DEVELOPMENT OF LONDON CITY AIRPORT TO ACCOMMODATE 9 MILLION PASSENGERS PER ANNUM

Planning Application Reference:	**22/03045/VAR**
Local Planning Authority Appeal Reference:	**23/00059/REF**
Planning Inspectorate Reference:	**APP/G5750/W/23/3326646**
Date of Inquiry:	**5 – 15 December 2023**

PROOF OF EVIDENCE OF DR CHRISTIAN NOLD

NOISE IMPACTS

CONTENTS

Introduction

Qualifications and Experience

1.1. I am Dr Christian Nold, a lecturer in Design at the School of Engineering & Innovation in the Faculty of Science, Technology, Engineering and Mathematics at the Open University.

1.2. I have more than a decade of experience in Citizen Science, having written my PhD on it and having coordinated and evaluated the 'Doing It Together Science' (Horizon 2020) project, which was an eleven-partner project working across multiple countries and languages. It engaged 4 million EU citizens via 715 public citizen science events. I also worked on the EU funded 'EveryAware' (7th Framework Programme) and 'EU.Citizen-Science' (Horizon 2020) research and coordination projects.

1.3. I completed my PhD in Civil, Environmental and Geomatic Engineering at UCL, in the Extreme Citizen Science Group ('ExCiteS'). This is an interdisciplinary group bringing together a diverse range of researchers to create methodologies, tools and guiding theories to help communities start their own Citizen Science projects.

1.4. Since 2005 I have created multiple large-scale public projects, such as the widely acclaimed 'Bio Mapping', 'Emotion Mapping' and 'Bijlmer Euro' projects, that have been staged with thousands of participants across sixteen countries.

1.5. I have written numerous books, journal papers and given keynotes and public lectures across the world. Some notable examples include the books: *Emotional Cartography: Technologies of the Self* (2009) and *The Internet of People for a Post-Oil World* (2011). Journal papers that have been widely cited include the 'Contours of citizen science: a vignette study' (2021) in the *Royal Society Open Science* journal, 'A question of dialogue? Reflections on how citizen science can enhance communication between science and society' (2021) in the *Journal of Science Communication*, and 'How Does Citizen Science Do Governance? Reflections from the DITOs Project' (2019) in the journal *Citizen Science: Theory and Practice*.

1.6. My PhD focused on noise monitoring apps that are designed for use by citizens and are very similar to the one used in the Citizen Science study presented here. I studied these devices from their initial concept, design implementation, calibration, real world usage with aircraft noise, governance impacts, as well as academic publications. I thus have extensive expertise with citizen noise monitoring.

Reason for Refusal

1.7. I am aware that this appeal concerns London City Airport's application that would allow additional flights between the hours of 06:30 and 06:59 on weekday and Saturday mornings and allow flights on Saturday afternoons and evenings until 18:30 (or 19:30 during British Summertime months). I am aware that the London Borough of Newham refused the application, with the first reason being:

> "The proposal, by reason of the additional morning and Saturday flights, and reduction of the existing Saturday curfew would result in a new material noise impact which would result in significant harm to the residential amenity of nearby residential properties. This would be contrary to policies D13 and T8 of The London Plan (2021) and policies SP2 and SP8 of the Newham Local Plan (2018)."

Scope of evidence

1.8. My evidence covers the air noise impacts associated with the proposed expansion of London City Airport and the airport's proposed noise mitigation via 'cleaner, quieter new generation aircraft'.

1.9. It draws on the academic study 'Citizen Science Study of Overflight Noise from New and Old Generation Aircraft at London City Airport' by Dr. C. Nold, Prof. M. Haklay, T. Walker J. Doherty, M. Morris and G. Boon. The study is currently a pre-print with the peer-reviewed journal *Community Science*.[1]

1.10. It draws on the London City Airport Benefits and Mitigation Statement (2022) [CD1.66], on Chapter 8 and Appendix 8.3 of the Environmental Statement concerning noise impacts [CD 1.15, CD 1.39], and on the Summer 2019 edition of 'Inside E16: London City Airport's Community Magazine' [CD 3.7.46].

1.11. I am aware there are planning policies relevant to aviation and to noise, but I do not have planning expertise and so do not set out or cover any planning policy.

[1] The official paper pre-print can be found here: https://doi.org/10.21954/mtkx-h460.

1.12. I am providing evidence on behalf of HACAN East. I am acting as an independent expert offering my (pro-bono) services based on my academic and practical experience. The evidence which I have prepared and provide for this appeal in this proof of evidence is true to the best of my knowledge and belief. I confirm that the opinions expressed are my true and professional opinions based on the facts I regard as relevant in connection with the appeal.

Evidence from Citizen Science Study of Overflight Noise

The value of citizen science

2.1. Citizen science involves participation of non-professional researchers within a scientific research project and contributing to scientific progress. This field has enjoyed a rapid growth since the 1990s and is now heavily funded at national, European and international levels.

2.2. It operates in different modes. Sometimes scientists will set a research question and citizens will contribute the data. In other circumstances, such as this study being presented here, the citizens direct the process, and approach professional scientists to analyse and validate the data and help articulate their findings.

