

# AIR TRAVEL - A SUSTAINABLE FUTURE

THE FUTURE OF TRAVEL

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February 2023



# Introduction

The aviation industry is emerging from one of the deepest and longest downturns in recent history. Airlines must now rebuild their businesses and their balance sheets. In the post-pandemic world, they must also contend with an elevated awareness of aviation's impact on the environment, and on climate change in particular, and widespread demands for action to mitigate this impact. This will require the aviation industry to accelerate innovations underway before the downturn and embrace newly emerging technologies. In this new paper, we lay out the foundations for the future, explore aviation's path to sustainable air travel and consider what this could mean for travel programs and business travelers.

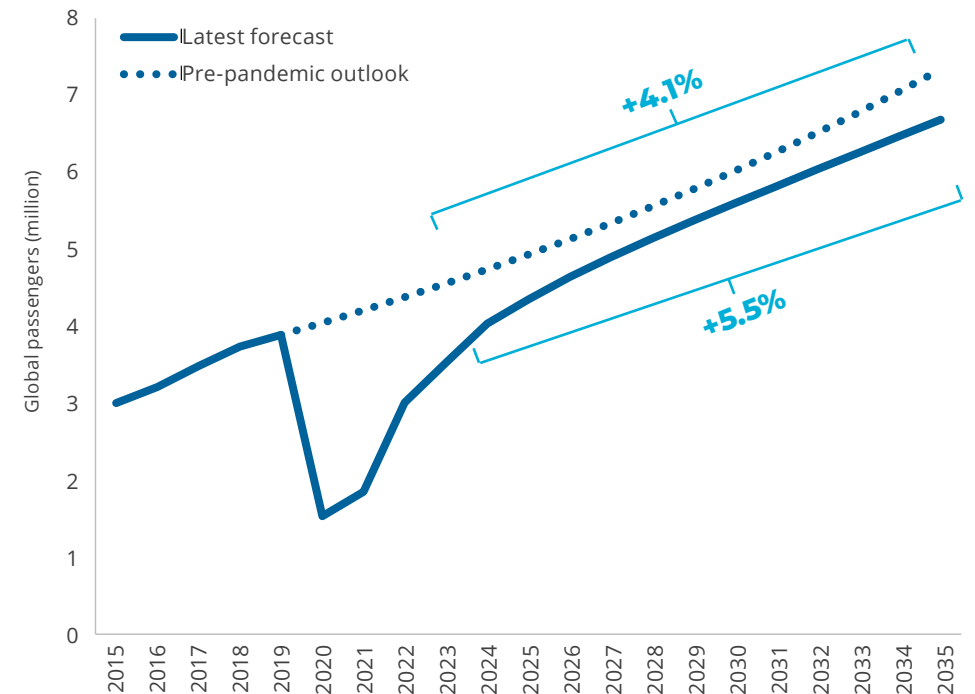
## Laying the foundations for the future

### Air travel was hit hard by the pandemic

Over the last three years, air travel and aviation companies have taken a big hit from the COVID-19 pandemic. For periods lasting weeks or even months, markets around the world were completely closed to air travel. And when they reopened, travelers had to navigate complex restrictions and regulations, which often changed at short notice, while having to assess the likelihood of their trips being disrupted or their health being put at risk. An inability to travel, combined with a reduced desire among many travelers to take a flight, hit demand hard. Pre-pandemic, the International Air Transport Association (IATA) had predicted global airline traffic in 2020 would post a second year of growth of just over 4%.<sup>1</sup> Ultimately, airline traffic (revenue passenger kilometers) contracted by 67%, while passenger volumes declined by 61%.

Since the early days of commercial aviation, the industry has faced multiple periods of disruption and downturn, with two Gulf Wars, the aftershock from the 9-11 terror attacks and 2008's global financial crisis among some of the more recent examples. While none of these later events have been of the magnitude nor duration of the pandemic, IATA is confident that **air travel will once again bounce back stronger than ever**. Indeed, the release of pent-up demand should drive annual growth of 5.5% between 2023 and 2035; this is higher than the 4.1% growth, should IATA's pre-pandemic prediction been sustained going forward. **Air travel should rebound stronger than ever.**

Global airline passenger outlook: post-pandemic rebound





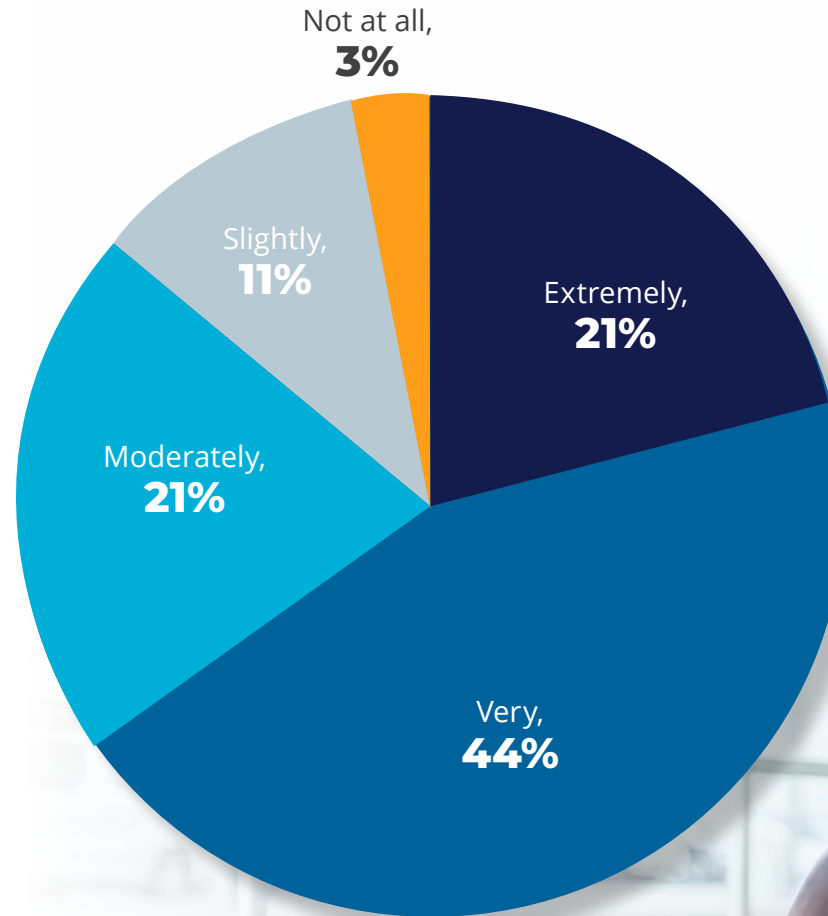
## Sustainability surges up the travel agenda

Amid talk of a wider global reset in the wake of the pandemic, sustainability has surged up the travel agenda, as calls grow for a coordinated response to the existential threat many consider climate change presents.

