Written evidence submitted by HACAN to the Environmental Audit Committee inquiry into Net Zero Aviation and Shipping

August 2021

1. Executive Summary

1.1 Technological improvement leading to greenhouse gas emissions reductions must not be allowed to compromise efforts to reduce noise and emissions deleterious to local air quality.

1.2 Potential reductions in emissions via operational efficiency gains to 2050 are insufficient to match the projected growth of aviation.

1.3 Alternative aviation fuels generation require significant investment from industry and/or Government to be competitive with kerosene – first plants could cost £600-700m.

1.4 New technological developments in the aviation sector usually take up to a couple of decades before reaching maturity.

1.5 Electric aircraft in development today have the technical potential to cut 13% of UK aviation's greenhouse gas emissions but improved regulation and major market intervention required to accelerate fleet turnover cycles.

1.6 Government should set out robust plans for demand management options, incentives and penalties to ensure promised technological improvements are delivered and a framework of mechanisms to ensure that the industry also addresses non-CO2 emissions.

1.7 A frequent flyer (or air miles) levy would be an effective, social, just and morally defensible way to reduce UK aviation emissions.

1.8 Government should apply a full life-cycle analysis of air transport infrastructure and supply chain emissions (manufacturing, operation, maintenance, etc.) into the environmental impact assessment of international aviation.

1.9 Offsetting is not a credible policy mechanism as it does not stop aircraft emissions from being released into the atmosphere.

2. Introduction

2.1 HACAN (Heathrow Association for the Control of Aircraft Noise)[1] is a campaigning organisation formed in the 1970s to give a voice to residents under the Heathrow flight paths. We are a regional body covering London and part of the Home Counties.

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[1] www.hacan.org.uk

2.2 Our members believe that the aviation unrestrained demand / supply model is distorted because the industry does not fully pay its environmental costs in terms of noise and emissions. These costs are born by local residents in terms of exposure to noise and the wider population in terms of local and global emissions.

2.3 According to the European Environment Agency, noise pollution is the second largest environmental threat to health, causing 12,000 premature deaths a year.[2] The harmful effects of noise include heart disease, annoyance and sleep disturbance.

2.4 There is a risk that technological solutions to carbon reduction may have adverse effects; for example, large scale electric aircraft may be significantly heavier and thus create even more noise than existing aircraft.

2.5 Existing Air Navigation Guidance states that up to 4,000ft the Government's priority is to minimise noise and the number of people impacted and that above 7,000ft the priority is to reduce emissions.[3] However, it is also not clear what the impact of Government Net Zero policy and the prioritising of carbon reductions will have on dealing with noise emissions and other non-CO2 emissions in the future.

3. Operational Efficiencies

3.1 The International Air Transport Association (IATA) has an aspirational target to deliver 2% operational efficiency per annum which is insufficient to meet Paris Agreement targets.[4]

3.2 Conversely, a report by the International Civil Aviation Organisation (ICAO) in 2019 assumed long-term overall efficiency gains, even under the most optimistic scenario, of 1.37% per annum. This includes improvements associated with both technology and operations.[5] The United Nations Environment Programme UNEP similarly states that likely improvements in aircraft airframes and engines in the next 20 or so years will improve the burn-fuel metric by around 1.2% per year.[6]

3.3 These potential efficiency gains do not come close to matching the projected and desired growth (5% per annum) from the aviation industry, and are insufficient to reduce emissions from the current level.

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[2] EEA (2020) Healthy environment, healthy lives: how the environment influences health and well-being in Europe. https://www.eea.europa.eu/publications/healthy-environment-healthy-lives

[3] DfT (2017) Air Navigation Guidance. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/587669/air-navigation-guidance-on-airspace-and-noise-management-and-environmental-objectives.pdf

[4] ICAO(2019) https://www.icao.int/environmental-protection/pages/climate-change.aspx

[5] ICAO (2019) Environmental Trends in Aviation to 2050. https://www.icao.int/environmental-protection/Documents/EnvironmentalReports/2019/ENVReport2019_pg17-23.pdf

[6] UNEP (2020) Emissions Gap Report. https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/34431/EGR20ch5.pdf?sequence=3

3.4 Baledón & Kosov (2018) highlight that ICAO's assessments on fuel consumption and emissions show that the aggregate environmental benefit achieved by a combination of the technological and operational measures will be insufficient to attain carbon-neutral growth from 2020. This means that international aviation will be increasingly reliant on the use of alternative jet fuels to achieve greater carbon reductions.[7]

3.5 Pidcock and Yeo (2016), show that carbon emissions from international aviation will still represent 12% of the 205Gt remaining global CO_2 budget in 2050, even if technological and operational efficiencies are maximised and the total demand for conventional jet fuel is met with alternatives. This may rise to 20% should alternative jet fuels not become available in sufficient quantities. [8]

4. Alternative Aviation Fuels

4.1 Alternative aviation fuels could be a key way for airlines to reduce emissions, but uptake to date has been minimal due to limited supply and high costs. In 2010 the aviation industry pledged to source 10% of fuels from sustainable sources in 2020. Yet by 2018, the industry had managed to source a grand total of 0.002%. Sustainable Aviation Fuel (SAF) production today is still less than 1 percent of overall jet fuel supply despite being pitched by the industry as the panacea for decarbonisation.

