Path to net zero: Turning ambition into action

By Haldane Dodd (ATAG)

The aviation industry is at a crucial point in its journey towards net zero. In the three years since ICAO's last Environment Report, great strides have been made to move from commitment into action. ICAO, with the support of the industry, did incredible work to unite governments behind a common net zero goal for 2050. Now, with this clear direction in sight, there has been a move towards more policy support in many countries, and greater investment in the decarbonization pathway.

Despite these successes, we are also experiencing a more complicated operating environment than we have seen in recent years. Questions over the cost of the transition haven't gone away, but challenges brought about by the political mood are also causing concerns. Key stakeholders have stepped back from projects that place the climate at their center. Traditional energy providers are placing obstacles in the ramp-up and scalability of sustainable aviation fuel (SAF) production – or simply pulling back on their climate commitments.

However, the fundamentals remain the same. Air traffic will continue to increase every year to serve a global population that sees great benefits in connectivity, and with it the need to decouple carbon emissions from growth grows even more important. As impacts are felt by citizens with more frequent flooding and wildfires, climate change will increasingly be a part of public consciousness, with greater demands for political, consumer and corporate action. We also cannot ignore the business cost of inaction: carbon costs will rise, and the insurance markets are already starting to factor in climate impacts – this will only become more apparent if the world fails to get a grip on the situation. It's an uncomfortable picture, but there is hope and despite the hurdles, the civil aviation sector remains firm in its commitment to reach net zero carbon.

The next three to five years will be a vital time for the decarbonisation of our sector. We need to demonstrate a continued commitment to ensure that the early gains we've seen can be solidified into long-term transformation. Most importantly, multi-stakeholder collaboration on a global scale will be crucial to future success, removing barriers and allowing the industry to innovate at scale.

Collaborative action towards a common goal

Over the last three years, we have seen a number of examples of how collaboration drives change, and what we can achieve if we all work towards a common goal. Developments in modern fuel-efficient aircraft, propulsion systems and light-weight construction materials continue to reduce emissions, while operational improvements on the ground and in the air are contributing to the industry's common goal. One example for this collaborative approach is EUROCONTROL's Free Route Airspace, which will save one billion nautical miles and 20 million tonnes of CO_2 when fully implemented across the continent in 2029.

Today, about one third of the current global fleet uses the latest generation aircraft operating with maximum fuel efficiency. There is a production backlog of 15,700 aircraft to be fulfilled in the coming decade, which will provide further efficiency gains. We are also at an early but promising stage of development into hybrid electric and hydrogen powered aircraft technologies for smaller and short-haul operations – there is a real need to scale-up the production and distribution of liquid hydrogen to help support this shift. Since 1990, about 14.66 billion tonnes of CO_2 have been avoided due to new technology and operational efficiencies. The adoption of digital tools, particularly as more organizations figure out best uses

for artificial intelligence in their particular field, will only serve to further these gains as increasingly efficient aircraft operate on increasingly efficient routes.

Alongside these initiatives, huge progress has been made by ICAO with the introduction of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA): airlines will need to purchase $20-30 billion in approved offsets for 1.2-2 billion tonnes of CO_2. This represents around 70% of the growth in international air transport emissions during the lifetime of the scheme. This is the result of extensive negotiations by developed and developing countries, the ICAO system, industry and civil society, and represents a measure that will be effective without having a disproportionately negative impact on developing nations and their capacity for growth. A total of 129 States have now volunteered for the first stage, making it likely to be one of the most successful UN-level carbon management projects.

Outside of carbon, collaboration is also key in the progress for contrail management. There is significant research currently going into understanding the complexities of contrails and their long-term impact on the environment, particularly into the potential to develop sensors for commercial aircraft that can help us understand where formation might take place, learning how avoidance might impact air traffic, and identifying the trade-off metric between contrail avoidance and CO_2 emissions. However, conversations are actively taking place between all stakeholders which demonstrates the progress we can make when stakeholders from all areas of the aviation and climate sectors work together.

Collaborative initiatives such as CORSIA, operational efficiency improvements, measures tackling non-CO_2 emissions, as well as innovation and infrastructure investment are all crucial for the industry's net-zero pathway. As we have known for some time, the most significant factor is the ramp-up of SAF. As of this year, there are 11 approved pathways for SAF production, and a further 11 are currently being assessed, which help diversify supply and create a menu of SAF options around the world, particularly in developing nations.

The good news is, we see an exponential increase in SAF production year over year, from 240,000 tonnes produced in 2022 to 500,000 tonnes in 2023 to one million tonnes in 2024. For 2025, we expect this number to double again to 2.1 million tonnes. More than 45 States have already introduced or are introducing SAF policies to incentivize SAF off-take. Additionally, 50 airlines globally, counting for 41% of global traffic, have committed to blends of more than 5% SAF by 2030. These initiatives from both the industry and regulators provide much needed confidence to suppliers and give a strong signal to ramp up SAF production. However, this momentum must be maintained – and accelerated – if aviation is to be able to narrow on a pathway to decarbonization.

Aviation cannot decarbonize in a vacuum

Current SAF output still represents less than 1% of all jet fuel, meaning more must be done to stimulate demand, which in turn would strengthen the supply side and ensure the development of fuel-producing plants. To achieve the long-term goal of up to 500 million tonnes per year, it requires stronger multi-stakeholder collaboration not only from governments and the civil aviation industry, but the financial investor community and traditional energy companies alike, the latter of which have recently scaled back their initial commitments on SAF production. It is up to governments to introduce measures that will hold oil companies accountable and ensure their crucial support in the scale-up of SAF.

Looking to the future, the next few years will be particularly crucial in our journey. Important commitments now need to be turned into clear actions. In the realm of SAF, an investment of at least $1.5 trillion will be required for SAF production over the next 25 years. Alongside the financing need, there is still a need to harmonize SAF regulation globally. This would provide confidence to airlines and the organizations involved in SAF production and allow for more effective planning. Governments, development banks and other institutional and private investors are beginning to increase funding for SAF, but financial mechanisms must also be expanded to help reduce the risk in these investments and accelerate adoption to the scale needed to fulfill the industry's net-zero targets.

Fundamentally, focused and consistent collaboration between all stakeholders is vital to overcome these challenges. Aviation can't decarbonize in a vacuum, and it is crucial for energy producers, the finance community and policymakers to fully align with civil aviation's energy transition and put their full weight behind SAF development and innovation. The past three years have shown what can be possible when the industry, governments and key stakeholders work together.

From progress on contrails, to SAF policy or CORSIA, significant developments are bolstering the industry's efforts to reach net zero. However, so much more needs to be done. The building blocks are in place. We have our plan, and we have a sector which – unlike almost any other – is used to working through global collaboration. The next phase of our mission will require even greater ambition, and a much faster implementation of solutions. Now is the time for us to work together, remove roadblocks and put systems in place that will allow the industry to innovate and execute faster than ever before. With the right policies, investments and commitments from across the stakeholder spectrum, there is every possibility that aviation can and will reach net-zero carbon.