Airlines' corporate customers concur with this sentiment, making it very clear that they want their employees to travel sustainably. **Almost two-thirds of travel managers rate environmentally sustainable travel as very or extremely important.**<sup>2</sup> A similar proportion (61%) already operate travel programs that actively encourage sustainable travel options. With three-quarters of travel managers prioritizing a reduction of travel's environmental impact, there's clearly more to come on the sustainability front as programs and priorities more closely align.

The position of travel managers echoes the views of travelers. Research by U.K. low-cost carrier EasyJet found that over three-quarters of its travelers think that companies need to urgently set out their plans to achieve net-zero and demonstrate how they are operating more sustainably.<sup>3</sup>

How important is environmentally sustainable travel?



The prospect for a period of stronger than previously forecast growth in air travel increases the imperative on aviation to respond to concerns about its environmental impact. As a long-time target of the environmental lobby, aviation has renewed its commitments to reduce its environmental impact and is taking action. IATA, which represents more than 300 airlines, has committed to net-zero carbon emissions by 2050.<sup>4</sup> It recognizes the challenge of reducing emissions while accommodating the growing demand for air travel. Individual airlines are making their own commitments and developing plans to achieve them.

The International Civil Aviation Organization (ICAO), a United Nations (UN) agency, followed IATA in October 2022, agreeing a collective long-term aspirational goal (LTAG) of net-zero carbon emissions for 2050 for global aviation.<sup>5</sup> The agreement among 184 governments and 57 organizations adds extra impetus towards decarbonized air transport and the green innovation required to achieve it. This will start with the accelerated adoption of new and innovative aircraft technologies, streamlined flight operations and the increased production and availability of sustainable aviation fuel (SAF). It ultimately aims to deliver emissions-free powered flight. But this will come at a cost at probably the worst time for aviation.

<sup>4</sup>IATA, Oct. 4, 2021

4 <sup>5</sup>ICAO, Oct. 7, 2022

<sup>6</sup>IATA, Sept. 2022

Airlines suffered immense financial damage during the pandemic. By the third quarter of 2022, the four largest U.S. carriers had together sustained net losses of US\$36 billion since the start of the pandemic, erasing the profits accumulated over the previous four years. **Airlines desperately need to rebuild their finances**, and this won't be easy. Amid heightened geopolitical turmoil and concerns about economic recession, the outlook for demand has become less certain, while high fuel and labor costs continue to weigh on profits.<sup>6</sup>

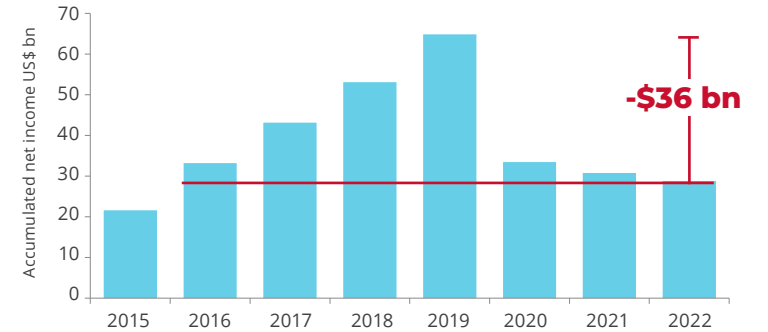
As they attempt to repair their balance sheets, airlines will need to respond to growing calls from consumers, governments and regulators for a more sustainable approach to aviation.

## The future of air travel needs to be sustainable, not just environmentally, but financially too. The future of air travel will be built around sustainable innovation.

In this new report, we consider how aviation is progressing towards a future of sustainable air travel, touching on some of the issues impacting travel programs, travel managers and business travelers.



Impact of the pandemic on U.S. airline profits







**Airlines' sustainability credentials increasingly matter to consumers.**

## **A sustainable journey**

### **Sustainability: Providing a competitive edge**

Most airlines have now created and published their roadmaps towards achieving net-zero carbon emissions by 2050. They recognize that their **sustainability credentials increasingly matter to consumers**, who want to take action today to reduce their own carbon footprints. Keen to capitalize on the competitive advantage they offer, airlines now actively publicize their own sustainability initiatives. They often engage directly with passengers, **who may demand action from their corporate travel programs**. That they are now using sustainability as a competitive tool demonstrates how important it's become in shaping airlines' business decisions. And it is important to airlines. After Ryanair claimed to be greener than its rivals, claiming to generate 66-70 grams of CO<sub>2</sub> per passenger, rival Wizz Air responded with a lower figure of 55 grams for its own operations. Ryanair hit back by declaring itself Europe's greenest *major* airline.

But what can aviation genuinely do in its pursuit of sustainable air travel? Many airlines are starting their journeys towards net-zero with sustainable aviation fuel.



## Sustainable Aviation Fuel

Sustainable aviation fuel (SAF) presents **the most practical immediate solution for reducing air travel's carbon footprint**. In fact, SAF is a proven solution: In 2008, a Virgin Atlantic Boeing 747 became the first commercial aircraft to be powered by a blend of conventional jet fuel and SAF.<sup>7</sup> And by 2017, more than 100,000 flights were powered by a SAF blend, according to IATA.

