

## Written evidence submission from Anthony Rae

*This submission is confined solely to aviation issues. Over the last 2 decades I have written consultation responses particularly on aviation emissions for organisations such as Friends of the Earth (E,W & NI) and Campaign for Better Transport. At present I'm associated with a group of transport campaigners engaged with Transport for the North and their decarbonisation strategy, but this submission is in a personal capacity.*

**Summary: the various means by which an aviation emissions reduction pathway might be implemented (the subject of the committee's questions) are less important than the factors determining how the pathway itself is designed and managed.**

1. This evidence submission provides an alternative perspective on the overall question being examined by the committee: the challenge to reduce aviation emissions consistent with a 'net zero by 2050' UK carbon budget which now formally includes international aviation and shipping emissions (IAS). It quite deliberately does **not** address the 8 questions identified for the enquiry on the basis, it argues, that they are creating the wrong framework within which to examine this challenge, or are viewing the issue 'through the wrong end of the telescope'.

2. Its approach involves distinguishing between 'means' and 'ends'. It's conventionally understood that the 'ends' (of a policy or framework) are primary and that the 'means' by which the ends can be achieved are secondary. The 'ends' established by the 2008 Climate Change Act are the attainment by the defined 2050 date of an established emissions target (now net zero - NZ), which therefore involves reducing the UK carbon budget (as now defined to include IAS) down a trajectory or pathway recommended by the Climate Change Committee (CCC), and doing so in quantifiable amounts (measured either annually or within the set 5-year carbon budgets) such that it can be understood with certainty that the end year target will be achieved. The CCA/CCC framework does not involve detailed prescription of the 'means' by which that trajectory is to be implemented. Whilst CCC provides guidance to government about the policy and regulatory frameworks required for future implementation, the actual delivery of quantifiable carbon reductions is left to a wider range of emissions sector actors to decide, to be selected by them on a 'least cost' basis.

3. It follows therefore that the committee's enquiry also needs to distinguish between the primary 'ends' relating to aviation and shipping emissions, and the secondary 'means' by which those ends are to be achieved. However, the committee's 8 questions relate only to those secondary means and not the primary ends. Furthermore this approach, elevating 'means' above 'ends', also replicates the approach to reducing aviation emissions being suggested and proposed by the Department for Transport (DfT), which the committee is meant to be scrutinising. To examine whether the DfT approach is adequate should instead involve **assessing each of three interlocking emissions pathways** - for the UK carbon budget (UKCB) as a whole, then *within* that for the transport emissions carbon budget (defined as 'total transport emissions', so surface transport+aviation+shipping - TTE), and then *within* that for an aviation carbon budget - **according to the following four tests:**

Test 1: Has a CCA compliant emissions pathway been established (or not), who is the pathway 'owner' responsible for delivering its implementation, and have they released its modelling assumptions and data to allow its technical credibility to be confirmed?

T2 (Relatedly) What has been the historic trajectory of that pathway from the baseline year (1990) to the present, and the policy framework within which that trajectory occurred? This is important to judge responsibility for, and the pace of change in, the future period to 2050.

T3 Specifically has the pathway 'owner' quantified the nominal annual or 5 yearly emissions tonnages and milestones which their trajectory needs to achieve in order to attain the end target? Have they committed to put in place *now* the various implementation frameworks (policy, regulatory, fiscal, technological, etc) that can be judged at the pathway start to be necessary to secure those annual/5 yearly reductions across the 30 year forward period to 2050? And have they demonstrated how they will manage the achievement of the pathway as it proceeds through implementation, in order to prevent overshoot?

T4 Has the pathway owner demonstrated (according to independent scrutiny) via the use of modelled scenarios and released assumptions/data packages, that its preferred pathway has encompassed the full range of 'least cost' means (and is also consistent with a wider range of sustainability criteria) so as to command public and political acceptance?

4. Within this different assessment framework - distinguishing between 'ends' and 'means' - it can be seen that most of the current DfT proposals, and the committee's questions, are confined to a set of interventions within just one of those T3 implementation frameworks - those focused on technological and efficiency changes - which the DfT are arguing will be sufficient to achieve aviation decarbonisation. The four tests about the primary policy 'ends' have however not been addressed, with as will be seen highly significant consequences.

