

SUSTAINABLE AVIATION FUEL: THE FUTURE OR A GIMMICK?



As the prominence of industrial sustainability and environmental awareness grows, stakeholders within the aviation industry are seeing a shift in attitudes and having to adapt accordingly. Skylark Consulting Group's Kelly Fleszar and Kenneth Currie previously explored the potential for investment in microgrids as an alternative power source and revenue stream for airports. But what about the aeroplanes themselves?

Here, Skylark's Adam Swede explores the alternative fuel technology which has continued to gain traction across the industry over the past few years, Sustainable Aviation Fuel ("SAF"). Skylark looks at the pressing questions of what wide-scale adoption of the technology might look like and explores how feasible the projections of full-scale adoption in the next few decades truly are.

Introduction

In late November 2023, Virgin Atlantic Airways ("Virgin Atlantic") carried out the world's first transatlantic flight powered 100% by SAF. This followed the first passenger flight to do so by United Airlines in 2021, and there has been investment from over 40 global airlines in the technology.

The fuel is primarily comprised of waste oils and animal fat, emitting 70% less Carbon Dioxide ("CO₂") than traditional jet fuel. Sponsored by the United Kingdom government, the flight signified a milestone in the country's broader ambition to fly net-zero by 2050, a pledge seconded by multiple international governmental and aviation bodies.

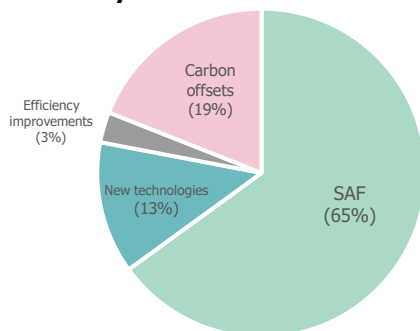
As is to be explored, however, the promise of the benefits of SAF is currently over-relied upon by companies, organisations, and governments to achieve Net Zero goals by 2050. SAF is more likely to be part of a balanced portfolio of technologies including electric and hydrogen propulsion aircraft.

The Route to Net Zero

It is undeniable that stakeholders in the aviation industry are beginning to recognise the importance of a shift towards sustainable air travel, with the industry accounting for 2.5% of annual global energy-related CO₂ emissions, and 12% of total transport emissions. To that end, air travel comprises a large portion of an individual's carbon footprint. Research has indicated that if current emission rates continue, the aviation industry could directly cause a 0.1°C rise in global temperatures between now and 2050. As such many airlines, management companies and international bodies including the International Civil Aeronautics Organisation have emphasised the goal of achieving net-zero emissions by 2050. National governments are following suit, as shown by the UK government's £165 million Advanced Fuel Fund to help achieve a mandated 10% total fuel mix target by 2030. Globally, billions of public and private dollars are being invested in the technology across its research, production, and distribution. This is a significant shift in attitude, and achieving this objective would bring an industry serving billions of annual passengers in line with global accords to build a sustainable future, most notably the 2015 Paris Agreement.

The International Air Transport Association (IATA) has broken down its strategy for nullifying aviation-related greenhouse gas emissions. As can be seen below, 65% of this offset is targeted to come from SAF. Whilst the strategy is clearly laid out, navigating the route to achieving these milestones is a massively complex undertaking.

IATA Strategy to Achieve Net Zero Carbon Emissions by 2050



Source: IATA – Fly Net Zero

The Opportunity Presented by SAF

Beyond the vast reduction in CO₂ emissions, the renewable sources of the fuel may have further environmental upsides. It would improve global air and water quality by reducing sulphur oxide ("SO_x") and nitrogen oxide ("NO_x") emissions. On a large scale, this would have far-reaching health and biodiversity benefits, particularly in areas in close proximity to airports. Furthermore, rural farming communities would benefit economically from the sale of SAF feedstocks, along with those in less fertile countries that could grow usable crops or provide other SAF feedstocks such as municipal waste.

Given the high hopes for SAF, it is likely that exponential investment, at least in the medium term, will be poured into this alternative fuel source. Indeed, the valuation of the SAF market is estimated to increase to over \$6 billion by 2030, a 10-year CAGR from 2020 of 56% (Infloor). This timeline aligns with pledges from major airlines, including Virgin Atlantic, who have stated that 10% of their total fuel output will be via sustainable sources by 2030.

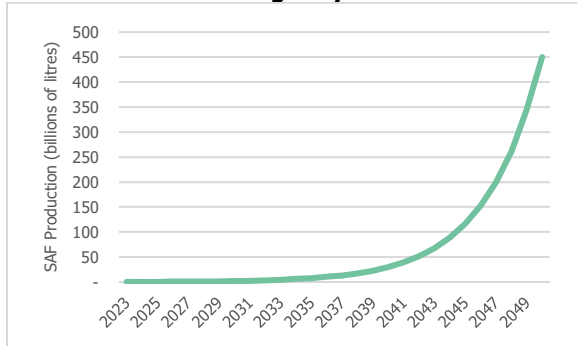
The crucial decade, however, will be 2030-2040, where policy and innovative advances are most likely to align. What is currently being seen is more akin to a consolidation of technology and preparation for mass-scale rollout.