SAF is a catchall term for fuels that are **renewable or derived from waste** and meet certain sustainability criteria. Raw materials or feedstocks are varied and include tallow, used cooking oil, corn starch, renewable diesel and mixed alcohols. Producers continue to explore new and more sustainable sources. For example, carbon technology business Air Company plans to use renewable energy to make SAF from captured CO<sub>2</sub> and has already secured orders from airlines, including JetBlue Airways and Virgin Atlantic.<sup>8</sup>

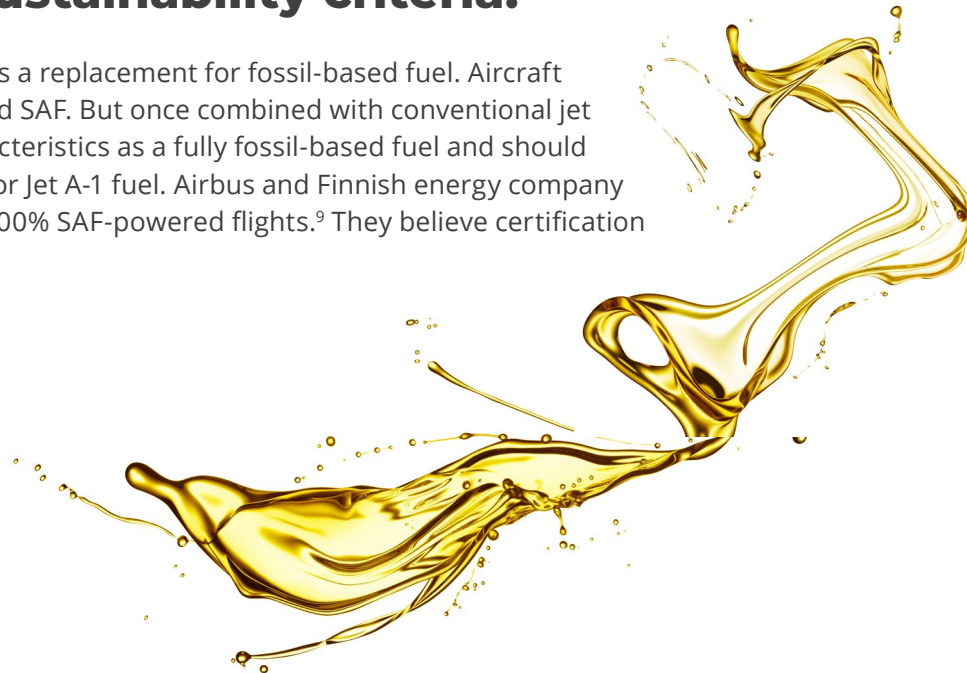
## Sustainable aviation fuels are **renewable or derived from waste** and meet certain sustainability criteria.

SAF is a drop-in fuel, meaning it can be dropped in as a replacement for fossil-based fuel. Aircraft are currently permitted to fly with up to 50% blended SAF. But once combined with conventional jet fuel in a 50:50 ratio, a SAF blend has the same characteristics as a fully fossil-based fuel and should be suitable for use on any aircraft certified for Jet A or Jet A-1 fuel. Airbus and Finnish energy company Neste are among the companies looking to enable 100% SAF-powered flights.<sup>9</sup> They believe certification can be achieved before 2030.

<sup>7</sup>[Fuels and Lubcs magazine](#), March 4, 2020

<sup>8</sup>[BTN](#), Sept. 22, 2022

<sup>9</sup>[Airbus](#), Nov. 30, 2022







## SAF can reduce CO<sub>2</sub> emissions by up to 80%.

Unlike other alternative fuels under development, such as hydrogen, SAF can be handled by existing infrastructure. IATA claims **SAF offers a reduction in CO<sub>2</sub> emissions of up to 80%**, and the figure could be even higher, should carbon be sequestered during the production process. But it's important to understand that SAF does not reduce carbon emissions from flying. Its carbon benefit is realized only once the **full lifecycle** is considered.<sup>10</sup> Emissions from SAF production are lower and the feedstocks used to create them should not theoretically run out.

While SAF is capable of being an immediate solution, it's still only at the beginning of its journey. In 2020, it accounted for less than 0.1% of total aviation fuel consumption, but that's about to change as **airlines and producers commit to scaling up the use and availability of SAF.**

**SAF's benefits are only realised once the full lifecycle is considered.**



## Travel programs are interested in SAF

Corporate travel programs are taking note of SAF, with a small but growing number committing to its use. Watchmaker Breitling aims to reduce its CO<sub>2</sub> emissions from air travel by up to 80% by purchasing enough SAF to cover all of its business travel on Swiss International Airlines.<sup>11</sup> It's not clear exactly how this arrangement will work in practice, but it's unlikely to involve Breitling employees only traveling on SAF-powered flights. It's more likely that Breitling can claim carbon neutrality by funding the airline's wider use of SAF across its flying program. **Some audit trail will need to exist** to ensure Breitling is getting value for its carbon dollars. Other companies are taking a more targeted approach. Volvo Group has done a deal with Braathens Regional Airlines specifically on its twice-weekly services between Gothenburg and Lyon. It's a small start, but it feels like a more manageable arrangement and is one that will **reduce CO<sub>2</sub> emissions by at least 40% from day one.**

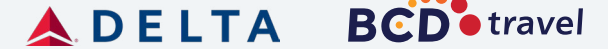
There doesn't appear to be a standard approach for engagement between travel programs and airlines in respect of SAF. The need for bespoke arrangements may add **extra complexity** to supplier relations. And as more companies commit to using SAF, it's not clear what happens if the sum of all corporate client commitments to SAF **exceeds aviation's ability to supply it.**

## There's unlikely to be enough SAF to go around

To meet aviation's net zero commitment, SAF will need to account for 65% of the industry's carbon mitigation in 2050.<sup>12</sup> This would require 449 billion liters of SAF to be produced annually. Current investments should enable 5 billion liters of SAF to be produced by 2025. With the right incentives, IATA estimates production could reach 30 billion liters by 2030. This could be the tipping point needed to promote large scale SAF production and use.

<sup>11</sup>[BTN Europe](#), September 20, 2022

<sup>12</sup>[IATA](#), June 21, 2022



## Delta and BCD sign first global travel management SAF deal

In 2021, Delta Air Lines and BCD Travel signed the first-ever sustainable aviation fuel (SAF) agreement for a travel management company to address the emissions from BCD employee travel.

[▶ READ MORE](#)







Airlines are expected to consume 84 billion gallons of fuel in 2022;<sup>13</sup> that's 382 billion liters. And this is before flights have returned to pre-pandemic levels. Put quite simply, the 30 billion liters of SAF that could be produced by 2030 would cover **less than 8% of global aviation's current needs**. Of course, extra production and new sources of SAF will continue to come on line over the next seven years, but capital projects don't happen overnight, so it will take years for production to ramp up. It seems clear that **SAF production will fall far short** of a meaningful percentage of the fuel consumed by aviation. And it's not simply a short term issue. Energy information provider ICIS expects SAF's share of global fuel consumption will still be less than 20% in 2050, far short of IATA's 65% goal.