2.3. The use of community-led forms of citizen science is common in the context of environmental justice issues, where the community is involved in collecting environmental data to have a voice in governance processes.

2.4. This contrasts with the early days of the modern policy response to environmental challenges in the 1970s, where it was assumed that only experts are supposed to create and use environmental information. At an international level, the importance of public access to environmental information has been recognised and codified in Principle 10 of the Rio Declaration 1992 and in the Aarhus Convention 1998.

2.5. Yet, environmental justice cases demonstrate the urgent need to go further and provide a space for environmental information that is generated by the public. Within these data, noise and air pollution monitoring are two of the largest topics in citizen science and include many examples of both bottom-up and top-down projects.

2.6. A common concern regarding citizen science revolves around questions of data quality. This concern becomes especially prominent when arguments are raised related to the participants' activism as potentially affecting the credibility of their observations. Substantial research has focused on analysing and quantifying the quality of data gathered through citizen science activities and consistently revealed that citizen science data generated by community members maintains high standards across the spectrum of activities (see, for example, Kosmala et al., 2016 [CD 3.7.42]).

2.7. Nonetheless, it is crucial for participants to adhere to a detailed and rigorous protocol, accompanied by proper documentation, to ensure the accuracy and impartiality of their observations.

2.8. Previous studies of citizen noise monitoring have shown that participants are highly focused on research rigour and aim to create high quality data (see, for example, Nold & Francis, 2016 [CD 3.7.43]).

2.9. Moreover, the primary objective of citizen science projects focused on environmental justice is typically to inform the relevant authorities and to prompt action based on these findings, rather than replacing official measurements. The goal for citizens is thus ultimately aligned with the governance process in trying to highlight and alleviate environmental harms.

Design and purpose of the study

2.10. The citizen science study presented in the paper 'Citizen Science Study of Overflight Noise from New and Old Generation Aircraft at London City Airport' [CD 3.7.20] adopts a rigorous study design, methodology and measurement protocol.

2.11. The study design is sophisticated for a citizen science study in the way it adopts a limited and specific objective: comparing the noise generated by new and old generation aircraft during overflight away from the runway.

2.12. The study is also rigorous in the way it highlights its limitations which should help decision makers and others evaluate its value in regard to the proposed London City Airport expansion.

2.13. The citizen research team selected the arrival flightpath at LCA when easterly winds prevailed as their focus for comparing new and old aircraft.

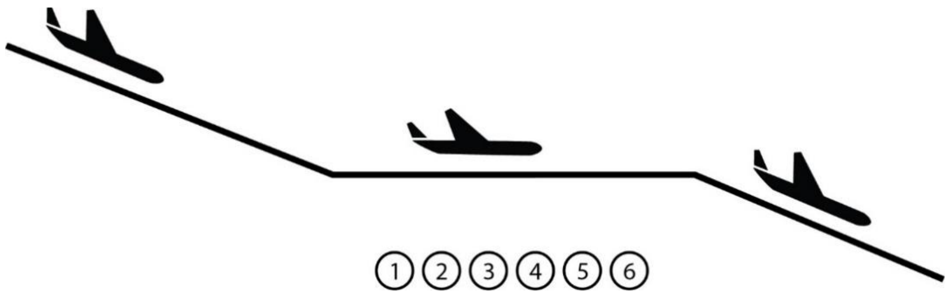
2.14. The citizen research team aimed to determine whether the new Airbus A220-100 and Embraer E190-E2 aircraft produce less noise than old generation aircraft in a real-world overflight scenario away from the runway at LCA.

2.15. In addition, the study focused on comparing the noise of two generations of the same plane, the older model Embraer E190 with the newer Embraer E190-E2.

2.16. Due to the study's dependence on smartphones for noise measurement, the study focused on gathering multiple measurements of the same flight to improve accuracy. Consequently, recording the overflights from multiple ground-level monitoring sites was decided upon to aid in the validation of individual measurements.

2.17. This study design was possible because LCA does not employ a Continuous Descent Approach (CDA) but instead follows a more conventional shelved flightpath where aircraft descend to a low and level altitude for several kilometres before finally descending to land. At LCA this is reinforced by an altitude restriction that prevents LCA planes from interfering with the flightpath of nearby Heathrow Airport, which operates at a higher altitude. Furthermore, the aircraft use Performance-Based Navigation (PBN) to minimise horizontal deviations from a central line to ensure a stable flightpath. The flatness and consistency of the flightpath during this shelved segment provide the conditions for measuring and comparing the noise generated by an individual aircraft from multiple ground-level locations.

Figure 1: Sideview of the shelved approach flightpath at LCA with the citizen science study monitoring sites (1-6) located underneath the flat segment.



2.18. The selection of the volunteers to collect the data was determined by multiple factors. As a prerequisite, these individuals had to live in the shelved section of the arrival flightpath where monitoring sites needed to be established. The volunteers were also required to dedicate their time to data collection, possess an iPhone, and be capable of installing and using the Explane application (or "app") for taking measurements in the study. Additionally, they needed access to an outdoor area free from noise disruptions, such as traffic, which could interfere with the noise measurements. During an initial briefing session, the team of citizen researchers received comprehensive instructions and support to ensure their familiarity with the function of the Explane app and the correct measurement procedures.

