

Does LCAF have a role in aviation sustainability?

It seems that the airline industry has finally turned the Covid corner and after nearly twenty months of impact, markets are reopening and pent-up demand to travel is leading airlines to have some confidence that 2022 might be a better year than they expected three months ago. One of the key changes we have noticed in the last few months is that airline leaders are no longer discussing the pandemic but are focussing on the need for sustainable aviation. The subject had been high on the agenda of most CEO's before Covid, and the airline industry has made remarkable progress in the last decade in reducing its carbon footprint - at least on a per kilometre flown basis - but pressure continues to grow for bigger and bolder steps to be taken.

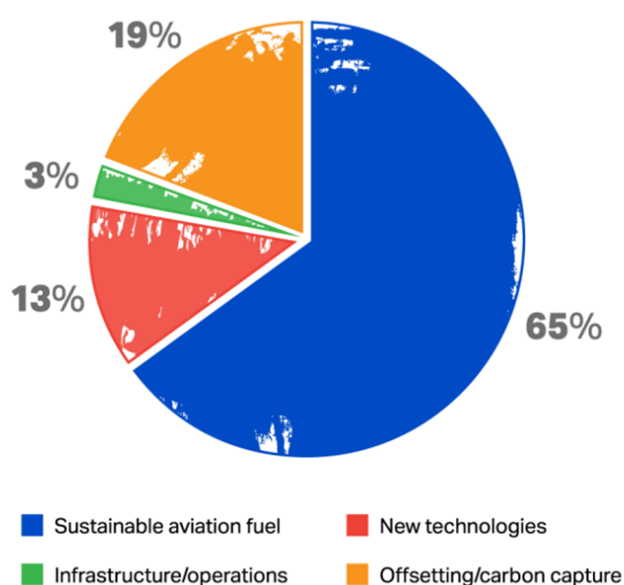
Setting ambitious targets and aiming for an industry that is carbon neutral is a huge step, but these are long term goals and easier said than done. Indeed, Tim Clarke, President of Emirates Airlines, warned in early October that the airline industry was in danger of over promising on achieving a 40% reduction in carbon emissions in the next ten years; he described the idea as "living in la la land". At the same IATA AGM, Willie Walsh, former CEO at IAG and now Director General at IATA warned too that air fares would have to rise if airlines were to achieve their proposed carbon objectives. Increased air fares will suppress demand and that in turn will reduce the economic growth and wealth of some countries; in essence, his was a message of "be careful what you wish for" and a nod to the law of unintended consequences.

When we at MIDAS Aviation hear these sorts of comments from industry leaders we take notice; it led to us thinking about how much work is still to be done towards the goal of delivering a sustainable industry Are net-zero emissions realistic or achievable? Or is the industry setting itself up for a fall? The scale of the challenge is immense.

The Scale of the Challenge

Meeting the challenges of a warming planet is rising up the agenda of individuals, businesses and governments around the world. This was recognised at the recent IATA AGM where a resolution

Contribution to achieving Net Zero Carbon in 2050



Source: IATA

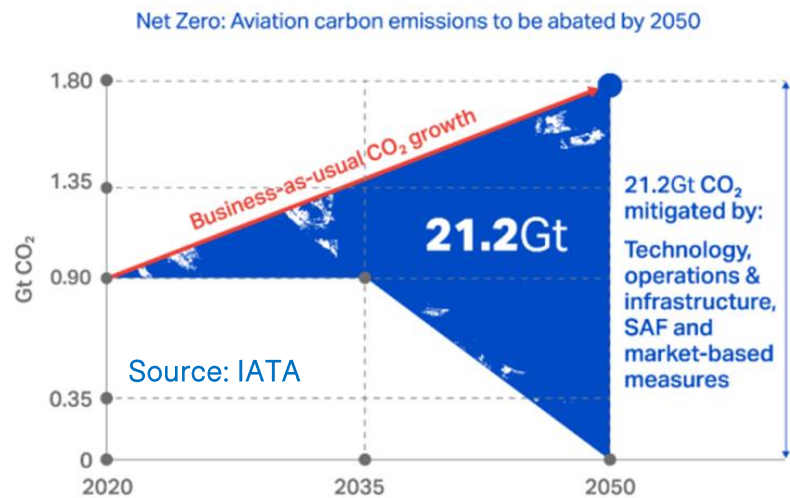
passed committing IATA members to net-zero emissions by 2050, and bringing the airline industry in line with the Paris Agreement which aims to limit global warming to 1.5°C. While it's clear that to achieve this a mix of tools are required, Sustainable Aviation Fuel (SAF) has made its way to the top of the list. IATA estimates that 65% of the contribution to achieving net zero emissions will need to come from SAF.