While it's possible for SAF production to exceed IATA's expectations, there are also concerns about the suitability and availability of feedstock. Some are byproducts of high greenhouse gas emitting industries, casting doubts on their low carbon credentials. And there's only so much biowaste available. Once supplies are exhausted, SAF producers will have to turn to other sources. This could include switching agricultural land from food to biofuel production. The potential to create food and water shortages and push up food prices for sake of sustainable aviation risks **damaging SAF's environmental credentials**.

Airlines may already recognize the limitations of SAF. Cathay Pacific has set a goal of using SAF for just 10% of its fuel needs by 2030.<sup>14</sup> Given the apparent urgency to reduce aviation's environmental impact, there are clearly other approaches needed to deliver sustainable aviation.

## Cost may be SAF's biggest challenge

Should sustainable air travel be pursued at any price? SAF carries a higher cost than the fossil-based fuel it's replacing. Estimates suggest **SAF can be anywhere between two to eight times more expensive than the crude oil-based jet fuel** it's replacing.<sup>15</sup> Given the current state of their finances, it's unlikely that airlines will be prepared to absorb this extra cost, which seems most likely to be passed on to customers. Unless this price premium is reduced, **it could make air travel prohibitively expensive**. It's likely to be some time before enough SAF is produced, for the economies of scale to start bringing down its price.

Governments may need to step in. In Denmark, to promote the use of SAF on domestic flights, the government plans to offer a subsidy from 2027, which will be funded by the introduction in 2025 of a Dkr13 (US\$1.70) passenger tax on all departures.<sup>16</sup> Everyone pays.

<sup>13</sup>[IATA](#), Fuel Fact Sheet

<sup>14</sup>[BTN](#), Sept. 22, 2022

9 <sup>15</sup>[BTN Sustainability Newsletter](#), Oct. 19, 2022

<sup>16</sup>[CAPA](#), Jan. 4, 2022





## Other forms of power may be a better long-term bet

SAF provides some immediate relief and enables aviation to show it is taking direct action to reduce its environmental impact. But **there are other ways to power aircraft in a sustainable way**, albeit still some years away. Various forms of electric power will reduce emissions and may even offer emissions-free flight.

### The steps towards sustainably-powered flight



Image credit: Eco Caravan, Ampaire



Image credit: Alice, Eviation



Image credit: ZeroAvia







## Hybrid-electric – the first step

Combining combustion and electric propulsion, hybrid-electric powered flight is close to becoming a commercial reality. Ampaire's nine-seater Eco Caravan has already made its first test flight, bringing the first hybrid-electric regional services an important step closer.<sup>17</sup> The Eco Caravan **reduces fuel consumption and emissions by up to 70%**; net emissions can be close to zero if SAF is used. And just as importantly for airlines and their customers, **operating costs may be reduced by 25-40%**, depending on airline route structure. Ampaire is already planning hybrid-electric upgrades for larger aircraft, such as the 19-seat De Havilland Canada DHC-6 Twin Otter, for which it's already secured an interest for 50 examples from air mobility company WingTips.<sup>18</sup>

Fully-electric powered aircraft are presently range-limited because of the weight and energy capacity of current generation batteries. But that will inevitably change given the rapid progress made recently in battery development for automotive applications. Hybrid-electric is just the start, until full-electric delivers the range and capacity required to be a commercially viable option. **Hybrid-electric enables airlines to start decarbonizing air travel while benefiting from lower operating costs.** And as the conventional engine can recharge the batteries inflight, scarcity of charging stations on the ground need not be a limitation to the deployment of hybrid-electric aircraft.



Image credit: Eco Caravan, Ampaire

11 <sup>17</sup>Ampaire, Nov. 18, 2022

<sup>18</sup>Ampaire, July 20, 2022





## Heart – where SAF meets electric – the next step?

Sweden's Heart Aerospace already has bigger aircraft firmly in its sights. It's developing the ES-30 and already has an order for 30 units from Air Canada. The 30-seater ES-30 is scheduled for service entry by 2028. Rather than an all-electric layout, it will adopt a reserve-hybrid approach, using two SAF-powered turbo-generators to produce electricity for the propulsion motors. This system secures reserve energy and can complement the electrical power provided by the batteries.

Air Canada sees the ES-30 as key to its efforts towards net zero emissions. United Airlines, regional partner Mesa Airlines, Braathens Regional Airlines, Icelandair, SAS and Sounds Air may follow Air Canada with their orders. Heart may already have commitments for more than 100 ES-30s. **By moving to hybrid-electric, airlines can offer cleaner and greener flying, but not yet emissions free.**



Image credit: Heart ES-30, Heart Aerospace





## Full-electric starting small too

Like Ampaire, Eviation is starting small with Alice, its full-electric nine-seater. A demonstrator aircraft has already flown for eight minutes at 3,500 feet as part of a certification process, which Eviation hopes to complete by 2025. It's marketing the lithium-ion battery-powered Alice as a commuter aircraft with a 440nm (815 km) range and cruise speed of 220kt (407 kph). The batteries should provide one flight hour for every 30 minutes of charging.

By December 2022, Eviation had received orders and letters of intent for 185 aircraft from companies including DHL Express, Cape Air, Evia Aero and Miami-based charter airline GlobalX. Air New Zealand has become the first national airline to show an interest in the Alice. Regional flights make up a sizeable part of its operation. As short-haul air travel comes under increasing pressure to reduce its emissions, the Alice enables Air New Zealand to offer passengers a sustainable alternative.

Eviation expects to Alice to be available from 2027, but **much depends on advances in battery technology towards improved energy density**, securing commercial viability for electric aircraft. Right now, companies like Eviation must develop their own batteries. Electric flight development could really take off once generic battery makers turn their attention to the needs of aviation.