Methodology & Measurement Protocol of the study

2.19. Data collection took place through coordinated team monitoring sessions. These sessions were planned by utilising medium-range weather forecasts to identify periods when easterly wind conditions were expected. The researchers referred to the LCA website to ascertain the anticipated flight arrivals, their scheduled flyover times in the monitoring area, and the aircraft types for each flight. This information was shared with the citizen research team via a dedicated WhatsApp group.

2.20. As the aircraft approached, the researchers positioned themselves in the centre of the open area, holding their smartphone at head height with the screen facing upward.

2.21. The measurement process in the Explane app commenced just as the aircraft reached its zenith directly overhead, capturing the maximum noise level during the app's predefined 10-second measurement period.

Figure 2: Image of one of the citizen researchers using the Explane app running on an iPhone. Measurements were taken over 10 seconds with the screen pointing up and the phone held at head height.

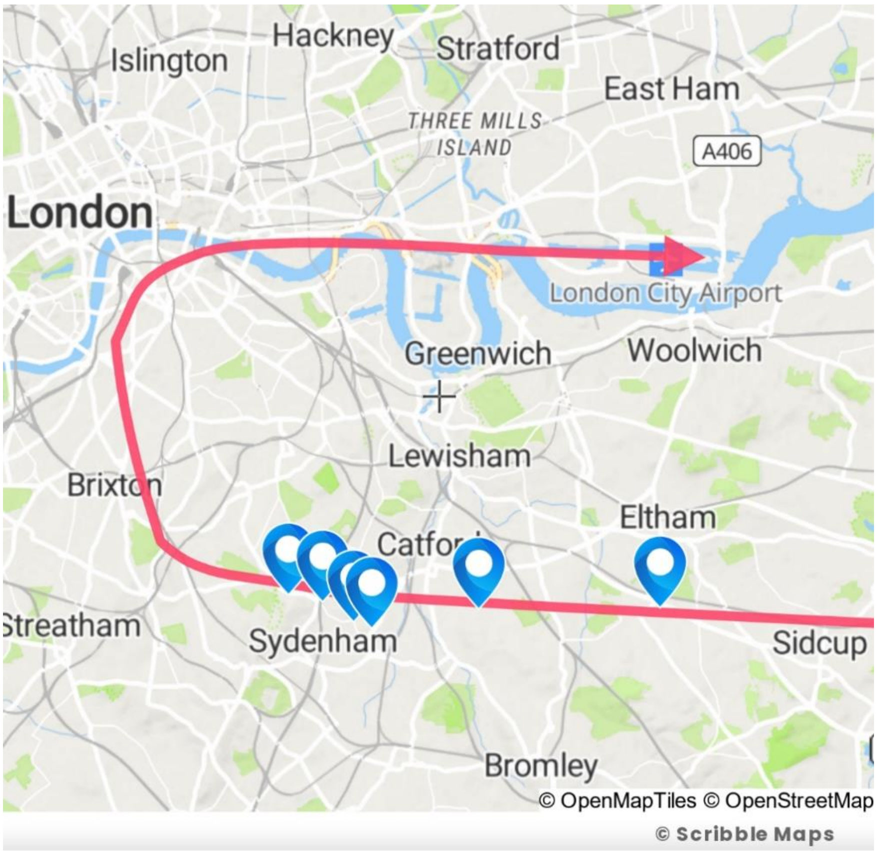
2.22. Subsequently, the app transmitted these dBmax measurements to the central Explane repository. Following the monitoring session, each researcher submitted screenshots displaying their own set of data to the team for verification and inclusion in the central study dataset. All the corroborated data was then tabulated in Excel.

Monitoring Sites in the study

2.23. The research team selected six monitoring sites along a 7.8km section of the easterly wind flightpath. Aircraft fly from east to west from Mottingham (SE9) 29km flying distance from landing to Catford (SE6) 26km, and then over the Horniman Museum and gardens (SE23), 22km flying distance from landing. Five of the sites were positioned directly underneath the flightpath and one offset by 1km.

2.24. These sites were fixed so that the altitude of overflights at each site was consistent with minor variation in the angle of overflight from the observer on the ground.

Figure 3: Map of the LCA easterly landing flightpath in red with the six monitoring sites (blue markers) located under the flightpath, 7.5 - 9km from the London City airport runway.



Monitoring Equipment used in the citizen science study

2.25. The measurements were collected using the freely available Explane noise measurement app, specifically developed for citizen aircraft monitoring in Holland.[2] Explane has been in use for five years, since 2018.

2.26. In operation, the Explane app identifies which plane is flying overhead using the Open Sky Network.[3] It then measures for 10 seconds to record the maximum decibel level during this timeframe.

2 *Explane.org: The app to register aviation noise*. https://cms.explane.org.

2.27. When a measurement is complete, the data is uploaded to the central repository where the data is available to view publicly and download.

2.28. The Explane website provides a page outlining the details of the data it collects.[4] It does not describe how the decibel level is calculated and whether any psychoacoustic weighting is being applied to the data. The webpage does not make any claims about the measurement accuracy and displays the sound level as dB using a single decimal point. This lack of specificity is common amongst participatory sensing apps. Since Explane is based on a maximum measurement, the study refers to the Explane data as dBmax.

