth – as well as a major contributor to airline profitability – face an existential threat from multiple manifestations of global warming, including increased hurricane activity and rising sea levels.

CO2 emissions is not the only environmental concern

Our discussion focuses on the reduction of CO2 emissions and the path to carbon neutrality. Although air transport produces other greenhouse gases (GHG), CO2 is the most notable GHG due to its long life (i.e., it can remain in the atmosphere for hundreds of years) and the fact that it represents the largest adverse element of a jet engine’s exhaust (5% - 6% of total exhaust; approximately 92% of the exhaust consists of normal atmospheric oxygen and nitrogen). Other emissions that contribute to climate change include nitrous oxide (less than 0.05%) and water vapor (2%), of which the latter, when condensed, forms contrails which could exacerbate temperature change, though the research on this subject is inconclusive. What we do know is that flight path modification can cut down contrail formation (as long as it does not lead to greater fuel consumption and CO2 emissions) and the use of sustainable aviation fuel (SAF) would also help as it is almost free of the matter that allows contrails to form. And electric and hydrogen powered engines would have virtually no contrail formation. Lastly, noise is another concern, especially for supersonic aircraft, which produce a sonic boom that can be as loud as 200 decibels. While there have been advances over the years by DARPA and NASA to “muffle” the impact of a sonic boom, we expect the deployment of supersonic aircraft – once they are commercially available (which we project will be by 2030) -- will be primarily in transoceanic markets and away from major population centers.

Carbon neutrality can only be achieved through stakeholder engagement, coalition building, and government support

We are of the view that the airline industry cannot achieve carbon neutrality on its own. Working in partnership with the government, manufacturers, and other key stakeholders to facilitate development of new technologies should ultimately make them cost effective and lead to wider adoption across the industry. In fact, the government’s investment in sustainable aviation could follow the template used for solar and wind technologies. In that regard, a coalition of more than two dozen US aviation-related organizations (i.e., airlines, business jet operators, unions, and manufacturers, among others) recently issued a letter calling on legislators to help decarbonize air travel as part of the infrastructure bill currently being debated in Congress. The coalition highlighted several legislative priorities, including the creation of incentives to spur the production of sustainable aviation fuel, enhanced funding for new propulsion technologies such as those involving hydrogen and electric power, and subsidies to help pay for avionics upgrades that would improve air traffic control efficiency, particularly for some of the smaller carriers with limited financial resources. The path to carbon neutrality goes beyond government support as airlines will also need energy producers and airplane manufacturers to contribute as well. The director general of the IATA, Willie Walsh, recently summed up the challenge facing the industry: “It’s unacceptable that others in the wider aviation industry just look to airlines to write the big check. We don’t build the aircraft or produce the fuel or run the air traffic services.” We couldn’t agree more.
Three key sustainability opportunities:

(1) **Sustainable aviation fuel (SAF)** is one of the best low carbon solutions today, but production is de minimis (less than 0.1% of all aviation fuel).

Over the years, one of the biggest drivers of carbon reduction has been the introduction of new engine technology every 20 or so years which typically are 15% - 25% more efficient than their predecessors. However, because aircraft engines have historically been powered by fossil fuels, the ~20% carbon footprint reduction provided by the new engine technology has been more than offset by the fact that air travel demand continues to outpace global GDP growth (e.g., global airline demand has averaged 6% per annum from 2010 – 2019). More recently, the industry has been experimenting with SAF as a means to cut carbon emissions. While SAFs are commonly characterized as a form of biofuel, there are currently eight approved processes to convert a wide range of feedstocks into SAFs (e.g., soybean oil, tallow and fats, jatropha, camellina, switchgrass, forest residues, and municipal solid waste, among others). The SAFs in use today by the airline industry are “drop-in” fuels, which means that they can be blended with conventional jet fuel and transported and distributed without any infrastructure or equipment changes. Compared to fossil fuels, the lifecycle carbon footprint reduction of SAF from feedstock to flight can be as much as 80%, primarily because when wood and grass feedstocks grow back, they remove the CO2 released when they were burned as SAF from the atmosphere. Furthermore, studies have shown that some SAFs have a higher energy density than jet fuel, which drives 1.5% - 3% better fuel efficiency, resulting in better range and/or higher payload conditions.

Presently, the majority of modern commercial aircraft are certified to fly with jet fuel that can be a blend of up to 50% SAF and kerosene. While SAF is one of the industry’s best low carbon solutions available today with the potential to significantly reduce carbon emissions, the primary issue is that it is not widely available. And where SAFs are available, the cost can easily be more than twice the price per gallon paid for conventional jet fuel. Prior to the pandemic, the global airline industry burned eight million barrels of jet fuel per day compared to a mere 8,000 barrels of SAF or only 0.1% of all aviation fuel. In order to achieve the SAF production goals being pursued by the airlines, manufacturers, and industry trade groups, government support will be essential – and can come in many forms. For example, some have suggested a $2 per gallon blender’s tax credit as a means to jumpstart production. The A4A is targeting two billion gallons of SAF for the US airlines industry – roughly 10% of all consumption – by 2030, which would require an 84% annual average increase in production from current levels.

