Transparency in Aviation Emissions: An open letter.

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This letter focuses on some significant issues regarding aviation environmental emissions. It questions the validity of ICAO's carbon calculator and the policy of adopting a fundamentally unsound instrument that risks damaging the credibility of international efforts at creating meaningful CO2 standards. It encourages a more open, honest and scientifically correct process of aircraft assessment, and invites airframers, engine makers, airlines and other institutions to consider the long-term strategic benefits of increased transparency. Lissys intends to support this philosophy by gradually releasing more of its Piano-X aircraft models in the public domain.

The International Civil Aviation Organisation (ICAO) is increasingly promoting its online carbon calculator as an official tool of the United Nations. This calculator is centrally dependent on fuel burns extracted from Piano and post-processed with a multitude of assumptions. Piano outputs were used without asking the permission of Lissys, as explained here. (Their earlier release in the Corinair report seems to be the result of a dilution of individual responsibility typical of large organisations and changes in personnel, rather than any malicious or unlawful action.)

The ICAO calculator gives you a carbon footprint per passenger, yet states that it is "not suitable as a comparison tool." The significance, usefulness and accuracy of this blanket number are all questionable. You cannot differentiate between aircraft, or know how many seats are occupied, or change any premise. Simple checks expose large deviations from reality. For example, ICAO's generic quotation from London to San Francisco is 589 kg CO2 per passenger, one way. I recently flew on this route with Virgin Atlantic in an A340-600, a typical, modern and efficient aircraft. In the best case with all seats occupied (as they were), Piano gives my CO2 footprint as 801 kg. The number increases to 1,506 kg for a half-empty flight. Details are below, and the aircraft model is released for independent verification under any assumptions. (If Virgin or Airbus disagree with the numbers, their comments will be reproduced here.)

The ICAO calculator is conceptually flawed in failing to provide comparisons and elementary adjustments. This makes it unusable for any purposes other than assigning collective blame, taxation, or indiscriminate penalties. It also makes it potentially grossly misleading, as shown by the above example.

Although ICAO's carbon estimates are extrapolated from Piano-derived fuel burns, you have to look to page 7 of their documentation (here) to learn this. In an action that strains credulity, ICAO has now signed a major commercial agreement with an IT supplier to jointly exploit the calculator (here). Together they claim to use "the best publicly available sources of information" and offer a "unified and common approach to deal with the complex issue of calculating individual carbon footprints". This requires a response and is one reason for this open letter.

ICAO is a diverse entity comprising layers of committees. Multiple sources within the ICAO CAEP process suggest to me that the creation of the carbon calculator was not viewed

favourably by various participants, but was promoted by the CAEP leadership. It seems to me that this venture impacted the credibility of the whole process and unfairly devalues many other positive contributions.

The diversity of interests represented within ICAO can induce a collective numerical paralysis and unease about direct comparisons. This leads to discussions of percentage improvements in ill-defined quantities relative to ambiguous baselines (15% being a sound-bite throughout the industry). For example ICCAIA, which represents manufacturers' interests, is unlikely to generate outputs that contrast competing products in meaningful terms, and might lean towards sanitised perspectives such as the one here. Compare this to a more transparent approach that provides a valid counterpoint here, addressing at least part of the story. Few will proffer details in public, but many professionals take promises of future advances through various forms of alternative configurations and leap technologies with a heavy pinch of salt.

This is far from dismissing the major contributions of the manufacturers: No one can doubt the commitment of airframers and engine makers to efficiency improvements. The direct connection between efficiency and profitability is a powerful driver, and it works wonders. However, the inherent commercial interest of manufacturers lies in promoting a product under all circumstances, and this can, and regularly does, lead to inefficient usage and distorted market policies. Broad examples include the large-scale replacement of turboprops by jets in ultra-short routes, domestic usage of long-range aircraft (e.g. B747-400D), and questionable strategic positioning of designs as exemplified by the B787-3 (now in limbo). Parallel issues are the non-retirement of older aircraft and the perpetuated use of 'grandfathered' versions.

These inefficiencies cannot be eliminated, but they can be reduced. Public transparency is as powerful a tool as coercion for reducing CO2 emissions. At a minimum, transparency is a prerequisite to fair regulation. Although Piano will not save the planet, it has a long established record in aircraft emissions assessment and can make some not insignificant difference. Lissys might encourage greater openness by releasing more of its Piano-X database models in the public domain. It calls on both manufacturers and operators to join it in this process.

The industry correctly protects its knowledge base, its technologies and capabilities that relate to *how* its products are conceived and built. However, the question of *what* aircraft do is one of vital public interest. Aviation CO2 emissions (i.e. fuel consumption) are a global concern. No scientifically sound path to their assessment can bypass the need for aerodynamic and fuel flow data. A call to release details like drag polars, engine decks, operating empty weights, performance deteriorations and in-service statistics (lapsing into aeronautical jargon) will meet resistance and horrify marketeers. But anything less is being economical with the truth. Any argument that a policy of 'open characteristics' would damage commercial competitiveness is misleading: You cannot build aircraft from this information; binding guarantees between the supplier and operator are distinct from nominal performance levels; and major purchasers regularly exercise their power to demand and receive full details. It is the public, not the professionals, that remains in the dark.

In fact, ICAO's publicly available engine exhaust emissions databank is a good example of genuine usefulness. Seeking to replicate and extend this openness in the ways outlined above seems to be a more worthy organisational goal than an implausible carbon calculator.

Irrespective of the above, Lissys plans to gradually open up more of its own independent Piano-X aircraft models. The pace of releases will be under continual review but it is hoped to eventually contribute a reasonable fraction of the total database. Piano-X prices will be frozen at the current level. Piano 5, Lissys' mainstay professional product, has a separate market focus and its position remains unchanged.

Lissys would like to invite those visionaries who understand the correctness of a more honest approach, as well as its long-term strategic advantages, to join it. There are ways to support and simultaneously benefit from this initiative. Industry leaders with genuine environmental concerns can make a difference.

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Notes / A340-600 model release

The Piano model of Virgin Atlantic's A340-642 (368t) can be downloaded from here. Simply extract the file, drag it into your 'pianox-planes' folder and restart Piano-X. The model is not in any way approved by either Virgin or Airbus. It is typical of reduced-MTOW versions. Relevant assumptions for the route are: Distance 4757 nm (LHR-SFO, GCD +2% route allowance), still air, nominal OEW 181.1 tonnes in standard Virgin 308 seat configuration, 95 kg/pax, zero cargo. M.82 cruise, RVSM flight levels, reserves 200 nm diversion, 30 min hold, 5% trip fuel. Resulting block CO2 with full pax is 246.8 tonnes. Block CO2 at 50% load is 232.0 tonnes. If you want to differentiate westbound / eastbound, you can use ESADs of roughly 4970 / 4570 nm (50% annual winds) and take the average. Note that ICAO lists an 'average number of seats per flight' for LHR-SFO as 481. Even if exclusively served by 747-400s, this would be untypical of the route.