2.29. For the Citizen Science study, only iPhones were used to create measurements. This is significant because the hardware microphones on these devices are more standardised and tend to be higher quality than on Android phones which use a wide variety of different hardware microphones.

2.30. To test the measurement accuracy of the Explane app used in the Citizen Science study, the organisation SchipholWatch setup a large-scale experiment where hundreds of aircraft measurements were collected with Explane and then compared against the official noise data collected by the Dutch Noise Pollution Foundation (NSG). The study identified that the app data had a maximum ± 2 dB margin of error from the official noise data.[5]

2.31. The app's limitation is that the data it generates cannot be directly compared against existing noise datasets that use standardised parameters such as psychoacoustic weighting. However, Explane is a powerful tool for environmental monitoring in identifying aircraft and creating a relative comparison between the old and new generation aircraft that were captured using the same app and phone hardware. There is less certainty about absolute decibel level measurements, but relative comparisons using the same hardware are likely to be reliable.

2.32. Despite this limitation, the app has been used in relation to other airports in Holland,[6] and data from a similar app (WideNoise) has been used by the Royal Borough of Windsor & Maidenhead in their submission to the Airports Commission (2013) [CD 3.7.39].

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3 *OpenSky-Network.org* (2023) https://opensky-network.org/.

4 *Aviation Noise Reports by Explane.org*. https://reports.explane.org.

5 SchipholWatch, *Average deviation Explane only 2 dB*. (15 August 2019) https://schipholwatch.nl/2019/08/15/gemiddelde-afwijking-explane-slechts-2-db/.

6 SchipholWatch, *City of Rotterdam embraces Explane app*, (22 November 2019) https://cms.explane.org/city-of-rotterdam-embraces-explane-app.

2.33. Studies of the similar NoiseTube app have demonstrated that smartphone apps can be used successfully for environmental monitoring, offering "concrete proof that participatory techniques, when implemented properly, can achieve the same accuracy as standard noise mapping techniques" (D'Hondt et al., 2013, [CD 3.7.38] p. 681).

2.34. According to the Explane website, approximately 550,000 aircraft noise measurements have been recorded in the Netherlands, contributing to a global total of 650,000 measurements. The website states that the app is being used by the Rotterdam city council and data has been requested by scientists, as well as the regional Public Health Services and other research institutions. Explane is included in the Dutch National Institute for Public Health and the Environment's 'Samen Geluid Meten' ('Measuring Sound Together') program, where Explane is being evaluated alongside other citizen noise monitoring devices.[7]

Atmospheric Conditions during data collection

2.35. The measurements for the study were conducted in July and August 2022, as well as September 2023, specifically during arrivals with easterly winds. These monitoring sessions during the summer months were chosen to coincide with extended periods of stable high-pressure systems, resulting in warm and dry conditions. No monitoring was conducted during high wind or rain conditions. Each monitoring session had a maximum duration of 1.5 hours to ensure the stability of atmospheric conditions and enable comparability across the measurements.

Aircraft Identification in the citizen science study

2.36. The Explane app only allows a noise measurement to be created if it can definitively identify the overflying aircraft. The aircraft location and identification details such as flight number and airplane type are taken from the Open Sky Network. If no identification can be made, then the app reports 'No airplane captured' and no decibel data is recorded.

2.37. To ensure the accuracy of this data, during the study, the Explane readings were cross-checked against the airport's online map-based tracking system TraVis.[8] This ensured that the date and time recorded for each passing aircraft was identified by flight number, which ensured the correct identification of each

[7] Rijksinstituut voor Volksgezondheid en Milieu, 'Samen Geluid Meten' (2019), https://samenmeten.nl/projecten/samen-geluid-meten.

[8] TraVis LCY. (2023). *TraVis LCY*. https://travislcy.topsonic.aero.

aircraft.

Data Collected

2.38. The dataset encompasses a total of 291 data points derived from 193 distinct flights. The primary data collection period spanned from July 21, 2022, to August 13, 2022, with a supplementary data collection session on September 27, 2023. The Embraer E190 emerged as the aircraft most frequently measured during this study which is also the most frequently flown aircraft from the airport.

2.39. The dataset for the citizen science study is available from Open Research Data Online [CD 3.7.34].[9] The dataset is an Excel file that includes the raw data as well as pivot tables used to generate the diagrams. No registration is required to access the data. The data is under a Creative Commons Attribution 4.0 International licence.

Figure 4: Summary findings for all models of aircraft surveyed.

