

# Fuel for clean aviation

Zero-CO<sub>2</sub> emissions air travel is within reach. That is the striking conclusion of last week's symposium on decarbonising aviation hosted by the World Travel Market. The online-symposium brought together leading scientists, engineers and policy-makers who showed how replacement of fossil kerosene by synthetic fuels could start as early as 2025. By 2050 all aviation fuel could be technically replaced by such e-fuels, and along with the introduction of short-haul aircraft with electric engines powered by fuel cells, aviation could be virtually zero-emissions by 2050.

Professor Paul Peeters, of Breda University of applied sciences, opened the symposium mentioning the economic devastation of COVID-19 for the travel sector, but stressing that the climate crisis is more dangerous, "because it comes at a slower pace, and there is no vaccine against it". He sketched the scale of the problem, the urgency of addressing it and the lack of effective solutions so far proposed by the aviation sector. He then presented long-term scenarios up to 2100 that show synthetic e-fuels made from carbon dioxide, e-fuels, green hydrogen, fuel cells, and electric propulsion are the way forward towards zero-emissions. The following presentations all developed parts of this scenario.

Harry Lehman of the German Environment Agency, explained that e-fuels were the way of decarbonising fuel without needing to change the existing aviation infrastructure. "Mandating a progressively increasing share of e-fuels is essential, and the German aviation industry is asking the government for a policy commitment to reach a 5% mix by 2030". When governments provide this incentive, the industry is ready and able to provide these fuels, as Carola Kantz, deputy managing director of the VDMA Power-to-X working group of the Mechanical Engineering Industry Association VDMA convincingly explained. All technologies needed are ready to be scaled-up to high-volume production. Marc Stettler of Imperial College London shared his research on the non-CO<sub>2</sub> climate impacts of aviation contrails and how small changes in flight altitudes and improvements to engines and fuels could reduce such effects.

Joris Melkert of TU Delft discussed the importance of weight in aircraft design and the totally inadequate energy to weight ratios of batteries for flight. Only for general aviation aircraft full electric flight seems possible. He furthermore mentioned a range of options to improve efficiency and reduce emissions, and argued that there "is no silver bullet". It has to be a range of measures but with a focus on those that are most effective like e-fuels and fuel cells. Thus, electric aircraft can make the difference when you replace the battery by a hydrogen and fuel cell system. Daniel Juschus, TU Delft, shared a detailed conceptual design for such a fuel cell electric aircraft with 19 seats and 1000 km range. Also, he showed the way to "scale-up such aircraft to 150 seats and medium-range". Pericles Pilides of Cranfield University, extended on this describing how hydrogen might eventually fuel much larger aircraft.

Gustavo Alonso of the Universidad Politecnica de Madrid detailed the aeronautical research agenda necessary to achieve "CleanSky3" for Europe. Gerard Rijk of Profundo considered how investors are increasingly switching to fund sustainable solutions. This could fuel the transition towards zero-emissions flight. Finally, Job Rosenhart, external advisor to the Ministry of Infrastructure and Water Management, Netherlands, discussed the policy options for governments including mandating aviation fuels, from which e-fuel should be part of. The Dutch government is actively pleading to introduce an European minimum share of sustainable alternative fuels. If European policy does not develop in a timely manner, the Dutch minister communicated that it would consider introducing a national mandate by 2023.

The main roadblocks are lack of support from the aviation and tourism industries, unsubstantiated faith in carbon offsetting and in battery-powered aircraft, and reluctance to pay the additional fuel costs. These roadblocks are substantial but there is a groundswell of public support and policy planning for action on aviation's greenhouse gas emissions in the light of the Paris Agreement targets and increasing recognition of the extent of the threat of climate change. And e-fuels, hydrogen and electric powerplants do have the potential to solve the air transport emissions concern once and for all, to the considerable benefit of travel and tourism. Support for and widespread promotion of the various initiatives already in hand or proposed should now be a critical focus for industry, investors and governments alike.

The presentations can be [watched here](#). The speakers make a powerful case that decarbonised aviation can be delivered.

There is an online Forum [here](#)

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