



FUELLING CHANGE

As the news on global warming heats up, making the airline industry more sustainable is a growing priority

WORDS JENNI REID



“First-class hypocrite!” blared the *Mail on Sunday*’s front page after Emma Thompson was spotted on a flight to New York. The reason for the outrage? The actor was travelling days after attending the Extinction Rebellion protests in London, which called for radical action to tackle climate change. Concern over the effects of carbon emissions on the planet are not new, but as scientific warnings get more dire and schoolchildren around the world strike to demand change, it has never been so urgently discussed.

Aviation’s role in all of this is no secret – it causes about 2 per cent of manmade global emissions, a figure that is predicted to rise rapidly. And the more pleasant your airborne experience, the worse your contribution is likely to be (those flying ten abreast in an A350 can feel a little less guilty than those relaxing in a private jet). But whatever class we sit in and however much we care about climate change, most of us still feel we can justify our need to fly in the first place. Like Thompson, our readers would likely argue it would be impossible to do their jobs without it.

The aviation industry is aware of the part it needs to play in helping to reconcile our reliance on flying with its harmful effects. The UN’s International Civil Aviation Organisation is implementing a carbon offsetting and reduction scheme that requires all operators to monitor, verify and report their

emissions on international flights. Meanwhile, the International Air Transport Association (IATA), which counts some 290 airlines among its members, has committed to capping aviation’s net CO2 emissions from next year and reducing its net CO2 emissions by 50 per cent by 2050, relative to 2005 levels.

The latest aircraft types have more efficient engines, lighter frames and reduced wing drag. Boeing says that its new B777X model will be the most efficient twin-engine jet in the world, helped by its folding raked wingtip and GE9X engine. Business jets such as Gulfstream’s G600, Bombardier’s Global 6500 and Embraer’s Praetor 600 will all be able to travel further than their predecessors on less fuel. And advances in air traffic control are also helping, with automated systems able to provide pilots with more detailed information at quicker speeds, reducing the likelihood of planes queuing in the air.

Still, efficiency won’t be enough to meet the goals being set by the industry as well as governments and other global agencies – much greater transformation will be required. Eventually, that could mean travelling on aircraft that are radically different to what we have now. There has been much discussion of “electric vertical take-off and landing” aircraft, for example, which are somewhere between a helicopter and a flying car. KLM recently partnered with a Dutch university to help develop a fuel-efficient plane that would put its passengers, cargo hold and fuel tanks within its wings, creating a large V shape. But first will come a rethink about what’s powering the aircraft we already have. →

The latest aircraft types have more efficient engines, lighter frames and reduced wing drag

BOOSTING BIOFUEL USE

The immediate problem facing an industry seeking to reduce its emissions quickly is that it will be decades before more efficient models replace older aircraft entirely. A widely touted solution is to turn to sustainable aviation jet fuels (SAJF) or biofuels, non-petroleum-based fuels that are blended with conventional fuels up to an industry-standard limit (currently 50 per cent, although in practice significantly less).

In a May 2018 report, the General Aviation Manufacturers Association (GAMA), the National Air Transportation Association (NATA) and others explained that to fall under the definition, the fuel must be resourced in a manner that avoids depletion of natural resources and mitigates its contribution to climate change. It must also meet current certification requirements for use in turbine-powered aircraft engines.

SAJF can be derived from various sources, such as cooking oil, plant oils, municipal waste, industrial off-gas, sugars and agricultural residues, and be processed in alternative ways, including thermochemical and catalytic production processes. Five production pathways have currently been certified by ASTM, an industry body, and several more are pending approval. Burning the fuel still creates emissions, but the result must be a net reduction in CO2 emissions across its life-cycle relative to fossil fuels.

Biofuels have been around for some time – in 2008, Virgin Atlantic used a blend made from coconuts and Brazilian babassu nuts to fly between London and Amsterdam; the following year Continental tested a blend that used algae and jatropha seeds. ANA and Singapore Airlines have powered flights with cooking oil blends, and last year Qantas used a 10 per cent biofuel blend processed from brassica carinata, which is a relation of rapeseed, on a flight from Los Angeles to Melbourne. Lufthansa, Norwegian, Finnair and others have targets in the field. As of June 2019, more than



180,000 commercial flights using SAJF had been completed.

Nonetheless, it can hardly be said to have gone mainstream. What has been holding it back? For one, there are still relatively few producers – they include World Energy, SG Preston, Gevo and LanzaTech in the US, Neste in Finland, and SkyNRG in the Netherlands. They are expanding capacity, but doing so is expensive, and they don't have the guarantee of much higher demand just yet.

