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Flying is terrible for the environment. Bio-fuels offer a solution to air travel's impact on climate change

Sustainable aviation fuels (SAFs), made from feedstocks such as plants and recycled cooking oil, have been tested by airlines including Etihad, Emirates and KLM
Their relatively high cost, however, and a lack of will by regulatory bodies are key barriers to their widespread use

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Sustainable aviation fuels (SAFs), derived from biological or synthetic feedstocks, offer a solution for a world hooked on air travel but imperilled by climate breakdown. Photo: Picture Alliance via Getty Images

Flying is costly, in more ways than one. For instance, each passenger taking an economy class return trip from Hong Kong to London is responsible for pumping 2.82 tonnes of carbon dioxide equivalent into the atmosphere, according to an online calculator.

The massive environmental cost of air travel is largely because aircraft are powered by fossil fuels, which, during the extraction, production and combustion processes, emit toxins and greenhouse gases that hasten global warming. The aviation industry is responsible for 2 per cent of all carbon emissions resulting from humans currently, but that figure could triple by 2050.

Sustainable aviation fuels (SAFs), derived from biological or synthetic feedstocks and adhering to strict sustainability criteria, offer a solution for a world hooked on air travel but imperilled by climate breakdown. Their relative cost, however, allied with inaction by airline industry regulators and governments, has slowed their development almost to a standstill.

Nevertheless, a handful of airlines have been experimenting. In January 2019, Etihad conducted an Abu Dhabi – Amsterdam flight partially using fuel made with an oil from a desert succulent called *Salicornia*. When Emirates received three new Airbus A380s last October, the delivery flights ran on a mixture of regular jet fuel and that produced from recycled cooking oil. And in February, KLM announced that an Amsterdam – Madrid passenger flight was partially powered by 500 litres of synthetic kerosene developed using carbon dioxide, water and renewable energy.

Etihad pilots and cabin crew of the first biofuel flight with Etihad biofuel. Photo: Etihad

But, as KLM press officer Marjan Rozemeijer says, SAFs currently account for just 0.18 per cent of the Dutch carrier's fuel consumption. And according to Emirates, fewer than 200,000 tonnes of SAFs were produced globally in 2019 – less than 0.1 per cent of the total jet fuel used by commercial airlines.

The major barrier to using such fuels is clear. "SAFs typically cost two to five times as much as conventional kerosene," says Robert Thomson, an aviation expert and partner at consultancy firm Roland Berger. "Given that airlines operate in a hyper-competitive market, and that 20 to 30 per cent of their costs come from fuel, it is not possible for them to switch to a high percentage of SAFs without passing the costs on to their passengers, which will in turn cause them to lose market share."

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Steve Csonka, executive director of the Commercial Aviation Alternative Fuels Initiative, concurs. "Cost is indeed the key factor, and this really is the challenge from which all other challenges emanate," he says.

The global aviation industry has declared the use of SAFs integral to its goal, announced in 2008, of halving net CO_2 emissions from 2005 levels by 2050. But "the aviation industry is not being honest", says Stefan Gossling, a sustainable tourism professor at Sweden's Linnaeus University.

"They are not interested in climate change. If they were, they would discuss massive carbon taxes, which is the only way to make the introduction of synthetic fuels viable. The industry will never become low-carbon without governments setting the cornerstones.

"Jet fuel is too cheap to make alternative fuels competitive. There is no market, and no global institution to press for progress – the United Nations International Civil Aviation Organisation produces only green rhetoric, nothing more. I have been following the industry's rhetoric on climate change for 25 years. During this time, emissions have grown exponentially."

KLM's Amsterdam-Madrid passenger flight that was partially powered by 500 litres of synthetic kerosene. Photo: KLM

Although SAFs still generate emissions during the combustion process, studies show that on the whole, they spew out up to 80 per cent less carbon dioxide than conventional jet fuel throughout their life cycle.

"The emissions savings are in how the fuel is produced and the source of the materials that it is made from," an Emirates spokesperson says.

In the absence of significant regulatory incentives, Csonka says that one way to close the price gap between SAFs and regular fuel is to pursue technologies that lead to the use of lower-cost feedstocks, such as waste by-products.

Researchers in the United States, for example, recently announced that they had developed a method to turn food waste, animal manure and waste water into a competitive jet fuel. "Also, increased production can itself lead to lower costs through learning-curve improvements and supply-chain optimisation," Csonka says.

> **I think there is definitely an opportunity for airlines to build back better from the [Covid-19] crisis**
> **Robert Thomson, partner, Roland Berger**

For the time being, the blending of SAFs with regular jet fuel appears to be the most commercially viable option for airlines.

"We believe that, in the future, we will use a combination of different kinds of SAFs, both biofuels and synthetic fuels," Rozemeijer says. "But until we have enough synthetic kerosene available, we will have to blend it with fossil kerosene."

Through its recently rebranded Corporate SAF Programme, KLM's corporate clients help finance the use of SAF blends for their business travel. To date, 16 institutions have come on board, including ABN Amro, Accenture and Royal Schiphol Group.

KLM has launched a similar programme for its cargo operation, inviting shippers and freight forwarders to pay a little extra to power their flights using SAF blends. It is hoped that by stimulating demand for sustainable fuel in this way, economies of scale will help push down production costs.

The global aviation industry is responsible for 2 per cent of all carbon emissions resulting from humans today, but that figure could triple by 2050. Photo: NurPhoto via Getty Images

To give the process a helping hand, a few regulators have set, or are considering, blending mandates. Since 2020, all jet fuel suppliers in Norway have been required to sell blends that are 0.5 per cent biofuel; the country hopes to increase this figure to 30 per cent by 2030. And in the coming weeks, the European Commission is set to unveil ReFuelEU, a legislative initiative that will mandate a minimum amount of SAFs to be blended with regular jet kerosene.

Britain is contemplating a similar mandate that could take effect from 2025.

Of course, most of today's aircraft are not equipped to run solely on SAFs, older engines having been designed to accommodate the unique properties of conventional jet fuels.

According to Boeing, for its aircraft, SAFs can be blended with regular jet fuel up to a 50/50 mix – the maximum permitted under current fuel specifications. However, the company announced in January that it was confident it would be able to deliver commercial aircraft capable of flying on 100 per cent biofuel by the end of the decade.

"With all the recent announcements, I believe we are seeing the signs of reaching a tipping point," Csonka says. "I remain hopeful that we will see an annual production capacity of 1 billion to 2 billion gallons of SAFs per year by 2026, and then a sustained level of advancement thereafter." To put that in perspective, the aviation industry burned through 96 billion gallons of aviation fuel worldwide in 2019, according to the International Air Transport Association.

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The Covid-19 pandemic could help SAF uptake over the long haul, though.

"There is currently tremendous pressure on airlines to reduce their impact on the environment – from customers, investors, [some] governments and even their own employees," Thomson says. "If anything, this has increased due to Covid-19, especially as we've seen improvements in air quality during lockdowns."

During the height of the global lockdowns, the skies emptied and emissions from the aviation industry fell by as much as 60 per cent, according to the Global Carbon Project.

"I think there is definitely an opportunity for airlines to build back better from the crisis," Thomson says.

Whether they will do so fast enough to help reign in runaway climate collapse remains to be seen.

Additional reporting by Elaine Yau