The other components are, broadly, new technologies (13%), infrastructure and operational improvements (3%) and offsetting and carbon capture (19%).

The challenge is enormous given the many forecasts that anticipate air travel

demand continuing to grow once it is past the point of recovery from the pandemic. A stark chart provided by IATA and available on its website demonstrates the scale of the challenge.

With the aviation industry seeking to mitigate 21.2 Giga tonnes of CO₂ there is a huge task ahead for everyone. With one Giga tonne the equivalent of 200 million elephants, there are a lot of elephants in the room that need to be considered to reach that target! To us it's therefore very clear that a multi-dimensional approach to the issue needs to be taken rather than just saying SAF is the solution, it's a big part but not the total solution.



While there is strong momentum in terms of acceptance, government support, mandates, testing and pathways for SAF, and some SAF is available now, current production quantities are small and availability needs to expand rapidly if it is to play the role in decarbonising aviation that is hoped.

In this context there is value in all the different approaches being offered, even if their contribution is relatively small.

What is LCAF?

Lower Carbon Aviation Fuel, or LCAF, is recognised by ICAO as one of the tools at the disposal of the industry. Much less well known than SAF and perhaps less headline making or ground breaking, LCAF may well have a role to play in reducing overall carbon emissions, not least in the short term. Unlike SAF, though, which uses an alternative to fossil fuel to power aircraft, LCAF is regular jet fuel but the production processes to produce it have been adapted so that the overall carbon footprint of the fuel usage is lowered by 10% or more. Technically, it is regular aviation fuel with a Carbon Intensity (CI) below 80.1.

With its continued use of fossil fuels it can't be argued that LCAF is a long term solution for the industry but it can be one of a basket of measures, especially in the next few years while supplies of SAF are still being ramped up. As a parallel, in the automobile industry hybrid cars are not the long term solution towards sustainable motoring, but as a staging point along the journey they are increasingly accepted as part of the solution as other fuel sources continue to be developed.

Positively, from what we can see LCAF doesn't require any change to current handling or fuelling procedures, and neither does it require aircraft engines to be adapted. It's the same as the current fuel but the lifecycle carbon intensity is less because of the way it is produced. Surely anything that delivers a 10% lower carbon footprint is a step along the journey to a net-zero position and one that at the very least should be worthy of more discussion?

Creating LCAF is primarily a task for the refineries themselves. Using measures such as carbon capture and storage and low carbon electricity for refinery operations reduces the carbon emissions associated with the production processes.

Timeline to Net Zero

Search the internet and there are numerous industry players and governments who are working on sustainability in aviation and have constructed charts showing a timeline to achieve net zero emissions. Each of them displays the contribution, often aspirational, from the various technologies in place or hoped for in the future.

In the short term, airlines will continue to switch to newer aircraft types with superior fuel efficiency, phasing out the older aircraft, gas guzzling models as they do so. At the same time, airlines, airports and air traffic management services will continue to work together to reduce delays in the air or on the ground, thereby optimizing fuel burn per flight and reducing inefficiencies. These are all small steps in the journey and the use of LCAF could be another of those steps and of course the more steps we take the closer the industry gets to its 2050 objectives.