Aircraft	No. Measurements	No. Flights	Average dBmax
Embraer E190	188	131	72.2
Airbus A220-100	44	23	73.7
Embraer E190-E2	27	14	70.5
De Havilland Canada DHC-8	15	11	73.1
ATR 72	7	6	73.8
ATR 42	6	5	72.2
Dassault Falcon 7X	2	1	65.5
Embraer Legacy 450/500	1	1	76.0
Dassault Falcon 900	1	1	62.0
Total	291	193	

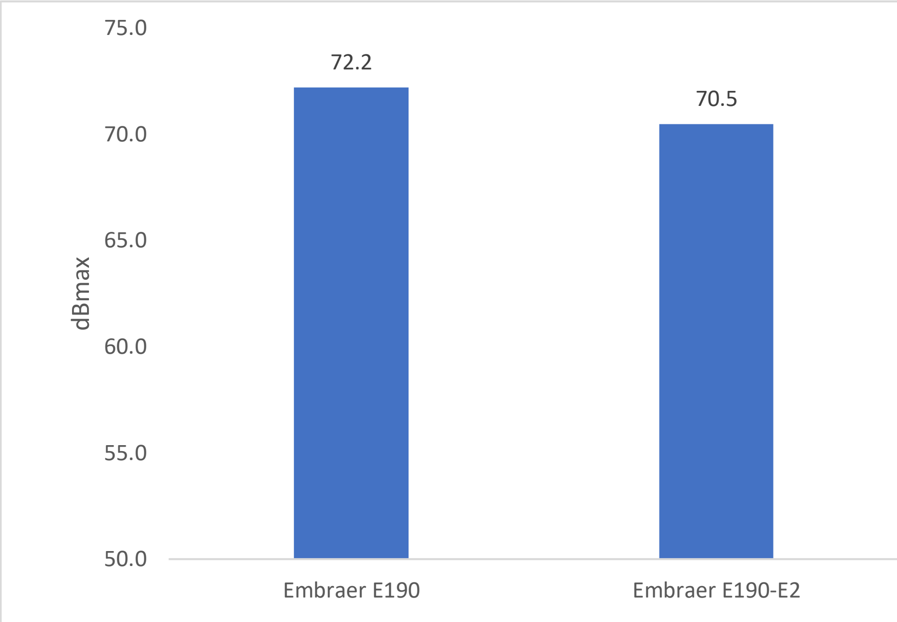
[9] Open Research Data Online: https://doi.org/10.21954/ou.rd.24453841

Findings

The new Embraer E190-E2 is almost as loud as the old Embraer E190 during overflight

2.40. When averaged across all locations, the old Embraer E190 measured 1.7 dBmax louder than the new Embraer E190-E2 during overflights.

Figure 5: Average decibel measurements for old generation Embraer E190 and new generation Embraer E190-E2.



2.41. This difference of 1.7 dBmax is small and might not actually be audible. According to the Civil Aviation Authority's webpage on 'Measuring and modelling noise: How aviation noise can be measured and modelled' "a change of 3dB has been defined as the minimum perceptible under normal conditions while a change of 10dB corresponds to roughly a doubling or halving of loudness" (para. 2).[10] This suggests that while 1.7 dB is a measurable difference with a sound level meter, this modest level of difference might not be noticeable to the human ear.

2.42. This 1.7 dB reduction in noise for the Embraer E190-E2 is notably smaller than the airport's claimed reduction of 3.2 dB for arrivals and 5.4 dB for departures in the LCA Benefits and Mitigation Statement [CD1.66, p. 18]. The figure of 1.7 dB

[10] Civil Aviation Authority, 'Measuring and modelling noise', https://www.caa.co.uk/consumers/environment/noise/measuring-and-modelling-noise/#:~:text='A%2Dweighted%20decibels'%20(,at%20low%20and%20high%20frequencies.

is also much lower than the claimed 14dB reduction in noise as stated in the airport's 'Inside E16' newsletter [CD 3.7.46, p. 6].

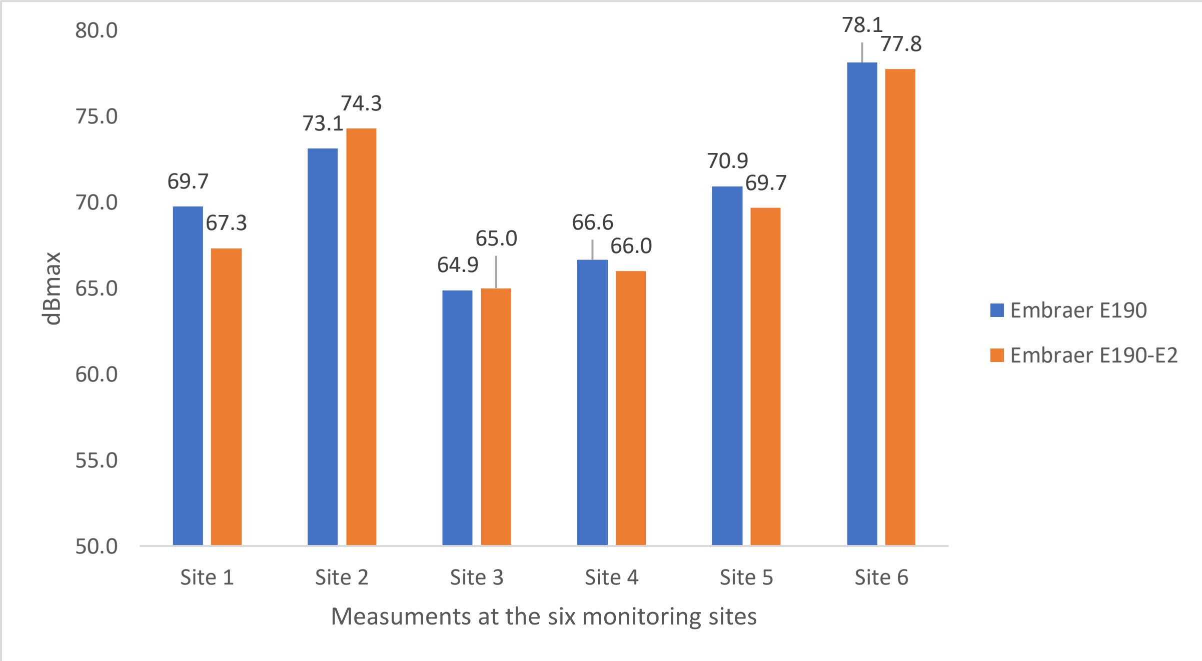
2.43. Thus, while the new Embraer E190-E2 may indeed be quieter than the older Embraer E190 during arrivals and departures at the runway, this reduction does not appear to extend to overflight noise, where the ground-level noise impact is similar for the new and old planes.