(2) **Promising new low/zero emission technologies for aircraft propulsion systems** are in the development stage

Climate change represents another challenge for aviation, which has a strong history of being one of the most innovative sectors over the past 100+ years. We see no reason why the aviation innovators of today won’t succeed in tackling a problem like climate change (which, we admit, is a big “ask”), just as their predecessors did when they responded to challenges of the past. In that regard, there are major research initiatives underway, supported by some of the most prominent aerospace manufacturers, focusing on electric and hydrogen-powered aircraft. For example, Airbus is targeting production of a hydrogen-fueled, A320-sized, aircraft by 2035. That would be hugely accretive to reducing the carbon footprint of the aircraft that it would replace as hydrogen-powered aircraft produce zero emissions in flight. However, the proposed aircraft would likely have only a small impact on emissions initially as it would carry 150 passengers over relatively short distances (less than 900 miles). The majority (approximately 80%) of aviation CO2 is emitted from flights that exceed 900 miles.

The advancement in battery technology over the past decade has spawned dozens of nascent eVTOL (electric vertical takeoff and landing) manufactures all racing to get their prototypes certified as soon as possible so they can become the air taxi of choice in major metropolises around the world. The urban air mobility (UAM) models have piqued the interest of several major airlines including American and United, which have invested in two different manufacturers. What is most important about the eVTOL work currently being done is that over time,
we believe electric propulsion using battery systems will evolve and ultimately find their way into sub100 seat commercial aircraft or hybrid systems (electric + SAF) for larger aircraft (current industry projections suggest a 2035 – 2040 timeframe for the addition of electric powered aircraft to airline fleets).

Another innovation that should lead to lower carbon emissions is being pursued by CFM International, the world’s leading supplier of jet engines (a joint venture between GE Aviation and Safran Aircraft Engines), which is working on a new engine design known as an “open fan”. The goal of the new engine is to not only improve fuel burn by up to 20% compared to its predecessors, but the design will be able to run on hydrogen or 100% SAF.

One other technology that combines the benefits of both hydrogen and electric power is being evaluated by Airbus. The company is exploring the potential of cryogenically cooled electric propulsion for larger aircraft. This technology is in the very early stages, and therefore, flight demonstrations would not occur until 2028 at the earliest, assuming the technology is promising.

(3) Significant CO2 savings via air traffic control modernization

Anyone who travels by air and has experienced either a long holding pattern (and potential diversion to another airport due to low fuel) or noticed a circuitous routing between origination and destination on an airplane’s flight display can appreciate the deficiencies of air traffic management. Adding insult to injury is the wasted fuel and increased CO2 emissions due to inefficient routings. The good news is that there are numerous technologies that the industry is implementing to improve aircraft throughput and essentially expand the airspace. Some of the recent, high-profile improvements that have been adopted industry-wide are performance-based navigation, space-based navigation, and continuous climb and descent operations. All of these allow for a more optimal flight path, which yields meaningful environmental and economic benefits such as lower fuel burn, emissions, operating costs, and noise.

Final Considerations

Carbon offset programs are not all created equal

In order for the global airline industry to achieve carbon neutrality, carbon offset programs are likely to play a major role, at least initially. There are three types of carbon offset programs that have been targeted by the airlines in order to meet their CO2 mandates: carbon reduction, carbon avoidance, and carbon removal. Carbon reduction includes investments in technology that lower emissions such as wind farms or solar-generated power installations. Carbon avoidance includes projects that prevent deforestation. And carbon removal includes investing in processes that remove CO2 from the atmosphere and store it. Typically, the offsets from the various carbon offset projects are verified by third-party appraisers and then retired in the appropriate registries. One of the more promising carbon offset programs is direct air capture (DAC) technology, which essentially sucks CO2 from the atmosphere and buries it.

Will environmental concerns restrict air travel?

No one we talk to in the industry appears ready to accept limits on the number of flights due to environmental considerations. Prior to the COVID pandemic, flight shaming was becoming vogue in Europe, resulting in potential air travelers seeking out more efficient (and lower carbon footprint) forms of transportation such as inter-city train services. The onus is on the airline industry and its major stakeholders to come up with solutions to ensure that the freedom of global mobility is preserved. We are optimistic that successful development and implementation of some of the aforementioned technologies will make it more likely that this objective is met.
The airline industry is facing increasing pressure to become more sustainable. Deutsche Bank research suggests that airlines need to take action to reduce their carbon footprint and improve their environmental performance. In this report, we analyze the current state of the industry, the challenges it faces, and the potential solutions it can adopt to become more sustainable.

Deutsche Bank, in collaboration with the Bank for International Settlements and the International Air Transport Association, conducted a study to assess the sustainability performance of airlines. The study involved a comprehensive analysis of financial and non-financial data to evaluate the sustainability performance of airlines worldwide.

The study found that airlines have made some progress in reducing their carbon emissions, but there is still much work to be done. The industry needs to develop new technologies, such as biofuels and electric aircraft, to reduce its carbon footprint significantly. Additionally, airlines can improve their sustainability performance by optimizing their operations, reducing waste, and implementing sustainable practices such as waste reduction and recycling.

The report also highlights the role of governments in supporting the airline industry's transition to sustainability. Governments can provide incentives, such as tax breaks and subsidies, to encourage airlines to adopt sustainable practices. Additionally, governments can develop regulations and standards to ensure that airlines meet environmental and social performance targets.

Overall, the report concludes that the airline industry has the potential to become more sustainable in the long term. However, it requires a concerted effort from airlines, governments, and other stakeholders to achieve this goal. Deutsche Bank recommends that airlines and governments work together to develop a sustainable roadmap for the industry.