LONDON CITY AIRPORT

AIRCRAFT NOISE CATEGORISATION SCHEME (ANCS)

2022 UPDATE

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APPENDICES

1.0 INTRODUCTION

1.1 Background and Planning Context to the ANCS

1.1.1 In July 2016, London City Airport (LCA) was granted planning permission to proceed with CADP1 (ref. 13/01228/FUL). Condition 18 of that permission, which is reproduced in Appendix 1, required that before the infrastructure delivered by CADP1 could be used, an Aircraft Noise Categorisation Scheme (ANCS) must be submitted to and approved in writing by London Borough of Newham (LBN). Following approval of that scheme, there was required to be a year of parallel operation of both the ANCS and the previous Noise Factored Movement (NFM) system which it replaced, the purpose of which was to ensure a smooth transition from one to the other.

1.1.2 The first version of the ANCS (ref. 17/03558/AOD) was approved on 4 December 2017 and took effect from 1 January 2018. This covered in detail the reasons for and logistics of the transition from the previous NFM system. They are not repeated in this document.

1.1.3 Following the year of parallel operation, the ANCS was reviewed in consultation with LBN to check that it was fit for purpose before replacing the NFM system. No changes to the ANCS were made at that review.

1.1.4 The ANCS has been in operation since that time and has just had a further review with the involvement of LBN as required by Condition 19 of the CADP planning permission. This resulted in some changes, which are included in this latest version of the ANCS. Also included are minor updates to some wording to reflect clarifications agreed with LBN since the scheme began operating.

1.1.5 A glossary of acoustical terms is included as Appendix 2.

2.0 AIRCRAFT NOISE CATEGORISATION SCHEME

2.1 General

2.1.1 The ANCS is based upon the following three principles now that CADP1 has been implemented. It will:

1) allow up to 111,000 actual movements and 120,000 NFMs each year;
2) restrict the noisiest aircraft types operating at the airport; and
3) set a noise quota which will control the amount of noise emitted on a weekly and annual basis.

2.1.2 These three principles provide the basis for further incentivising the use of quieter aircraft at LCA and the limits and caps set out below have been established to achieve this objective.

2.2 Quota Count Classification System

2.2.1 The ANCS uses a Quota Count (QC) classification system which, in the case of departure noise, is based on official noise certification data derived from measurements made on actual aircraft which have been conducted in accordance with the International Civil Aviation Organisation (ICAO) certification process.

2.2.2 A similar noise certification process exists for civil aircraft on approach, but this is based on operations at a glide slope of 3 degrees, not 5.5 degrees as used at LCA. To account for this difference, the AEDT[1] software has been used to compute, at the approach noise certification point[2], the difference in noise level between a 3 degree and a 5.5 degree glide slope using the AEDT in-built aircraft database. This difference is then applied to the noise certification data to estimate a certification value based on a glide slope of 5.5 degrees.

[1] The term AEDT throughout this document refers to the latest version of the Aviation Environmental Design Tool, produced by the Federal Aviation Administration.

[2] 2.0 km from runway threshold.

2.2.3 Whereas this method for approach noise levels provides a reasonable correlation with measurements of turbofan aircraft at LCA, it does not reflect well the noisiness of turboprop aircraft on steeper approaches. As a result, measured data at LCA has been used to validate the turboprop aircraft types within the AEDT model to achieve a reasonable correlation between prediction of approach noise at the noise certification point and measurement.

2.2.4 The ANCS uses manufacturers' noise certification data to categorise aircraft and allocate a specific 'QC score' to each aircraft type permitted to fly into and out of the airport. Each aircraft has a certificated 'sideline', 'flyover' and 'approach' noise level. These are described in **Box 1** below and illustrated in **Figure 1**.

2.2.5 The ANCS takes into account those communities to the east and west of the airport which will be affected by aircraft 'flyover' noise produced by aircraft on departure, and 'approach' noise produced by aircraft on landing (see **Box 1** below), as well as those to the north and south, typically affected by 'sideline' departure noise.

2.2.6 In accordance with the Aerodromes (Noise Restrictions) (Rules and Procedures) Regulations 2003, noise certification data will be derived from measurements made on actual aircraft which have been conducted in accordance with prescribed procedures under the International Civil Aviation Organisation (ICAO) Annex 16[3] . The use of noise certification data rather than monitored data to categorise aircraft will bring the operating restrictions at LCA up to date and in line with what is now expected under the Regulations.