Image credit: Alice, Eviation

## Electric airlines – a new business model

Much in the same way as the Internet inspired and facilitated the low-cost airline revolution in the 1990s, the prospect of commercially-viable electric aircraft is inspiring a new airline business model: built from the ground up based purely on e-powered flight. Netherlands-based Fly With Lucy is pioneering the model, with plans to commence operations from Eindhoven in 2025, initially relying solely on a fleet of five-seater e-aircraft with a range of around 250 km. Using the Lucy app, travelers would travel to an uncongested regional airport by electric vehicle, before transferring to an electric aircraft for the flight to their final destination. The start-up has already attracted interest and investment from low-cost carrier Transavia, which is interested in the prospect of Fly With Lucy taking over some of its current routes by 2030.

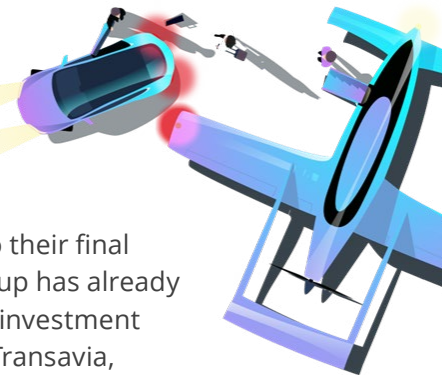


Image credit:  
Flywithlucy.com



## Hydrogen, the third way to sustainable flying

At the same time as pursuing SAF and electric-powered flight, aviation is already exploring a third cleaner power source, hydrogen, which can be used either in batteries or as a fuel directly “burned” by aircraft engines. Hydrogen-based fuel cells are already in development. ZeroAvia is aiming for 2024 certification of a partially electric-powered engine suitable for small utility aircraft, such as the Cessna Caravan. It’s also working on a powertrain for regional aircraft with 40-80 seats, targeting service entry in 2026. But the weight and power constraints of current battery technology will limit its application in aviation beyond small aircraft.

In an industry first, aeroengine maker Rolls-Royce has recently ground tested a conventional aircraft engine powered by hydrogen.<sup>19</sup> As hydrogen contains no carbon (unlike kerosene), when it burns, no CO<sub>2</sub> is produced. The development is supported by EasyJet, which believes **hydrogen power offers the best way for short-haul aviation to reduce emissions.** It regards hydrogen as a better alternative to electric batteries. It will be some years before a battery possesses the “fuel density” needed to power even narrowbody airliners. Right now, batteries are simply too heavy to power larger aircraft.

Hydrogen-powered commercial flight is still some years away, however. Testing is still in its early stages, as aviation explores the zero carbon possibilities of hydrogen.<sup>20</sup> Rolls-Royce has shown existing engines can run on hydrogen, but safely powering a passenger aircraft will require an entirely new engine and a redesigned aircraft. And then there’s the infrastructure needed to supply the fuel. In liquid form, hydrogen takes up four times the space of kerosene and needs to be stored at -253°C. It also needs to be turned back into gas before being burned. **Some big technological issues still need to be resolved.**



Image credit: ZeroAvia

14 <sup>19</sup>[BBC](#), Nov. 28, 2022

<sup>20</sup>[BTN Europe](#), Nov. 28, 2022





And then there's producing the fuel itself. Green hydrogen can be a very clean fuel, if renewable wind energy or tidal power is used to split water into hydrogen and oxygen. However, most industrial hydrogen produced today requires a considerable amount of energy, often provided by burning fossil fuels, releasing a considerable amount of CO<sub>2</sub>. The sustainable solution would be green hydrogen produced at scale.

In its approach to hydrogen, Airbus is not confining itself to its ZEROe demonstrator aircraft, which will be fueled by hydrogen. It's also developing hydrogen fuel cells to provide electric propulsion. Not only is this an alternative to a hydrogen-burning gas turbine, but it could also be integrated with hydrogen-powered engines in a hybrid-electric format. Like Rolls-Royce, it's progressed to ground trials and hopes to have a fuel cell propulsion system certified by 2035.

Like most new aviation technologies, hydrogen-powered aircraft will require new regulations covering aircraft certification and operation, hydrogen production, and distribution infrastructure. And like SAF, supply could be an issue. Enough green hydrogen must be available at the right quantity, right place and right price.