At the recent European Business Aviation Convention and Exhibition (EBACE) in Geneva, Tim Obitts, chief operating officer of NATA, said: "We really have to make sure as an industry that we come up to a critical mass of production, because operators are asking for the product and are being told, 'Let's talk about it later' because the volume is not available. We have to find ways – maybe mandates, maybe other ways – to grow that supply."

Mike Zayas, marketing manager at World Fuel Services, which provides logistics for the aviation industry, said that while demand was outpacing supply, concrete demand also needed to grow so that economies of scale could lower the costs of production and distribution, and the price for buyers. "Right now, biofuels are not at a price that makes

'There needs to be more availability of biofuel at a price that operators can afford to pay'

them 100 per cent viable," he said. "Last year they were around four times more expensive than traditional fuel; that's now coming down to three times."

Supply issues were apparent at EBACE, where 23 business jets arrived part-powered by biofuels. Twelve of those came from business airport TAG Farnborough, but the fuel for them had been shipped to the UK from the US, which had its own environmental impact.

"There's going to have to be more availability of this fuel, particularly in Europe, and it needs to be at a price that operators can afford to pay," said Farnborough chief executive Brandon O'Reilly, who has committed to making the airport more sustainable – since last year, its ground operations have been certified as carbon-neutral. "We're at a turning point now, as far as education and uptake are concerned. We want to help in the education process by showing that this fuel can be put on to planes like ours. But the fuel needs to be available and cost-effective. There needs to be incentives in place, perhaps through taxes or other means."

ABOVE: A business jet is refuelled with a SAJF blend at TAG Farnborough

THE INDUSTRY IN NUMBERS**2%**

Aviation's contribution to global emissions

4.5%

Annual growth of the civil aviation industry

180,000

Number of commercial flights powered by biofuel blends as of June 2019

170

Number of companies working on electric aviation projects

£1 million

Value of the prize Heathrow is offering to the first electric-hybrid aircraft in service at the airport

300mph

Target speed of the all-electric aircraft that Rolls-Royce plans to fly next year

82%

Percentage of Qantas frequent flyers who say they want to offset their carbon emissions

The education component was something addressed by other attendees at EBACE. According to Obitts, "Pilots are still afraid of SAJF. They shouldn't be, but misconceptions are still there. It's certified as jet A1 fuel so there is no difference."

Zayas agreed: "It's safe, it has all the same characteristics as jet fuel. That's what we want everybody to be aware of." World Fuel Services has so far sent about 13 million gallons of sustainable fuel to commercial projects and half a million to business; it wants to help make sustainable fuels mainstream by 2050.

Many believe the 20,000 aircraft-strong business aviation industry could pave the way for this. "The scale that refineries can produce at the moment is better for business aviation," according to Charles Etter, staff scientist at Gulfstream Aerospace. "We're not as price-sensitive to jet fuel as commercial."

TARGETED ACTION

Juergen Wiese, chairman of the European Business Aviation Association, suggested that new fuels "might not only be the licence to grow but the licence to operate in future." Governments including Sweden, France, Spain and the Netherlands are already starting to set targets on SAJF adoption. From the start of next year, Norway will require all aviation fuel sold to be 0.5 per cent

SAJF, although "problematic" sources such as palm oil are ineligible.

The latter point taps into an important concern – that claims to "sustainability" can become muddled when accounting for the processes used to obtain SAJF, even if net carbon emissions go down. Friends of the Earth has argued that biofuels will compete with food production for land and water, with companies potentially making land grabs to grow crops and clearing forest land. The International Civil Aviation Organisation has been working on measures to address such concerns, but the industry currently lacks global standards in the area.

The International Council on Clean Transportation states in a 2019 report that it is crucial to use low-carbon sources or no carbon gains will be achieved. It also notes that biofuels are in high demand not just in aviation but also in power, plastics, road vehicles and other industries, with most biofuels currently being used by the road sector.

"Realistically, there may not be enough low-carbon bioenergy available to significantly decarbonise aviation fuel until well beyond 2050," the authors write. "Any long-term approach to decarbonising jet fuel must involve both reducing liquid fuel demand across all sectors and transitioning to and ramping up a global sustainable biofuel industry."

Nonetheless, the report is optimistic that while its limitations must be understood, there is still "substantial opportunity for greatly increased production of sustainable, low-carbon biomass-derived fuels for the transport sector".

SAJF adoption looks likely to continue to be a slow burn. The International Energy Agency anticipates biofuels reaching about 10 per cent of aviation fuel demand by 2030, and close to 20 per cent by 2040. Still, airlines are stepping up their commitments. Virgin Atlantic is working with LanzaTech to build a UK facility for converting ethanol from waste emissions into biofuel, →



LEFT: EasyJet is collaborating with Wright Electric on new aircraft

supported by a government grant. In May, United said it would buy 38 million litres of biofuel from World Energy over the next two years. And KLM says that from 2022 it will purchase 75,000 tonnes of SAJF per year for ten years from SkyNRG, calling it a “necessary short-term option for the commercial aviation industry to reduce CO2 emissions”.