Is this a realistic possibility?

It is easy to recognise that decarbonising a transport-based, trillion-dollar industry in just under three decades is a mammoth task. Currently, global biofuel production barely scratches the surface of what would be required. If the world's total biofuel production (50 billion litres/year) were geared completely toward SAF, it would meet around 1/3 of the industry's current fuel demand. Consider then that demand for air travel is expected to increase to 10 billion passengers per year by 2050, and the required SAF production would have to increase from the 2023 output of 300 million litres to 450 billion in

2050 – a 3,000-fold increase. The visual below assumes a constant 27-year CAGR of 31.1% and demonstrates the exponential increase in production that will be required for the fuel to achieve IATA's 65% goal for 2050. It is noted that in reality, the process of scaling the fuel will take a different path, and the figure simply aims to demonstrate the size of the task at hand.

Growth in SAF production required to meet IATA's 65% offset target by 2050.



2024 levels of production would only account for 0.53% of the industry's fuel requirements and 6% of all renewable fuel production. At this stage, these numbers simply are not large enough to make any significant difference. Indeed, IATA has outlined that to meet its objectives, 25-30% of current renewable fuel production capacity must go to SAF.

Whilst many have already marked the timeframe as unachievable, there is widespread acknowledgement that SAF should at least be adopted to some degree across the industry, with most large airlines outlining their quota in terms of current fuel mix and future SAF usage. For instance, United Airlines is among the major airlines to have begun using blended SAF fuel on selected commercial routes. In addition, having used 13,000 tonnes of SAF in their fuel mix during 2022, The Lufthansa Group is among the five largest buyers of the fuel worldwide and has committed to investing up to US\$250 million in the procurement of SAF in the coming years. For some airlines, the cargo market is a good entry point to their commitments, with Delta Airlines (DL) currently offering a sustainable fuel program for its customers, with the broader goal of meeting a 10% SAF target by 2030.

However, for any scalable integration to happen, processes for innovation, production and adoption must be streamlined far more than they currently are. This is particularly true in terms of land use, as current biofuel extraction methods would require the use of farmland the equivalent size of California, Oregon, Washington, Nevada and Louisiana combined to satisfy an industry-wide SAF adoption.

The aforementioned Virgin Atlantic flight required around a year of intricate coordination and a combination of efforts from corporations, universities and government institutions. On a domestic level, this can and has been proven to work. But when scaled up to an industry such as aviation, it is difficult to imagine immunity to what has so far been the biggest sticking point in the achievement of decarbonisation: getting multinational organisations and governments to collaborate towards a common goal.

Initial steps have been taken. EU regulators recently passed the RefuelEU Aviation Initiative, and the US has set a goal of producing at least 3 billion gallons of SAF per year by 2030 as part of its Sustainable Aviation Fuel Grand Challenge. Whilst these are steps in the right direction, countless more acts of the like will be needed to drive necessary levels of output and adoption of the fuel.

In addition to governance, one of the largest limiting factors for SAF is its current cost. They are around 3-5x more expensive than that of traditional jet fuel. Even if the supply were there, this makes their adoption currently unviable, not least because the drastically higher fares commanded by the fuel would likely weigh on the public's advocacy of the technology. It is therefore essential that the economies of scale from mass production are gained quickly and integrated into the global model before large-scale adoption.

Despite inevitable teething problems and high initial costs, it must be remembered that the technology is still in the very early stages of its lifecycle, and as it matures and is adopted more widely, its true potential may be realised.

Final Thoughts

The decarbonisation of the aviation industry is a hugely complex global initiative which will take significant investment, time and governance. A movement toward SAF is perhaps the most essential stage in the process, as a large portion of current emissions would be curbed.

It may unravel that SAF acts as a bridge between previous traditional jet-powered aircraft and a more long-term solution of using alternative vehicles such as electric and hydrogen-powered aircraft. Whilst the technology is not yet refined for the latter, Airbus has invested heavily in electrical and hydrogen-based aero technology, with their ZEROe project looking to bring a range of possible concepts to reality by 2035.

Perhaps the most likely outcome is a combination of all these things. We are likely to see SAF take up an increasingly large amount of the global aviation fuel mix, in conjunction with the development of alternative propulsion methods. Whilst the current timelines are somewhat unrealistic, it is hopeful that they will prompt the sense of urgency that the process necessitates.

About Skylark

Skylark Consulting Group provides business planning advisory services to the aviation industry including airlines, airports, investors, and aviation service providers, and is available to discuss the development of SAF.

Skylark has considerable experience in evaluating and developing ancillary airport services across the Globe.

To learn more about Skylark's expertise, visit us at skylarkcg.com.