4.2 The current global targets for approximately 50% alternative jet fuel use in 2050 would require three new bio-jet fuel refineries to be built every month for the next 30 years. Today there are just two facilities – the market is not delivering at the pace required.

4.3 A report commissioned by the UK Department for Transport to look into the feasibility of commercial SAF plants in the UK found that there is significant technology risk, high capital costs and uncertainty on the monetary value of policy support. The study concludes that first-of-a-kind commercial plants could cost between £600m - £700m.[9] It is not clear how much investment industry or Government is willing to commit to enable alternative aviation fuels generation to be scaled up and sold at a price that is competitive with kerosene.

4.4 E-fuels are seen as potentially delivering the highest carbon savings. For example, the most sustainably produced hydrogen, green hydrogen, is the most expensive option and its production requires large amounts of electricity . It is not yet clear where this electricity will come from. Hydrogen produced by means other than electrolysis should not be considered as zero carbon.

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[7] Baledón & Kosov (2018) "Problematizing" carbon emissions from international aviation and the role of alternative jet fuels in meeting ICAO's mid-century aspirational goals. Journal of Air Transport Management, Volume 71, August 2018, Pages 130-137 https://doi.org/10.1016/j.jairtraman.2018.06.001

[8] Pidcock & Yeo (2016). *Analysis: aviation could consume a quarter of 1.5C carbon budget by 2050.* Retrieved from: https://www.carbonbrief.org/aviation-consume-quarter-carbon-budget

[9] https://www.e4tech.com/uploads/files/final-report-aviation-abdc-feasibility-study-issue-v1-0.pdf

4.5 Large-scale production of alternative jet fuels could also aggravate the environmental impacts linked with intensive agriculture of dedicated bioenergy feedstocks (Novelli, 2011)[10], and result in an absolute increase of carbon emissions from international aviation (Staples et al., 2018)[11].

4.6 There is not a single internationally agreed definition of SAF, nor is it clear how emissions in production are accounted for. There is an assumption of benefit of waste being turned into fuel as opposed to be left to rot (thus generating methane), however jet fuel from waste could still generate similar levels of carbon emissions as kerosene. In order to achieve net zero both the methane and carbon emissions need to be avoided.

4.7 Biofuels in general are complex solution to manage as they can only be considered 'sustainable' if recruited from waste streams (which requires external verification), could discourage waste reduction strategies and encourage deliberate creation of 'waste' oils. Biofuels direct sourced from crops would not qualify as sustainable.

4.8 The Climate Change Committee (CCC) advises that we shouldn't plan for aviation biofuel to exceed 10% of total aviation fuel use by 2050. Their analysis suggests that the largest contribution to reducing emissions from aviation will come from new technologies and aircraft design.[12]

4.9 The International Energy Association (IEA) Sustainable Development Scenario (SDS), anticipates biofuels reaching around 10% of aviation fuel demand by 2030, and close to 20% by 2040.[13]

4.10 However, the price of biofuel is again crucial. Lu (2018) that it is not until biofuel price is around 8-11% higher than the traditional fuel that the use of biofuel becomes more economical than traditional fuel.[14] Thus, whilst alternative jet fuels may play a role it is not yet clear how significant this role might be in terms of decarbonisation.

5. New Technologies

5.1 The industry's own assessment suggests that even if a technological breakthrough does become commercially available before 2050, new technological developments in the

[10] Novelli, P. (2011) Sustainable way for alternative fuels and energy in aviation (SWAFEA), report prepared for the European Commission's directorate general for mobility and transport. https://www.icao.int/environmental-protection/GFAAF/Documents/SW_WP9_D.9.1%20Final%20report_released %20July2011.pdf

[11] Staples, M.D., Malina, R., Suresh, P., Hileman, J.I., Barrett, S.R.H., 2018. Aviation CO2 emissions reductions from the use of alternative jet fuels. Energy Pol. 114 (C), 342–354. https://doi.org/10.1016/j.enpol.2017.12.007

[12] https://www.theccc.org.uk/wp-content/uploads/2013/04/Aviation-factsheet.pdf

[13] https://www.iea.org/commentaries/are-aviation-biofuels-ready-for-take-off

[14] Lu, C. (2018) When will biofuels be economically feasible for commercial flights? Considering the difference between environmental benefits and fuel purchase costs. Journal of Cleaner Production Volume 181, 20 April 2018, Pages 365-373. https://doi.org/10.1016/j.jclepro.2018.01.227

aviation sector usually take up to a couple of decades before reaching maturity (IATA, 2013).[15]