ELECTRIC AVENUES

With a mixed outlook for new types of jet fuel, what about aircraft that could do without them altogether? While most agree that electric aircraft are not going to be commonplace for a few decades at least, stories emerge frequently about new projects and breakthroughs in the field.

onboard generator using jet fuel, which will replace one – and if successful, two – of a plane’s four gas turbine engines.

At the same time, Airbus is collaborating with SAS on research into infrastructure to support hybrid and electric engines. Rolls-Royce is working with UK manufacturer YASA on the most energy-dense battery pack ever used in an aircraft to power the fastest-ever electric plane, while Siemens is developing several new battery types geared towards engines.

Rolls-Royce’s chief technology officer, Paul Stein, says that while the company’s core capability will be in gas turbine engines for many years to come, electrification will play an

Electrification will play a greater role in propelling smaller aircraft and increasing large aircraft efficiency

Low-cost carrier Easyjet is positioning itself as a leader in the race towards the first commercial electric planes. It is partnering with US start-up Wright Electric on a battery-powered nine-seat aircraft that it wants to test this year, and has

filed a patent for a motor that will be used in a larger aircraft. The carrier’s chief executive, Johan Lundgren, has said that he thinks all-electric commercial flights are “in sight”, and is looking at where Easyjet could establish “electric flyways” on key short-haul routes such as London-Amsterdam. Across the Atlantic,

US-based Zunum Aero and Boeing are aiming to build a 12-seat hybrid plane by 2022 with a 700-mile range. And the University of Illinois has announced that NASA is underwriting a project to develop a cryogenic hydrogen fuel cell system for powering all-electric aircraft.

Kyle Martin, director of European regulatory affairs at the General Aviation Manufacturers Association, pointed out at an EBACE seminar: “The power-density issue of aviation fuel means the early adopters of electric and hybrid propulsion will be smaller, shorter-range aircraft. You’re looking at operations up to 500-1,000km in range, journeys of an hour or 90 minutes in the next five years at the most... maybe regional aircraft operations in 20 to 30 years.”

According to Mathias de Dampierre, director of the Starburst Aerospace Accelerator in Paris, venture capital money in the start-up space is mainly going into developing EVTOL-type aircraft. “When you look at the amount of money invested, you still have a lot of room for improvement,” he said at the same seminar. “Development of new batteries has so far been largely

→ CONTINUED ON PAGE 74



ABOVE: Rendering of an electric aircraft by Zunum Aero, which is working with Boeing

The number of companies working on electric aviation schemes worldwide is approaching 200, with legacy manufacturers working on ambitious projects alongside start-ups. It’s also forcing legacy companies to think more like start-ups – Embraer has set up a vertical called Embraer X dedicated to “the development of disruptive business”, for example.

Partnerships are proving crucial. Rolls-Royce, Airbus and Siemens are working together on the E-Fan X, a two-megawatt, hybrid-electric engine for commercial aircraft that is due to power test flights next year. An electric unit will be powered by an

increasing role in propelling smaller aircraft and enabling new approaches to large aircraft efficiency.

“There are many challenges from a technical perspective, from battery life and thermal management to systems integration complexity,” Stein says. “These technologies also need to meet safety and certification standards in aviation, which are significantly higher than many other applications.”

But he believes that new forms of regional aviation could revolutionise intercity mobility by as early as 2030, owing to electric vertical take-off and landing aircraft (known as “E-V-TOLs”) and hybrid-electric regional aircraft.

Darling, about our weekend in Rome; would you rather stay in a hotel or in an apartment?



DON'T HESITATE ANYMORE. CHOOSE APARTHOTELS ADAGIO.

THE LONGER YOU STAY, THE LESS YOU PAY: FOR LONGER STAYS*, WE REDUCE OUR PRICES UP TO 35%.

Aparthotels Adagio. More than 110 destinations worldwide. Here, you'll feel right at home: a proper kitchen for cordon bleu chefs, a spacious apartment for your daily yoga session, and hotel services providing everything you need.

adagio-city.com



Stay, live, enjoy

*Save up to 35% by staying 4 nights or more. Rate subject to conditions and availability.

Adagio, SAS au capital de 1 000 000 €. Siège social : L'Artois, Espace Pont de Flandre, 11 rue de Cambrai 75947 Paris Cedex 19, France. Immatriculée sous le n°503 938 110 RCS PARIS, SIRET n°503 938 110 00015 - APE 5520 Z.