SAF will inevitably take time to scale up and over time will be blended with regular aviation fuel in increasing quantities. However, it may only contribute significant reductions in carbon emissions as we move into the next decade, or even beyond that. IATA expects SAF to contribute only 5% to CO₂ abatement by 2030 but then expects the contribution to be 17.5% by 2035. This jump in just 5 short years may be unrealistic and, indeed, the UK's Sustainable Aviation Fuels Road-Map published last year reported that independent analysis suggested that SAF production may equate to only 4%-8% of global aviation fuel use by 2035. Either way, this places huge pressure on the later years for CO₂ reductions and suggests there is an element of just kicking the issue down the road.

Every timeline chart that we have seen so far assumes that new aircraft technology will play a major role as we near 2050. Hybrid-electric and all electric aircraft may start to make an appearance in the mid 2030s, while hydrogen fuelled planes are another longer-term ambition. Airbus has stated publicly that it wants to put a hydrogen-powered aircraft of some size, possibly or perhaps optimistically even 100-200 seaters, into service by 2035. Both electric and hydrogen technologies have obstacles to overcome. Electric aircraft will require batteries which, until now, add weight, while hydrogen tanks take up much more space in the aircraft fuselage.

On the ground, both technologies will require changes at airports to handle the new aircraft types, which will have to effectively operate parallel systems for old and new technologies for years if not decades, and that in itself poses an additional barrier to their introduction that needs to be addressed. Airports will seek to pass any infrastructure development costs such as parallel fuelling systems onto airlines that in turn will balk at the increased operating costs. Many of us have filled our cars with the wrong fuel on occasion, filling an aircraft tank with hydrogen rather than JetA1 would however be on another scale of mistakes.

Easier to introduce than new technologies are a range of market-based policy measures designed to achieve environmental goals. These may include emissions trading schemes and carbon offsetting as well as carbon removal measures. The European Union has its own Emissions Trading Scheme and ICAO, the International Civil Aviation Organisation, has CORSIA, the Carbon Offsetting and Reduction Scheme for International Aviation. Currently in its pilot phase, CORSIA will enter its first full phase in 2024. The more States that join up to CORSIA the more international air travel will be covered by the

initiative which provides airlines with a mechanism to offset emissions and reduce overall emissions by the industry.

CORSIA allows airlines to reduce their offsetting requirements if they use certain eligible fuels. To be eligible those fuels need to meet criteria demonstrating that they reduce lifecycle greenhouse gas emissions by at least 10%. SAF meets these criteria and ICAO is in the process of evaluating the ability of LCAF to do the same. For LCAF to be a viable option lifecycle analysis certification, which will be expensive and technical, will need to be provided by ICAO and audited by an accredited sustainability agency. Anyone that has followed ICAO's response to Covid-19 will know the speed with which they work but can we afford for time to be wasted on a detailed certification programme?

Calculating the carbon intensity of fuel from extraction from the ground to delivery to an aircraft wing is also a complex task and needs verifying by an independent agency. Production based around highly advanced refining facilities helps as does being closer to the place where the fuel is delivered to the aircraft.

Scaling Up

While SAF is safe and proven technology, currently using biomass as the raw material but with potential to be expanded into numerous other source material, one of the difficulties of scaling up use of SAF at this point is undoubtedly cost. The aviation industry watches the rises and falls in the price of fuel carefully, a harbinger of profit or bust. Some industry leaders have been sceptical about whether SAF can be economically viable, and the lifecycle cost of SAF needs to factor in the need to transport the biomass or other raw material from widely distributed locations to where it can be processed. Deliberately opting for a more expensive fuel when your competitors don't may be commercial suicide unless the business case can be made, and comparative advantage found elsewhere. In 2019, the last year before Covid sent shockwaves through aviation, the industry made an operating profit of US\$28 billion; spending on fuel over the year was US\$188 billion. Since then the price of fuel per barrel has increased from US\$63 per barrel to US\$98¹. Should the production of SAF be more than the current high price for aviation fuel then the whole industry's profitability could be compromised leading to inevitable airline collapses and a need for more state funding in some cases.