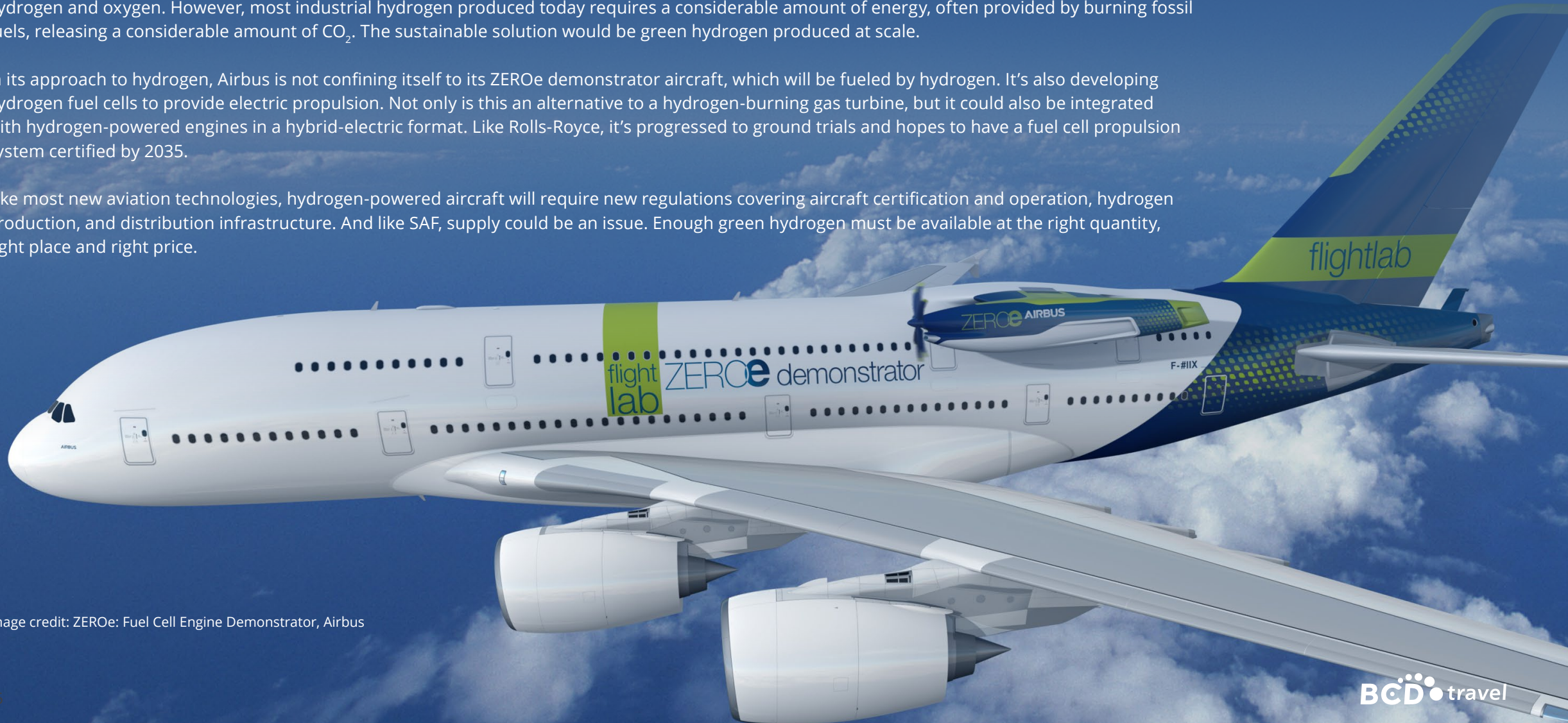


Image credit: ZEROe: Fuel Cell Engine Demonstrator, Airbus



## Aviation is already preparing for hydrogen

Airlines know they cannot afford to ignore hydrogen's potential. American Airlines has joined JetBlue Airways in investing in Universal Hydrogen, which is developing a modular hydrogen capsule system as an alternative fuel source for aircraft. The capsules are designed to be loaded on aircraft like cargo and will be distributed via existing transport networks rather than via an entirely new fuel distribution infrastructure. American could use the capsules to fuel hydrogen-electric powered engines produced by ZeroAvia.

Seizing on travelers' desire for sustainable solutions, start-up carrier Connect Airlines aims to be at the leading edge of smarter, greener travel. To meet its ambition to be the first zero emission airline in the U.S. by 2025, it's working with Universal Hydrogen to retrofit 75 ATR 72-600 turboprop aircraft with hydrogen electric conversion kits. First deliveries are expected from 2025.<sup>21</sup>

Airports are also preparing for hydrogen, even though it might not be until the mid-2030s that aircraft start using the fuel. In the U.K., Manchester Airport has unveiled plans to install a direct hydrogen fuel pipeline, so it can use it at scale as soon as it's available.<sup>22</sup>

## Hydrogen can only be part of the solution

IATA acknowledges that hydrogen-powered aircraft are a part of aviation's plan to achieve net zero emissions by 2050. But, **like electric power, hydrogen's application is likely to be limited to short-haul routes.**<sup>23</sup> Project NAPKIN (New Aviation Propulsion Knowledge and Innovation Network), a consortium which includes London's Heathrow and City airports, GKN Aerospace and Rolls-Royce, believes hydrogen-powered **intercontinental flights might be possible by 2040.** But even if confined to small- and medium-sized commercial aircraft, it could take decades for the world's fleet and infrastructure to accommodate hydrogen.

<sup>21</sup>[Future Travel Experience](#), Oct. 2022

16 <sup>22</sup>[Manchester Airport Group](#), Nov. 29, 2022

<sup>23</sup>[IATA](#), June 21, 2022

## Tips for reducing air travel emissions

The Global Analytics for Travel Emissions (GATE4) methodology developed by corporate travel consultancy Advito provides a useful checklist to help travelers and travel managers tackle the carbon emissions from air travel.



- Aircraft type: Significant differences exist in emissions between aircraft types. New generation aircraft may also be more fuel efficient than older types.
- Cabin class: Premium class seats are typically heavier and take up more space, increasing unit emissions per passenger.
- Cabin configuration: These can vary even for the same aircraft type within a given airline.
- Airline load factor: An airline's success in filling available capacity will affect each passenger's share of emissions from a flight's underlying fuel use. Per passenger emissions will be higher on empty flights.
- Flight distance: Flying on direct services should generally mean shorter flights, while reducing the extra fuel use associated with takeoffs and landings which would result from multi-sector itineraries.

Armed with a strong methodology and guided by Advito's consultants, travel managers can help employees travel better and achieve CO<sub>2</sub> reductions for their organizations. To find out how GATE4 can help tackle carbon emissions for business travel, visit the dedicated [GATE 4](#) page or contact Advito [here](#).



## How carbon offsetting can contribute to more sustainable travel

We are living in a decisive decade in which climate action and taking responsibility is crucial to limit our impact. Climate change is a global problem that requires dedicated effort and actionable solutions. By investing in carbon offsets, companies can take responsibility for emissions they cannot reduce or avoid (yet).

Carbon offsetting can mitigate corporate footprints through the purchase of carbon credits. One carbon credit represents a reduction or removal of one ton of CO<sub>2</sub> via offsetting projects, which range from forestry projects to installing efficient cooking stoves. Offsetting is accepted as a legitimate mechanism to achieve the goals of the Paris Agreement.

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Climate Neutral Group (CNG), part of Anthesis, is a partner in the BCD Travel marketplace, offering solutions for offsetting your organization's business travel, scope 3 emissions with CO<sub>2</sub> credits. The CO<sub>2</sub> credits comply with the highest international standards, ensuring positive co-benefits for nature, biodiversity and people and therefore contribute to the UN's sustainable development goals. Find out more about sustainability solutions at [solutionsource.bcdtravel.com](https://solutionsource.bcdtravel.com).