2.44. The importance of this finding lies in the fact that a significantly larger number of individuals are affected by overflights then those few living near to the runways and who are affected by take-off and landing noise. This raises doubts whether the new aircraft would create any meaningful reduction in aircraft noise for most of the communities overflown by LCA aircraft.

In some locations the new Embraer E190-E2 was louder than the older Embraer E190

2.45. An unexpected finding was at a third of the measurement sites, specifically Site 2 and Site 3, the new Embraer E190-E2 aircraft were louder than their older counterparts.

Figure 6: Sites where new generation Embraer E190-E2 were louder than old generation Embraer E190.

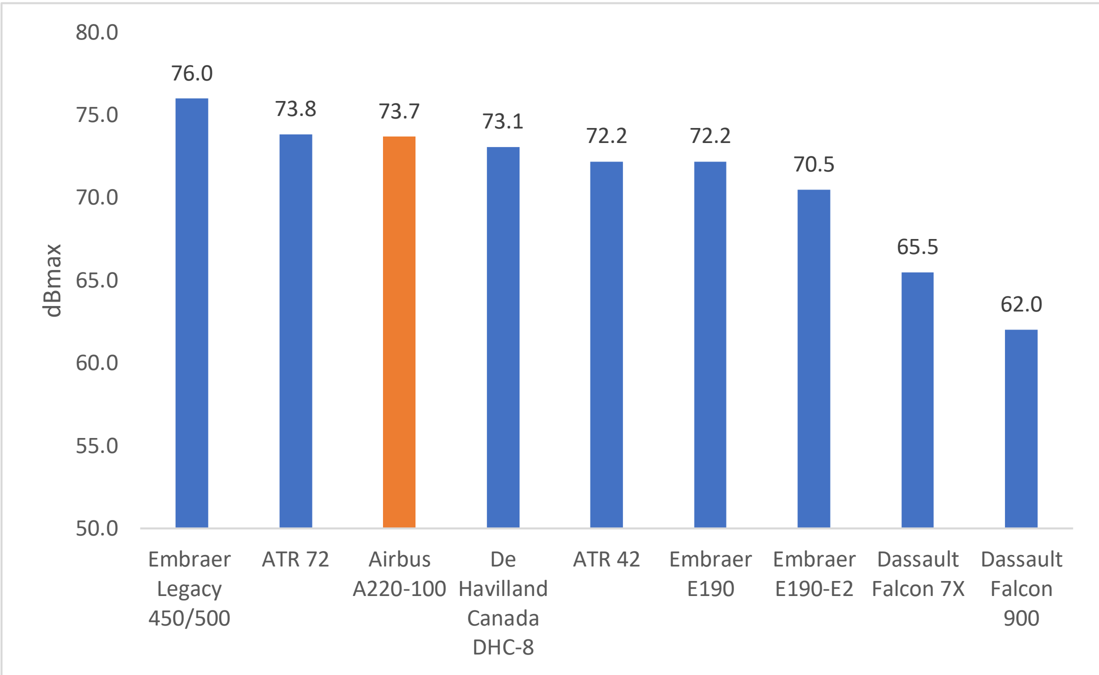


2.46. Although this variance might stem from factors like user error or ground-level site characteristics, it may be linked to the inherent variability in aircraft noise impacts at ground level. This observation underscores the minimal noise difference observed between the two Embraer models and the unpredictability of noise measurements in real-life scenarios. Consequently, this observation raises doubts about being able to describe the new Embraer E190-E2 as universally 'quieter' than the older Embraer E190.

The new A220-100 is one of the loudest aircraft overall

2.47. In the dataset the Airbus A220-100 is the third loudest aircraft overall: see Figure 7 below. The orange bar is the new generation Airbus A220-100, which is the third loudest aircraft overall.

Figure 7: Ranking of the noisiest aircraft during overflight.



2.48. The data suggests the new generation Airbus A220-100 is louder during overflights than the older Embraer 190. This challenges the data presented by the airport in the LCA Benefits and Mitigation Statement [CD1.66, p. 18], where the A220-100 is presented as a significantly quieter aircraft than the Embraer 190 during arrival and departure. This data raises questions whether the Airbus A220-100 can be described as a 'quiet' aircraft.