There does, however, seem to be some momentum behind SAF now at a government policy level which may make SAF more attractive. There's a bill now working through the US Congress that would provide tax credits to sustainable fuel blenders and Boeing has proposed a "tax credit for consumption" of SAF. As with all new technologies, costs are often more expensive in the early stages and early adopters may need support, but once the technology becomes mainstream a tipping point is reached and prices fall. This has been true in other areas of environmental technology such as solar panels and wind generated energy, to the point that now they are competitive with older technologies.

The increase in investment and research in sustainable fuels is clearly to be welcomed and sits alongside pressures to divest in fossil fuels. One unintended consequence of this, however, is the lack of incentive for existing companies to invest in making processes more fuel efficient. Pragmatically, if fossil fuels continue to be part of the fuel options for the next 30 years or so, this may well be a missed opportunity.

¹ <https://www.iata.org/en/publications/economics/fuel-monitor/>

The issue of cost is even more complex for LCAF where the commodity for sale is the same as regular kerosene. A bit like a Fairtrade labelled product, the commodity is the same but the conditions around production are improved and this is what can lead to a higher price. Unlike a Fairtrade product, however, the air passenger is not in a position to choose the flight which uses a fuel with a perceived better means of production, as it is the airline buying the fuel, and the airline may be constrained in terms of how it can pass on the additional cost. Like Fairtrade, though, certification can help with ensuring that LCAF qualifies for reduced offset requirements. In practical terms, LCAF may already be readily available but it is not differentiated from regular aviation fuel. Work needs to be done on understanding the lifecycle carbon footprint of kerosene and clear standards developed to identify where some regular kerosene is already meeting the threshold of a 10% improvement in lifecycle emissions compared to the kerosene in general use.

Differentiating Fossil Fuels

If the notion of differentiating fossil fuels in terms of the carbon intensity of the fuel seems an unlikely route to go down, look to Sweden where the Swedish energy agency has recently introduced eco-labels at the fuel pump. Now compulsory, these colour coded labels tell consumers the proportion of fossil raw materials and renewable raw materials in the fuel options. It is only a matter of time before airlines begin to use their carbon credentials in their marketing and social media strategies and if LCAF offers a 10% lower carbon footprint then that would seem to be a positive message for any airline to sell in their marketing.

This matters because whether we like it or not fossil fuels will be with us for the foreseeable future. Even SAF needs to be blended with fossil fuels and so blending with a fossil fuel with a certified lower carbon intensity makes sense even if explaining this to the public means drawing attention to the fossil fuel component.

Every Little Helps

Even supposing the most optimistic perspective on the development of zero-carbon technology, it is unlikely electric or hydrogen propulsion will meet the needs of long haul air travel for many years. It is inevitable that some level of fossil fuel requirement will be needed to power the worlds planes for some time yet. LCAF offers some potential as a complementary approach to reducing the carbon footprint of the industry at a point in time where as many viable approaches are needed as possible.

It has the potential to enable airlines to lock in a 10% reduction in greenhouse gases in proportion to the amount of LCAF used in the relatively short term and without needing to change any aspect of their operations. Indeed, from the research we have looked at and the hard data that is available LCAF seems a no brainer for consideration by the airline industry.

Despite lofty ambitions about a net zero industry by 2050, there remain innumerable hurdles. Many question marks remain about future technology and to reach scale in less than 30 years is challenging. There has been more than one industry leader speaking out about the risk of over-promising on the ability of the aviation industry to deliver on its goals but that of course is no reason not to try. At this point in time in the industry needs every available tool at its disposal. As air travel recovers following the pandemic, demand will rise again. In the next few years while few real alternatives are in place to reduce the carbon emissions of aviation, the industry needs incentives to operate with fossil fuels that are doing the least damage to the planet. LCAF could fill this space.