5. When the four tests are applied to the two higher level pathways, their test scoring is as follows:

*UK carbon budget:* **T1** - the UKCB pathway has been established by the CCC, who typically release its underpinning data package. **T2** - since 1990 UK carbon emissions have reduced by 40+%, so are approximately on course at the midpoint of the overall 60 year period. **T3** - CCC have identified quantified tonnage amounts for both 5 yearly and annual reductions for each of the UKCB's constituent emissions segments, including transport. They have also identified the various potential implementation frameworks for each sector, but responsibility for adopting those lies with government. **T4** - the CCC 6th carbon budget report (December 2020) has been judged to have integrated that full range of 'least cost' means. Therefore the **CCC's UKCB pathway can be seen to have passed the 4 tests.**

*Transport emissions pathway:* **T1** - the DfT pathway owner has included a representation of a TTE pathway in the Transport Decarbonisation Plan (July 2021 - TDP *figure 3 page 47*) but have not released the underpinning modelling assumptions and data package. They have been requested to do this, but have so far not responded. Consequently it cannot yet be authoritatively assessed as to whether it's CCC compliant, but it's likely that it may not be. **T2** - TTE emissions 1990-2019 (so pre-Covid) *increased* by +9% *above* the 1990 baseline, so had not even commenced on a CCC-compliant reduction pathway. The reasons for this 'failure to decarbonise' can be variously interpreted but my explanation would be that the DfT overarching policy stances relating to road demand/capacity, and aviation demand/airport capacity did not have regard to the decarbonisation imperative, or indeed - in the case of aviation - actually promoted carbon tonnage increases. **T3** - DfT as pathway owner have not made public their annual/5 yearly pathway tonnages for TTE, nor does the TDP commit to putting in place the implementation frameworks required to secure them, or explain how its pathway will be managed to 'keep on track'. For example, if the first of the 5 year reviews, in 2026, found that TTE emissions were 'off track' it would already be too late to make sufficient corrective measures. **T4** - neither the TDP or the preceding *Decarbonising Transport* (March 2020 - DT) indicated that the DfT intending to proceed to construct a TTE pathway via scenario modelling (although the shipping section of DT made reference to the extensive scenario modelling undertaken for Clean Maritime Plan). Not only is there no demonstration in the TDP that its pathway construction has encompassed 'the full range of least cost means', but an analysis of its technical underpinnings reveals that the critical 'volume of demand' component of pathway construction has been excluded from the pathway preparation. The other pathway component - the emissions intensity of transport (which can be subject to technological investigation and improvement) - on the other hand has been allowed to dominate the TDP approach. Therefore generally the **DfT's TDP transport emissions pathway fails the 4 tests.**

6. This now provides the context within which to applying the same tests to the aviation emissions pathway, to test its adequacy and how this would impact on the two higher level pathways of which it is a significant constituent component.

**T1** - DfT are now consulting on what should be the aviation emissions pathway and have released the underpinning scenario modelling and data package. The [Jet Zero Consultation](#) document (JZC) refers to a more detailed [Evidence & Analysis](#) report (A&E - both 14th July) which, when requested, was supplemented by a [data/assumptions package](#) (released 13th

August). This is a significant difference from, and advance on, the TDP because it allows independent scrutiny of scenario selection and assumptions – the T4 test. The A&E report includes comments on whether its scenarios are CCC compliant.

**T2** - Aviation emissions increased from 21m tonnes in 1990 to 39Mt in 2019, an **increase of +86% above the CCA baseline**. This was as a result of a deliberate, determined and long-term DfT policy framework promoting the expansion of air travel and of airport capacity, within which the need to constrain or reduce aviation emissions so as to contribute to the overall CCC UKCB pathway was explicitly ignored. This was played out in the decade-long refusal to accept the CCC recommendations for IAS formal inclusion (first in relation to the CCA S.30 2012 inclusion 'deadline', and then with repeated postponements of consideration) which was only finally overcome when the imminence of the UK's hosting of COP26 made continued refusal politically impossible. However, from the start of the TDP consultation DfT indicated that its policy stance of aviation/airport expansion was not going to be open to questioning (DT para 2.49 'airport expansion is a core part of boosting our global connectivity and levelling up across the UK *emphasis added*), something which has now been confirmed in JZC footnote 39, which reaffirms that 2018's *Best use of existing runways* and the airports national policy statement 'continue to have full effect'. This therefore constitutes an implicit rejection of the assumptions of the CCC aviation emissions pathway as set out in its sector summary report – see paras.7 and 12 below.