2.2.7 This approach, which offers a more equitable means of rating an aircraft's overall noise levels, also mirrors the approach adopted by many other UK airports including Heathrow, Gatwick and Stansted to control noise at night. At LCA, where there are no night flights (between 22:30 and 06:30), the system is used to control noise during the daytime instead. This was the first time such an approach was adopted at a UK airport for daytime operations.

[3] With the exception of approach noise levels which are derived as explained in Section 2.3

BOX 1 - Aircraft Certification Data *

The terms sideline, flyover and approach relate to noise measurement positions which are used when a new aircraft type is tested in accordance with International noise standards. This allows a like for like comparison for various aircraft types.

The International Civil Aviation Organization (ICAO) defines these three terms as:

- **Sideline**

    a) For jet-powered aeroplanes: the point on a line parallel to, and 450m from, the runway centre line, where the noise level is a maximum during take-off.

    b) For propeller aircraft certificated prior to 19 March 2002:

        i) the point on the extended centre line of the runway 650 m vertically below the climb-out flight path at full take-off power; or

        ii) the point on a line parallel to, and 450m from, the runway centre line, where the noise level is a maximum during take-off

    c) For propeller aircraft certificated after 19 March 2002:

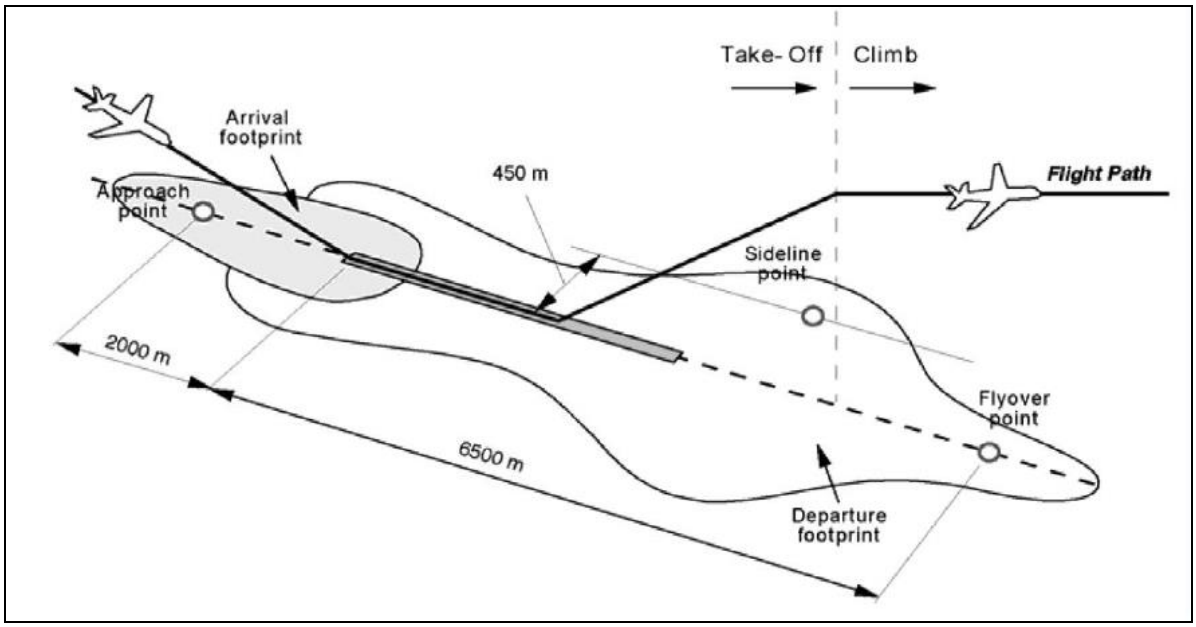
        i) the point on the extended centre line of the runway 650 m vertically below the climb-out flight path at full take-off power.

- **Flyover** – for jet and propeller powered aeroplanes, the point on the extended centre line of the runway and at a distance of 6.5km from the start of roll; and

- **Approach** – for jet and propeller powered aeroplanes, the point on the ground, on the extended centre line of the runway 2,000m from the threshold. On level ground this corresponds to a position 120 m (394ft) vertically below the 3 degree descent path originating from a point 300m beyond the threshold.

*****ICAO Chapter 16 noise measurement locations are taken in ideal measurement locations. These differ from the LCA Noise Monitoring Terminal positions which, due to the relatively quiet nature of aircraft operating at LCA, and the constraints of the built environment, are generally located closer to the airport than described above to ensure appropriate noise monitoring is in place at relevant distances and that aircraft noise measurements are not affected by extraneous ambient noise.