## Airlines aren't standing still on sustainable flying

Airlines aren't simply waiting around for the arrival of more efficient ways to power aircraft. They know that they need to act now to reduce their emissions and there's more that they can do. **Airlines are making changes to the way they operate to reduce their environmental impact.** EasyJet, for example, is investing in descent profile optimization (DPO) and continuous descent approach (CDA) technology. By allowing aircraft to descend from cruise altitude using only idle engine thrust and enabling them to spend more time at cruise level, DPO and CDA should deliver permanent fuel savings of 1%, as well as cutting noise. Once installed across its fleet of more than 300 Airbus A320 family aircraft, the technology will realize annual CO<sub>2</sub> savings of 88,600 tonnes.<sup>24</sup>

While pursuing a longer term goal of zero carbon emission flying, this is one example of an airline focusing on day-to-day reductions in its emissions. Fleet renewal is another approach. While it's not inspired purely by the pursuit of sustainability, **introducing newer aircraft, such as the Airbus A320neo family, can offer fuel efficiencies of around 15%** compared to the models they replace. Other operational adjustments that airlines are making include single engine taxiing on arrival and departure, reducing the use of auxiliary power units (APUs) when on the ground, advanced weather warnings to improve navigational performance and engine washing to remove debris and enhance performance.

A number of airlines, including Air Canada, British Airways and Delta Air Lines, offer customers the chance to participate in carbon offset programs.<sup>25</sup> These can be integrated into the booking process, so that travelers are presented with estimates of their journeys' emissions and an opportunity to voluntarily offset them. The quality of the programs does vary, however, and carbon offsetting does not present a long-term solution for reducing the emissions from flying.



Image credit: Photo by Alexandre Doumenjou, A320neo, Airbus

<sup>24</sup>Future Travel Experience, Sept. 2022

<sup>25</sup>Conserve Energy Future



# Rail has a role to play

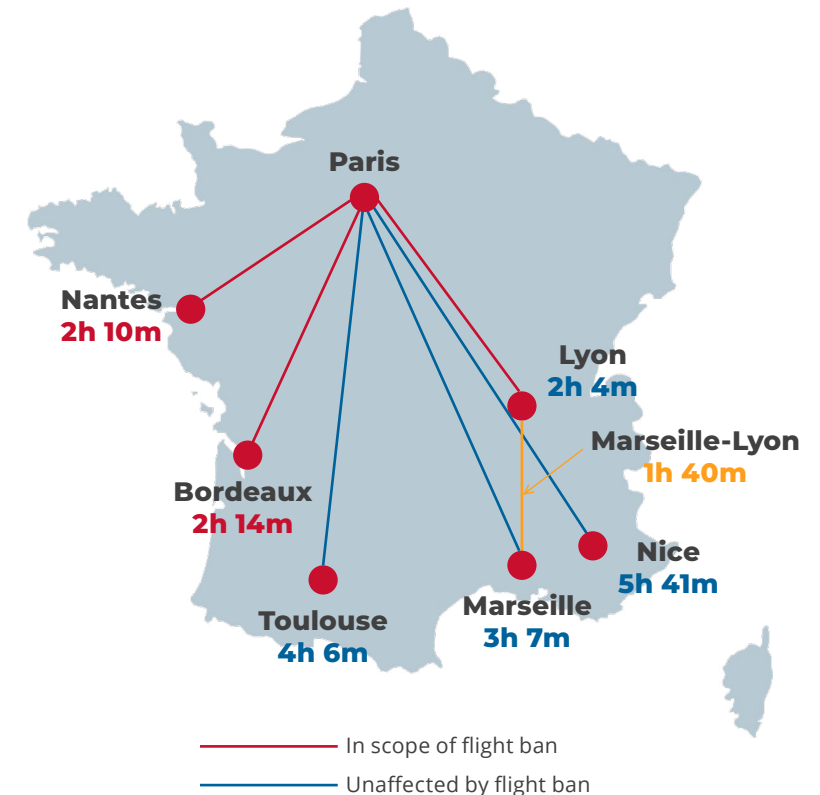
## An alternative to some flights

For many journeys, air isn't always the only way to travel. For shorter trips, rail is being increasingly touted as an alternative, more sustainable way to travel. High-speed rail services are already well-established in a number of markets, particularly in China, Japan and across Europe, providing the speed and comfort that business travelers look for. They're most attractive for travel between city centers, and may often offer faster total journey times than air, particularly once check-in times and travel to/from airports are added in.

As well as saving time for some journeys, **switching from air to rail can certainly help reduce a trip's carbon footprint.** A study by the Intergenerational Foundation (IF) think tank concluded that banning flights on mainland U.K. routes, where a rail alternative of under 4.5 hours was available, could cut emissions from domestic aviation by 53%.<sup>26</sup> There are downsides to switching, however. As rail typically entails traveling between city centers, two-thirds of travelers will have longer journey times compared to flying. On average, journeys would be 14 minutes longer, and prices would be comparable if booked in advance. So a change of behavior would be required both pre- and during the trip. But it seems to be a small price to pay for the environmental benefit.

To encourage flyers to make the switch, the French government intends to ban short-haul flights, where a train or bus alternative of 2.5 hours or less is available. This was due to come into effect from April 2022 but was held up by a legal challenge. The 2.5 hour threshold falls short of the four hour rail journey environmental campaigners had wanted.<sup>27</sup> As the map shows, a number of key travel markets fall within the scope of the ban. As the ban approaches, few, if any of these markets, have yet to lose their air services. In any case, flights will continue from Paris to Bordeaux, Lyon and Nantes by virtue of an exemption granted for connecting flights from Charles de Gaulle airport. But Air France's 16 weekly flights between Marseille and Lyon should be vulnerable, as this is a journey that a TGV INOUI rail service takes one hour 40 minutes to complete.<sup>28</sup> The sentiment of the French government is clearly encouraging, but will the execution fall short of expectation?

### Rail alternatives to French domestic flights



<sup>26</sup>[Engineering & Technology](#), Oct. 12, 2022

<sup>27</sup>[Railway Technology](#), Sept. 27, 2022

18 <sup>28</sup>[Trainline](#), Trains from Marseille to Lyon, Nov. 24, 2022





## A greener alternative to flying

Rail's green credentials are certainly something that Eurostar uses to promote its services. By traveling on its London-Paris service, **a passenger will use 93% less CO<sub>2</sub> than flying.**<sup>29</sup> That means a passenger's carbon footprint from a single flight can be the same as making 13 Eurostar journeys.<sup>30</sup> Unlike aircraft, all of Eurostar's trains are electric-powered, and when operating in the Netherlands, this electricity is generated entirely by wind power. All trains operating in the U.K., France and Belgium should run on renewable energy by 2030, giving Eurostar a compelling case to present itself as the sustainable option.