**T3** - The JZC dataset, released one month after the main consultation report, provides an annualised quantification of residual emissions tonnages under its 4 scenarios. Since JZC is a consultation document we wouldn't expect there to be commitment to implement a specific set of implementation frameworks but, in terms of managing annual progress in emissions reduction down through the pathway to prevent overshoot, neither JZC or E&A propose any arrangements by which this would be prioritised. Instead they emphasise the uncertainty associated with their own scenarios with their particular reliance on future technological advances.<sup>1</sup> Collectively this is not satisfactory: limiting scenario choices just to their preferred ones, but undermining their certainty and not proposing to manage their delivery either.

**T4** - The fact that, unlike for the TDP, the data and assumption package for JZC has been made available allows consultees to now assess the adequacy of its scenario construction, in terms of both quantified tonnage reductions and whether the full range of scenarios has been identified. My full analysis of the dataset will be completed before the closing date for the JZC consultation on 8th September but for the moment I'll describe just its most obvious finding: that the pathway preparation fails to include a scenario with passenger demand constrained to any extent, despite its powerful effect on reducing emissions. (DfT have separately confirmed that 'No other scenarios were assessed as part of the analysis feeding into the Jet Zero Consultation.'). This is consistent with (as noted above) that the critical 'volume of transport demand' component has been removed from the entire TDP analysis.

7. This is important for a number of reasons: because all the 4 E&A scenarios assume a major expansion in passenger demand - 58-60% by 2050<sup>2</sup> (ordinarily it would be important to undertake even a sensitivity test as to the consequences of this growth); whilst a critical component of the CCC aviation emissions recommendations is that passenger demand should not increase at all above 2018 levels before 2035 unless delivery of *its* emissions pathway permits this (*CCC aviation sector summary figure P8.2*) Consequently a 'passenger demand capped at the 2019 pre-Covid peak' scenario would allow consultees to assess the compliance of JZC with the CCC pathway. It cannot be argued that such a scenario would constitute an unnaturally severe restraint on demand, with the UK already having one of the highest 'propensities to fly' in the world.<sup>3</sup>

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<sup>1</sup> E&A 'There is much uncertainty however, and clearly there could be many combinations of technology improvements, GGR costs and demand growth which would achieve net zero 2.22 and 'There is significant uncertainty surrounding the abatement potential, uptake and costs of the measures described in this document and therefore these scenarios should be seen as illustrative pathways rather than forecasts.' 4.3 And see also 3.2

<sup>2</sup> Within this there is a further problem: the E&A demand scenarios are all based on the DfT 2017 forecasts which, apart from being challengeable even then, were prepared nominally within the old CCA 80+% 2050 target. DfT have confirmed that new forecasts are not available.

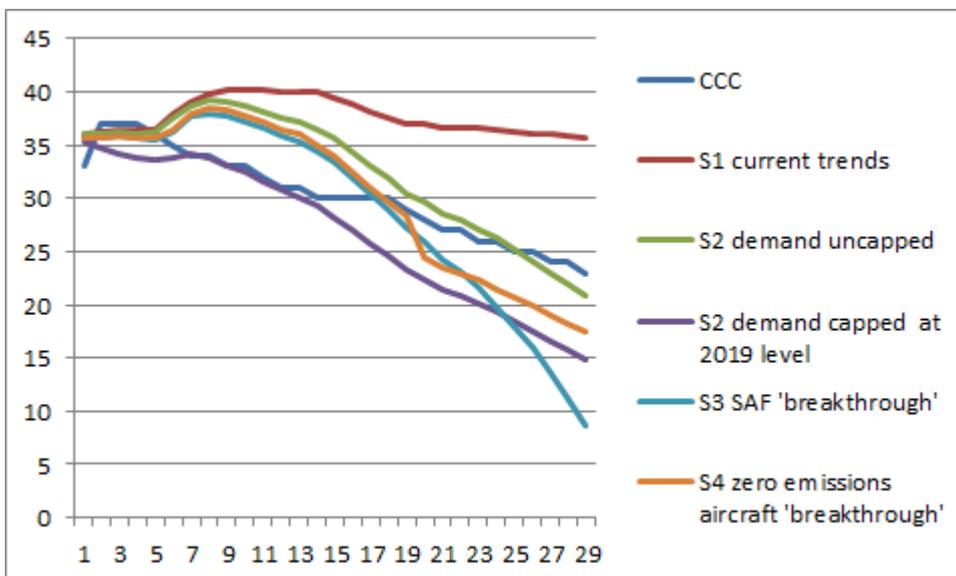
8. Provision of the DfT dataset now allows the impact of constraining demand on cumulative emissions to be calculated, with both uncapped and capped demand budgets being compared to the CCC recommended budget, as in the following table and figure.