Measurements of the same aircraft vary considerably

2.49. When flights were recorded from multiple monitoring sites, there were often notable discrepancies in the decibel measurements of the same aircraft as it passed overhead.

2.50. For example, on August 13, 2022, an Airbus A220-100 with the callsign SWR478V, flying at 1653, was measured as 83 dBmax at Site 2 and 69 dBmax at Site 5. This represents a significant 14 dB difference between the highest and lowest measurements. This high level of variation could be attributed to numerous factors, including the possibility of user error or ground-level conditions. Yet, in the Excel spreadsheet, the researcher at site 2 made a note regarding the high 83 dB measurement, mentioning that the aircraft emitted whistling and whale-like sounds.

2.51. A review of the dataset reveals multiple instances of such notable measurement differences. This is in line with other empirical studies such as Simons and colleagues who identify that "variability in noise levels for flyovers of the same aircraft type can be as large as 12 dB, hampering noise assessment around airports" [CD 3.7.41, p. 1625]. The study proposes that variable atmosphere affects the acoustic propagation and variations in the aircraft emitted noise are the two main contributors to this variability.

2.52. There are many reports from residents and airport authorities from across the world which acknowledge that the new generation aircraft in particular the Airbus A220-100 generate intermittent loud whistling noises that are highly disturbing.[11] Such intermittent loud noises contribute to the overall noise levels as well as increasing the level of annoyance for residents in the area.

2.53. In summary, the level of observed variation suggests that there is a significant amount of unpredictability and uncertainty about the nature of the noise impact that an aircraft will generate at a specific ground level site on a given time and day.

Limitations

Can this study be relied on, given its unconventional methods and equipment?

2.54. This research adopts a citizen science approach and equipment that does not directly align with the data collected by the fixed noise monitors placed near the LCA runway. This study is based on a rigorous study design, methodology and

[11] Richard Weiss, 'The Airbus 'Whisperjet' Is Too Loud for Zurich Residents', (5 November 2018), https://www.bloomberg.com/news/articles/2018-11-05/self-styled-airbus-whisperjet-is-too-loud-for-zurich-residents; Bradley Wint, 'Zurich residents complain about whale-like sounds coming from passing Swiss A220 jets' (6 November 2018) https://www.gatechecked.com/zurich-residents-complain-whale-like-sounds-swiss-a220-689#:~:text=There%20have%20been%20a%20number,few%20seconds%20during%20its%20approach; SchipholWatch, 'Did that plane just make a whale sound?' (October 2023), https://www.schiphol.nl/en/schiphol-as-a-neighbour/blog/did-that-plane-just-make-a-whale-sound/#:~:text=When%20the%20aircraft%20engines%20turn,what%20you%20are%20used%20to.

protocol and uses a smartphone app that was specifically designed for monitoring aircraft noise.

2.55. As set out at paragraphs 2.30 – 2.32 above, despite the app's limitations, it has been used in relation to other airports in Holland and data from a similar app (WideNoise) has been used domestically by the Royal Borough of Windsor & Maidenhead in their submission to the Airports Commission [CD 3.7.39].

2.56. It is the rigorous study design, methodology, analysis, and internal consistency of the data that indicate that the study's findings are robust.

2.57. However, like all scientific research, this study should be validated and would benefit from a follow-up study with Class 1 sound level meters that can create data that is directly comparable with the existing noise datasets recorded using noise meters.

Does this study offer sufficient data to support conclusions about the noise of old and new aircraft?

2.58. It is important to clarify that this study does not aim to determine definitively whether the new planes are universally quieter or louder. Instead, its goal is confined to evaluating the noise impact during real-world overflights, specifically away from the runway at LCA.

2.59. In terms of scope and size, this study is on par with the indicative aircraft noise surveys commissioned by LCA, which encompass a similar number of flights.[12]

2.60. The amount of data presented in this study is sufficient to suggest that any difference in noise levels between new and old aircraft during overflight is not very large.

Why collect data at a considerable flight distance from the runway?

2.61. Validation studies like the one conducted by Filippone, Zhang, and Bojdo (2019) [CD 3.7.45] utilise measurement microphones positioned only a short flight distance of 8.5 kilometres from the runway.

[12] LCA surveys, can be accessed alongside its Noise Action Plan 2018-2023: https://www.londoncityairport.com/corporate/environment/noise-management-and-monitoring/noise-action-plan.

2.62. Yet, the rationale of the study presented here is that flight distance does not impact the measurements in this case due to the shelved approach flightpath at LCA which allows the monitoring sites to collect comparable measurements.

2.63. Despite the monitoring sites being situated beyond the LCA noise contour, they are still affected by overflight aircraft noise as evidenced by resident complaints from this area [CD 9.2, p. 20].

Issues with the Appellant's approach

The Appellant's projective noise model.

3.1. The data model used for the projected expansion of the airport is based on the assumption that the new generation aircraft are significantly quieter than the present aircraft flown at London City airport [CD 1.15, pp. 13 –14 and CD 1.39].

3.2. These contours include not just the immediate proximity of the runways but also large sections where residents are being overflown.

3.3. While there might be a reduction in noise with the new aircraft during take-off and landing, this citizen science study suggests that the new generation aircraft are not significantly quieter during overflight away from the runways.