The European Commission (EC) agrees with Eurostar. It considers rail to be the cleanest and most efficient means of transportation, but it acknowledges that it still faces a number of hurdles.<sup>31</sup> These include the complexities around ticketing and booking rail travel, both for domestic and international trips. The latter is particularly fragmented, constraining passenger engagement with cross-border high-speed rail travel within the European Union. This may be slowly changing. Following their merger in May 2022, high-speed rail operators Eurostar and Thalys have offered their first joint promotion, enabling Eurostar passengers to connect at Brussels onto Thalys' European services to destinations including Cologne in Germany.<sup>32</sup> A first step towards a consolidated integrated offering perhaps.

<sup>29</sup>Eurostar, Reasons to travel with Eurostar

<sup>30</sup>Eurostar, The Greener Way to go

19 <sup>31</sup>BTN Europe, Nov. 8, 2022

<sup>32</sup>Travelmole, Nov. 9, 2022



## Airlines are taking note of rail

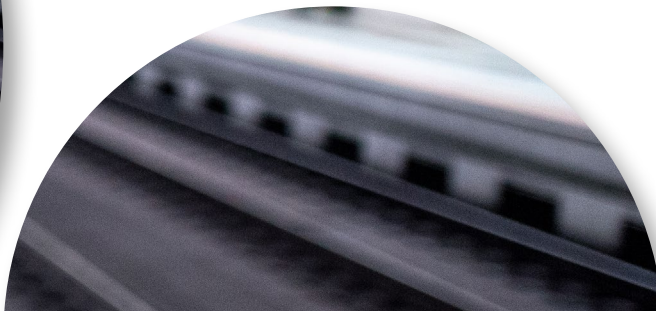
Airlines are taking note of rail as a means of extending their reach to markets where it makes little sense to fly. Through its Air+Rail train connection program, Delta Air Lines has been working with leading rail operators in European countries to provide onward train journeys via stations located at airports. For example, passengers flying into Zurich can now connect onto rail services operated by SBB to seven Swiss cities, including Bern and Lausanne. As well as offering travelers convenient connections to their final destinations, Delta can help them lower their emissions through reduced road and short-haul air travel.



## As an alternative, rail's potential is limited

Rail can clearly make a genuine claim to be a more sustainable choice for travelers making short journeys. But the advent of electrically powered eVTOL (electric vertical take-off and landing) aircraft and the eventual arrival of electric and hydrogen-powered aircraft could **tip the balance back in air's favor**. And unlike an eVTOL, which promises door-to-door journeys, **trains can only take travelers as far as the nearest station**.

Arguably train companies lack the capacity to accommodate a mass transfer of travelers from airlines. And they lack the flexibility to ramp up capacity to meet any surge in demand. There's only so many train services that can physically and safely be accommodated by existing rail infrastructure. Expanding rail networks is slow and costly – the HS2 high-speed rail development between London and Manchester in the U.K. has a budget of £44.6 billion and is not expected to be operational until 2033.<sup>33</sup> And of course there's a big environmental price to be paid for such an immense construction project.



**Taking the train instead of the plane has yet to really resonate with travel managers. It's low down the list of sustainable travel options presented to business travelers, with just one-third of programs offering rail as an alternative to flying.<sup>34</sup>**

20 <sup>33</sup>Civil Service World, Oct. 28, 2022

<sup>34</sup>BCD Travel survey of 101 travel buyers, April 6-26, 2021





## Summary

### Air travel must become more sustainable

Aviation's need to reduce its environmental impact is widely accepted. There can be no doubt that the future of air travel will be built around sustainable innovation. Sustainable air travel will evolve in phases, and travel managers will need to familiarize themselves with the costs, benefits and wider implications of each one. Sustainable flight might start with SAF, but its ultimate destination seems likely to lie with electric or hydrogen-powered flight. But **it will take some years for aviation to implement the most critical innovations at scale.**



## Aviation's power struggle

If only it were as simple as innovating towards sustainable air travel. Transitioning to SAF-powered flight is unlikely to be the solution given the clear indications of insufficient supply. And it'll be some years before alternative forms of power, such as electric and hydrogen, are available at scale, both in terms of aircraft size and numbers. This casts doubts on aviation's ability to make real progress towards net-zero targets, even by 2050.

As it embraces new forms of power, aviation may come into conflict with others' demands for clean energy. According to Advito's Sustainability Practice Lead, Julien Etchanchu, in order to convert to electric power all flights currently departing from Paris Charles de Gaulle airport, France would need to build up to seven new nuclear power plants. Aside from the significant investment required, how acceptable will it be to divert much-needed clean energy simply for the sake of travel?

Faced with a shortfall of sustainable energy supply, in order to meet its emissions targets, aviation may have to limit future demand for air travel. This could be achieved through higher prices, reducing the number of passengers for whom travel is affordable. Failing this, airlines would instead have to limit passenger numbers, which could also result in higher fares. Faced with higher costs, companies may need to be more selective when allowing business trips. And this will mean travel managers clearly defining what constitutes necessary travel. Crucial tasks will include measuring the value of a trip, demonstrating the quality of its outcome, and proving to internal stakeholders that it's worthwhile.

**In the meantime, both travelers and travel managers will need to do what they can to mitigate the environmental impact of their travel programs, while ensuring they are also cost effective.**



## Everyone has a role to play in sustainable air travel

Sustainable business travel goes hand in hand with sustainable aviation. However, addressing the carbon emissions generated by aviation, particularly in light of the sector's forecast growth, remains one of the greatest challenges in the quest for net-zero. While the high-level commitments by IATA and ICAO are a great step forward, it is clear that achieving the decarbonization pathways they set out is far from given. It will take commitment and collaboration across the industry to generate the demand for and create the supply of SAF to the levels required, and significant investment to bring the alternative technologies to market. Government support, subsidies and incentives will be critical to driving progress and facilitating change. In the meantime, however, each business traveler can play a part in the future sustainability of aviation. We can all critically evaluate the need for each flight taken and look for sustainable options such as flying on new aircraft, selecting direct routes or traveling in the economy cabin. The future of aviation lies in purposeful travel that maximizes value and minimizes impact. At BCD Travel and Advito, our global business travel consultancy, we have a wealth of tools to help achieve this.



**Olivia Ruggles-Brise**  
Vice President, Sustainability



## Share your thoughts

Do you have questions or comments regarding this report?  
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