5.2 Peeters et al (2016) conclude that,

> *"conclude that technology myths require policy-makers to interpret and take into account technical uncertainty, which may result in inaction that continues to delay much needed progress in climate policy for aviation."*[16]

5.3 Further, Hassan et al (2018), highlight that despite environmental targets set by IATA, the achievability of meeting all those targets is extremely low (0.3%) for the expected demand growth rates in the US.[17]

Electric Aircraft

5.4 Analysis by Fellow Travellers[18] reveals that electric aircraft in development today have the technical potential to cut 13% of UK aviation's greenhouse gas emissions. Delivering this level of emissions reduction before 2050 would require regulation and major market intervention to accelerate product development and fleet turnover cycles.

5.5 Engineering constraints mean larger gains are unlikely in this timeframe, and it is probably not possible for transatlantic-range battery powered craft to be economically viable. There are no electric aircraft currently in development which could compete with the majority of the current global civil aviation fleet on range or capacity.

5.6 Electric aircraft will not reduce their weight due to fuel combustion over the duration of a flight. This means on a like for like basis, electric aircraft may be heavier on arrival leading to an increase of airframe noise. HACAN has a reasonable expectation that as electric aircraft come to market noise emissions remain a key design factor and noise from arriving aircraft will not increase.

Hydrogen

5.7 In June 2021, Airbus told the EU that most airliners will rely on traditional jet engines until at least 2050. They plan to develop the world's first zero-emission commercial aircraft by 2035, but assert that, *"Zero-emission hydrogen aircraft will be primarily focused on regional and shorter-range aircraft from 2035. Which means that current and future*

[15] IATA, 2013. Technology Roadmap, fourth ed. Retrieved from: https://www.iata.org/whatwedo/environment/Documents/technology-roadmap-2013.pdf

[16] Peeters et al (2016). Are technology myths stalling aviation climate policy? Transportation Research Part D 44 (2016) 30–42. https://doi.org/10.1016/j.trd.2016.02.004

[17] Hassan, M., Pfanender, H., & Mavris, D. (2018) Probabilistic assessment of aviation CO2 emission targets. Transportation Research Part D 63 (2018) 362–376. https://www.sciencedirect.com/science/article/pii/S1361920917300548

[18] Fellow Travellers (2018) *Electric Dreams: the carbon mitigation potential of electric aviation in the UK air travel market*. https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/Electric+Dreams.pdf

iterations of highly efficient gas turbines will still be required as we move towards 2050, especially for long-haul operations."[19]

5.8 If hydrogen is to form part of the Government's alternative aviation fuels strategy then it will need to set goals that are realistic and achievable, and focus on creating a secure market for green hydrogen with high sustainability standards so that industry can make the long-term investments that are required to scale up sustainably. As stated above only hydrogen currently produced by electrolysis could hope to meet this standard depending on where the electricity needed is generated from.

6. Government's Net Zero Aviation Strategy

6.1 In order to meet Net Zero targets there will need to be a robust framework from Government with strict targets and incentives to help boost investment and innovation. In its Transport Outlook 2017, the ITF encourages countries to support research and development in conjunction with the implementation of "avoid (travel) and shift (mode)" policies to influence demand through behavioural change (ITF, 2017).[20]

6.2 Government should require airlines to adopt short-term emissions reductions targets which are in line with the Paris Agreement. It must be clear how those targets will be met, without relying on offsets, or other measures which do not sufficiently reduce climate impacts. They should not encourage unrealistic optimism by the aviation industry about its ability to deliver low carbon aircraft, particularly given its poor track record.

6.3 Consequently, Government should produce an assessment of how other appropriate technology solutions for aviation will be delivered between now and 2050, and what policy interventions will be needed in order to ensure that these are delivered.

6.4 The UK Renewable Transport Fuels Obligation should include a requirement for airlines to purchase genuinely sustainable aviation fuels (e-kerosene). This would could help to provide an incentive for investment and innovation.

6.5 ITF's 2021 Outlook[21] calls for countries to implement more ambitious carbon reduction policies, stating that existing policies will result in transport emissions increasing. They suggest that measures to shift demand to more sustainable modes where possible, enhanced vehicle efficiency and improved fuel technologies must all play a role. They also state that increasing the price of carbon intensive transport will encourage a shift to low-carbon alternatives.