Scenarios	total emissions 2022-50 <i>m tonnes</i>	emissions more than CCC pathway <i>m tonnes</i>
CCC pathway	877	
DfT JZC S1	1093	216
DfT S2 demand uncapped	943	66
DfT S2 capped at 2019 level*	<b>776</b>	<b>-101</b>
DfT S3	841	-36
DfT S4	877	6

Source: DfT JZ dataset, 'residual emissions' for each scenario.  
NB these tonnages/pathways are calculated from rounded numbers.

9. It's best to apply the 'uncapped' versus 'capped' demand alternates to the 'High Ambition' scenario 2 (S2) - which 'includes the same assumptions on demand, carbon price and capacity as S1 'current trends' which has a generalised step-up in ambition on efficiency improvements, SAF uptake and the introduction of zero-emission aircraft'. In S2, if passenger demand increases as per DfT assumptions (+ 60% by 2050), **the CCC cumulative emissions budget of 877Mt 2022-50 is exceeded by 66Mt**. But if passenger demand is capped at a DfT 2019 assumption level, cumulative emissions to 2050 are **101Mt below** the CCC budget tonnages.

10. The JZC four scenario emissions outputs, S2 capped variant, and CCC recommendation can also be displayed as pathways between 2022-50.



**Emissions pathways 2022-2050** (1-29 on the X axis)

11. In the figure the JZC S2 (uncapped - green line) reaches a slightly lower output in 2050 , than the CCC pathway (blue line) - 20.9Mt compared to CCC 23Mt - but with a higher cumulative emissions across the period. But the S2 capped pathway (purple line) pulls annual emissions down to a lower level of 14.8Mt in 2050. Although the JZC S3 pathway (SAF breakthrough) reaches a 2050 lower tonnage (8.6Mt), it's based on speculative

<sup>3</sup> <https://ourworldindata.org/carbon-footprint-flying> Per capita emissions from domestic *and* international flights, displayed as a table (not map)

technology/assumptions etc that arrive late in the pathway period, whereas the alternative intervention using demand constraint can be applied early (thereby increasing delivery certainty) and consequently contributes more to reducing cumulative emissions.

12. What this quite straightforward analysis of the JZ dataset reveals is that the justification for introducing 'demand constraint' as a separate JZC scenario is powerfully demonstrated. However this has not been included in JZC; indeed as A&E makes clear it's been deliberately excluded. The convoluted justification for this decision *paras.2.21-22* is that i) the CCC demand constraint assumption of +25% requires a high carbon price to deliver; ii) which would have the effect of incentivising implementation of lower cost technological interventions; and therefore iii) 'This analysis suggests that capping demand may not be necessary to reduce emissions to levels which can be offset by GGRs to achieve net zero (such as the level suggested by the CCC's Balanced Net Zero Pathway, 23 Mt in 2050).' This should be understood as a pretext introduced into JZC in order to remove the entire issue of demand constraint from the discussion.<sup>4</sup>

13. Please note that this is a different point from that asked by the committee's Q5, which seeks views on *methods* by which 'demand *management*' might be applied (reformed APD, frequent flyer levy etc). Instead this is pointing to the prerequisite need for the optimum aviation emissions pathway to have at least considered a demand *constraint scenario*. Since that scenario has been excluded by the DfT and ministers, then the 'means' by which it might be implemented is neither here nor there. To be clear: there is nothing inherently wrong with using any of the Q5 interventions to reduce aviation emissions. What is at issue is the credibility of the pathway framework within which they are just components. If the pathway itself has been wrongly constructed, on the basis of partial scenarios, then the mix of interventions and incentives will set in quite the wrong direction, a situation which won't be discovered until too late to be corrected.

14. **Conclusion** The analysis in this submission has demonstrated how, once the JZC proposals and scenarios are able to be subjected to more detailed, quantified analysis (as per the T4 test), it then becomes visible that **the Jet Zero aviation emissions pathway also fails the 4 tests**. The consequences of this failure would then be magnified, impacting the certainty of delivery of both the TTE pathway and in turn the UK carbon budget as a whole. The technical credibility and viability of the pathway which gives expression to the primary 'end' – the trajectory to NZ – and the mechanisms which govern how that pathway is designed, constructed and implemented with certainty are much more important than the means by which it might be implemented. So the committee is also urged to give proper attention to the integrity of the pathway itself.

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September 2021

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<sup>4</sup> As per JZC 3.41 'Our analysis shows that there are scenarios that can achieve similar or greater CO2 reductions to those in the CCC's Balanced Pathway ... by focussing on new fuels and technology, with the knock-on economic and social benefit, rather than capping demand.'