3.4. This raises questions about the accuracy of the model in being able to predict the noise impact of a future expanded London City airport away from the proximity of the runway.

Absence of real-world data about new generation aircraft

3.5. The starting point for this citizen science study was the fact that local residents did not have access to any real-world data about the new generation aircraft.

3.6. The airport relies on data provided by the aircraft manufacturers rather than carrying out their own real-world measurements. The community studies commissioned by the airport which are located further from the runway have not addressed the question of creating a comparison between the new versus old generation aircraft.

3.7. This lack of targeting means that the community studies commissioned by the airport currently cannot confirm or disprove the findings of the citizen science study.

3.8. This suggests a clear need for an aircraft noise study using accurate and validated noise meters that directly addresses the comparison of new generation versus old generation aircraft noise.

3.9. London City Airport is aware of the preliminary findings of this study [CD 3.7.19] and during a Consultative Committee meeting, stated that they "did not agree with the findings of the report and will provide its own findings" [CD 3.7.32, p. 2].

3.10. It is a positive step for the airport to engage with the citizen science study even if they disagree with its findings. More importantly, their commitment to follow this up may be the path towards to a larger follow up study to validate these findings. However, to my knowledge, the Appellant has not yet taken any steps to conduct such a study.

Imperative to communicate uncertainty more clearly.

3.11. As the citizen science study identified, there are multiple kinds of uncertainty in terms of noise impacts, such as intermittent whale-like aircraft noise, atmospheric conditions, local ground conditions, and measurement variability.

3.12. This makes it hard to be certain about the exact level of noise impact that will be experienced at a specific site and on a specific date.

3.13. The citizen science study has indicated that there might be localised islands of variability, such as the important leisure area of Horniman gardens where the impact of noise is higher than expected due to the open land and elevated ground.

3.14. The airport stakeholders bear the obligation of conveying public information with greater precision and nuance, both in terms of what is established and what remains uncertain concerning noise.

3.15. There are pieces of public communication produced by the airport that appear to be misleading. The Summer 2019 edition of the airport's community magazine 'Inside E16', that is used to inform residents about changes at the airport, makes the claim that the Embraer E190-E2 "is 14dB quieter – the quietest single-aisle jet in the world" [CD 3.7.46, p. 6]. Yet, this figure does not seem to be supported by the airport's own data.

3.16. The study suggests that airport stakeholders should refrain from employing universalising expressions such as 'cleaner, quieter new generation aircraft', as these phrases can be misleading and fail to adequately convey the real-world impacts experienced by residents.

Summary and conclusion

The citizen science study undermines the claim that an increased use of new generation aircraft will mitigate noise during overflights.

4.1. The citizen science research study has identified that the noise level of new and old generation aircraft at LCA is very similar during overflight. Indeed, at a third of the monitoring sites the new aircraft were louder, while the new generation Airbus 220-100 was one of the loudest aircraft overall.

4.2. This raises doubts whether a shift towards the new aircraft would create any meaningful reduction in aircraft noise for the communities overflown at London City Airport.

4.3. It also raises questions about the airport expansion noise models employed in Chapter 8 and Appendix 8.3 of the Environmental Statement, which are premised on the assumption that the new generation aircraft are significantly quieter [CD 1.15, pp. 13 – 14 and CD 1.39].

The study findings suggest an urgent need for a larger follow up study.

4.4. There is an urgent need to validate these findings by setting up a larger follow up study using professional sound level meters beyond the vicinity of the runway.

4.5. It is a positive step that the airport has engaged with the preliminary findings of the citizen science study, and their commitment to follow up on this issue may be the path towards a study to validate these findings.

There is a high amount of uncertainty about noise impacts.

4.6. The study contends that airport stakeholders bear the obligation of conveying public information with greater precision and nuance, both in terms of what is established and what remains uncertain concerning noise.

4.7. While aircraft may exhibit known characteristics under controlled test conditions, real-world settings include intermittent whale-like noises, unpredictable weather conditions and pilot behaviour which introduce a significant level of uncertainty regarding the noise impact experienced at a specific location on a given day.

4.8. The study suggests that airport stakeholders should refrain from employing universalising expressions such as ‘cleaner, quieter new generation aircraft’, as these phrases can be misleading and fail to adequately convey the real-world impacts experienced by residents.

4.9. The level of uncertainty identified in this study suggests that a precautionary approach towards airport expansion should be adopted.

Citizen Science should play a significant role in future airport monitoring.

4.10. The study confirms that citizen science can play a significant role in airport monitoring, as was found in previous studies and adds to the increasing calls to formalise the role of citizen science within environmental decision-making.

4.11. The study shows that citizen science methods and tools can address significant policy-relevant research questions that lacked prior datasets, with strong involvement from the affected community.

4.12. Citizen science can act as a ‘canary in the mine’ early warning for topics that require urgent investigation by the relevant authorities to assess environmental impacts.

4.13. At the same time citizen science can complement traditional monitoring methods which lack the granularity of data and local insight that can only be provided by individuals living in the affected areas.

4.14. Citizen science can make airport operations and noise mitigation more transparent and help to build mutual trust between airport stakeholders and residents and support policy decision making.