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[19] https://www.reuters.com/business/aerospace-defense/airbus-tells-eu-hydrogen-wont-be-widely-used-planes-before-2050-2021-06-10/

[20] ITF(2017). ITF Transport Outlook 2017. OECD Publishing, Paris. https://www.oecd-ilibrary.org/transport/itf-transport-outlook-2017_9789282108000-en

[21] ITF (2021), IT Transport Outlook 2021. OECD Publishing, Paris. https://read.oecd-ilibrary.org/transport/itf-transport-outlook-2021_16826a30-en#page1

6.6 The Government should drop the 'growth everywhere' mantra and set out robust plans for demand management options, incentives and penalties to ensure promised technological improvements are delivered and a framework of mechanisms to ensure that the industry also addresses non-CO2 emissions.

6.7 The Government must commit to aviation related targets as part of its COP26 workstream and incorporate them within a revised Aviation National Policy Statement as soon as possible.

7. Frequent Flyer Levy

7.1 Aviation taxes should increase in line with those paid by motorists to help generate additional revenue (around £10bn per annum) for the Treasury. It is clear from the advice of the CCC and the International Energy Association that aviation policy needs to include demand management.

7.2 HACAN believes that taxing flights and distance flown would appear to better align with the Government's environmental objectives by ensuring airlines maximise their available capacity and that those who fly the furthest pay the most.

7.3 A per flight tax could be based on just two factors, the aircraft type and the distance travelled. The Government can set the tax for the aircraft and it would then be up to the airline as to how it distributes that cost amongst passengers.

7.4 HACAN endorse the work of Possible in their proposal for a frequent flyer levy[22] and the New Economics Foundation in their analysis and assessments of how a frequent flyer levy could be introduced.[23]

7.5 A frequent flyer (or air miles) levy would be an effective, social, just and morally defensible way to reduce UK aviation emissions while maintaining access to air travel for all members of British society.

8. International Action

8.1 The Government should apply a full life-cycle analysis of air transport infrastructure and supply chain emissions (manufacturing, operation, maintenance, etc.) into the environmental impact assessment of international aviation. According to Chester and Horvath (2009)[24], this would contribute at least an additional 31% to the tailpipe

[22] Proposal for a frequent flyer levy https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/FFL+Policy+Proposal.pdf
[23] Managing Aviation Passenger demand with a frequent flyer levy https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/FFL+Modelling+paper.pdf
[24] Chester, Mikhail V.,& Horvath, Arpad, 2009. Environmental assessment of passenger transportation should include infrastructure and supply chains. Environ. Res. Lett. 4 (2), 1–8. https://iopscience.iop.org/article/10.1088/1748-9326/4/2/024008/pdf

emissions. This would provide a more comprehensive understanding of the carbon contributions of international aviation to climate change and a better chance to effectively mitigate the environmental impacts of air transport.

8.2 Emissions of aircraft at altitude also include non-CO2 pollutants and these are not properly understood or accounted for. It is likely that including non-CO2 emissions would result in a doubling of the overall climate impact of aviation.[25] Following the recommendation of the CCC it is vital that further research is commissioned to guide policy and regulations for non-CO2 emissions.

8.3 The UN's Sustainable Development Goal 12 (SDG.12)[26] on responsible consumption and production has been mainly approached by the aviation sector from a technological perspective. However, many of these technological efficiencies introduced over the years would have taken place regardless of the sector's climate commitments and as a result of cost-reduction strategies and compliance with local regulations.

8.4 SDG.12 urges governments to adopt regulatory and policy measures to phase-out fossil-fuel subsidies so as to reduce the environmental externalities of wasteful consumption. However, there are no initiatives from ICAO, its Member States or the industry to address these targets and they are not mentioned in their official reports.

9. Offsetting

9.1 Offsetting is not a credible policy mechanism as it does not stop aircraft from emitting greenhouse gasses into the atmosphere.

9.2 At the start of 2020, ICAO's governing body agreed that only six offsetting programmes were eligible to be considered within CORSIA, one of which is the Clean Development Mechanism (CDM). The European Commission already reported that 85% of the offset projects under the CDM failed to reduce emissions.[27]

9.3 The United Nations Environment Programme estimated in 2020 that the international CORSIA aviation offsetting scheme *"will result in the offset of only 12% of total international and domestic aviation emissions by 2030".*[28]

9.4 Further, the CCC has advised the Government not to use CORSIA as a way to meet our 2050 net zero target. CORSIA does not include an actual emissions reduction target. It relies on airlines buying offsets to compensate for their emissions growth, which will never be enough to offset the known damage of flying, and is also at odds with the Paris agreement's goals.

[25] Lee et al (2021) The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018. Atmospheric Environment, Volume 244, 117834. https://doi.org/10.1016/j.atmosenv.2020.117834
[26] https://www.un.org/sustainabledevelopment/sustainable-consumption-production/
[27] https://www.transportenvironment.org/press/eu-publishes-damning-report-emissions-offsets-calling-question-eu%E2%80%99s-aviation-climate-strategy
[28] https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/34431/EGR20ch5.pdf?sequence=3 (p.59)