FUELLING CHANGE

SUSTAINABLE AVIATION

Continued from page 32



→ financed by the automotive industry. Now the auto industry is reaching what is required, there will be a need to add a lot of money dedicated to the aerospace industry. The step-change required is enormous.”

As with SAJF, that could mean it is business aviation that pioneers the new technologies. Of the 170 or so companies working on projects, about 40 per cent are for business and general use, not commercial.

What other steps are airlines taking? Qantas has pledged to eliminate 75 per cent of onboard waste by the end of 2021 and use 100 million fewer single-use plastics by the end of 2020. Etihad, Portugal's HiFly, Delta Air Lines, Virgin Australia and others have made commitments to reduce plastic waste.

Carbon offsetting schemes are offered by several carriers. The concept sees airlines promise to invest in environmental projects such as tree planting. However, they are criticised by some as an excuse to keep polluting, and there is no industry-wide body to monitor airlines' overall programmes. BBC research found that only about 1 per cent of flyers were willing to pay more for them.

Qantas bucked this trend, with 10 per cent of passengers offsetting. Andrew Parker, its group executive for government, industry, international and environment, said: “We've been carbon offsetting for a decade; we now have the largest airline offset programme in the world.” Projects involve improving water quality in Australia's Babinda Reef, and funding rangers who prevent deforestation.

Making aviation sustainable can feel like one flight forward, two flights back. Still, there are signs of progress. In the words of Emma Thompson: “We're often involved in situations where we will be hypocritical. But if we don't address this, we are failing our children and our grandchildren.” **BT**

STAY GREEN

MAKING HOTEL STAYS MORE ECO-FRIENDLY

Continued from page 38



→ Other companies have launched imaginative initiatives to get employees on board. Scandic, the largest hotel operator in the Nordic market, has involved staff in its sustainability endeavours since 1993, when a team member's “hang up your towel” policy became standard practice worldwide. Last year, it wanted to “add a fun spin” to its efforts, according to Vanessa Butani, Scandic's director of sustainable business, with 18,000 team members participating in a “sustainability hackathon”. Staff submitted 400 social and environmental ideas, which were voted on before facing a jury.

Turn off the Tap, the winning environmental idea, will pilot this summer in Norway. Guests are advised to switch off the tap when brushing their teeth, aiming to save more than 200 million litres of water per year.

Accor similarly engages staff through its Acting Here app for employees, which launched in April last year. The app includes both educational and activity elements, allowing staff to receive rewards for publishing selfies of their sustainable actions, or doing quizzes to boost their knowledge.

CUTTING FOOD WASTE

While sustainable initiatives may seem altruistic, there is a financial incentive, too. Accor's food and beverage accounts for half of its waste, 40 per cent of its global water consumption, and is the second-largest contributor to its carbon footprint.

In fact, one-third of all food produced in the world is lost or wasted. To address this, chains such as Accor and IHG have partnered with Winnow, a company using smart meter technology to record and analyse food waste. Winnow's co-founder,

Marc Zornes, says: “Although the scale of the problem is enormous, it presents a huge opportunity for businesses to recover value and become more efficient.” Through Winnow's real-time reports, “businesses and chefs can adjust their food purchasing decisions accordingly, reduce their spending and tackle a fundamental problem of food waste: overproduction”.

Accor's Sofitel Bangkok Sukhumvit piloted the system in 2015, resulting in a 50 per cent reduction in food waste within four months, and estimated annual savings of more than US\$60,000. In fact, charity WRAP and the World Resources Institute found that a typical food manufacturing, retail or hospitality business could achieve a 14:1 return on investment by reducing food waste. Such technology will prove useful in helping Accor to achieve its aim of reducing food waste by 30 per cent by next year.

Scandic is working with digital platforms Karma and Too Good to Go to sell leftover food at half the cost price. Last year the group saved more than 125,000 portions of unsold food using such digital platforms.

It's not all about technology. Accor's Novotel Nantes Carquefou creates puddings from breakfast pastries, while the Pullman Auckland uses peel from juiced oranges to make marmalade. Through a combination of behavioural changes, technology and creativity, it is entirely possible to meet the UN's Sustainable Development Goal 12.3, the reduction of global food waste by 50 per cent by 2030.

Cooperation between companies will be crucial in meeting targets. “Fully aware of our environmental footprint, we are convinced that eco-responsible hotel management is a collective concern,” says Accor's Herrmann. Its Planet 21 online platform shares studies, research and best-practice analyses regarding sustainable development in the hotel industry. IHG, meanwhile, is a founding member of the International Tourism Partnership, which brings hotel companies together for collective action on social and environmental responsibilities.

And in the meantime, there's plenty of small steps you can take yourself to travel more sustainably – see Smart Traveller, page 88, for more tips. **BT**