Figure 1: Aircraft Noise Certification Measurement Points



2.2.8 Figure 1 is reproduced from ERCD 0205[4]. The sideline point shown is for jet-powered aircraft. For propeller aircraft, depending on when the aircraft was certificated, the sideline position may be the point on the extended centre line of the runway 650 m vertically below the climb-out flight path at full take-off power. For reasons given in ERCD 0205, the use of a different measurement position for sideline noise from propeller aircraft is because of practical difficulties in measuring sideline noise at the 450 m sideline point required for jet-powered aircraft. ERCD found that the results obtained in the two locations are practically the same.

2.2.9 Each aircraft in operation at the airport is allocated a separate QC score for arrival and departure operations, based on its certificated noise levels (adjusted to reflect the approach glide slope used at LCA), and categorised into 1 dB bands (rather than 3 dB bands as is the case in most other QC schemes). The QC classification bands are set out in Table 1 below. As an example, the ANCS would allocate a QC score of 1 to an aircraft departure or arrival in a noise band range of 91.0 dB to 91.9 dB and a QC score

[4] ERCD Report 0205 Quota Count Validation Study: Noise Measurements and Analysis, Civil Aviation Authority

of 0.1 to a quieter aircraft departure or arrival in a noise band range of 81.0 dB to 81.9 dB.

2.2.10 For reference, two of the most common aircraft presently in use at the airport, the Embraer E190, and Dash 8-Q400 are considered here. The E190 is typically allocated a QC score of 0.4 for each departure, whereas the quieter Dash 8 is allocated a score of 0.1 or 0.125, depending on the specific aircraft operating.

Table 1 – Aircraft Noise Classifications

(NB. This classification system is a modification and extension of that operated by the designated airports in their Night Noise Quota Count System)

Noise Level Band[5], EPNdB	Quota Count (QC) Classification	Noise Level Band, EPNdB	Quota Count (QC) Classification
94 – 94.9	2	78 – 78.9	0.05
93 – 93.9	1.6	77 – 77.9	0.04
92 – 92.9	1.25	76 – 76.9	0.0315
91 – 91.9	1	75 – 75.9	0.025
90 – 90.9	0.8	74 – 74.9	0.002
89 – 89.9	0.63	78 – 78.9	0.05
88 – 88.9	0.5	77 – 77.9	0.04
87 – 87.9	0.4	76 – 76.9	0.0315
86 – 86.9	0.315	75 – 75.9	0.025
85 – 85.9	0.25	74 – 74.9	0.002
84 – 84.9	0.2	73 – 73.9	0.016
83 – 83.9	0.16	72 – 72.9	0.0125
82 – 82.9	0.125	71 – 71.9	0.01
81 – 81.9	0.1	70 – 70.9	0.008
80 – 80.9	0.08	69 – 69.9	0.0063
79 – 79.9	0.063	68 – 68.9	0.005

[5] The grey noise bands are presented for information purposes only as no aircraft would be permitted to commence operations at LCA within these noise bands as a result of a need to comply with the noise certification level limits within the scheme.

2.3 Derivation of Noise Certification Levels

2.3.1 Under regulations laid out by the European Commission[6], all aircraft of the types used at LCA are required to hold a certificate that sets out the noise certification levels for the aircraft and states the weight at which the aircraft was certificated (a higher weight typically corresponds with a higher noise level).

Departure

2.3.2 The sideline and flyover noise levels on the noise certificate are used to describe the noise of departing aircraft for all aircraft other than light propeller aircraft (see Section 2.3.10). Noise certification data for a given aircraft type can exist at a variety of different take-off weights. In addition, some aircraft of a given type are fitted with modified (quieter) engines and are certificated accordingly. As a result of this, the selection of noise certification levels for an individual aircraft shall be based on:-

i) the sideline and flyover departure noise values set out on the noise certificate for the individual aircraft; or

ii) the values set out in the EASA[7] database for the specific aircraft type[8] accounting for the permitted Maximum Take-Off Weight (MTOW) of that aircraft at LCA. If no entry in the database is available for the specific aircraft at this MTOW, the entry for the next highest MTOW will be used; or

iii) under exceptional circumstances, evidence presented to LBN which demonstrates to their satisfaction, confirmed in writing, that the aircraft is capable of operating at its permitted MTOW at LCA within the noise constraints applicable at the airport.

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[6] Commission Regulation (EU) 748/2012

[7] European Aviation Safety Agency (2016) *Aircraft type certificate data sheets*, [Online], Available: http://www.easa.europa.eu/certification/type-certificates/aircraft.php [6/09/2016].

[8] This relates to the noise certification levels given for the aircraft at a MTOW in the EASA database that equals the average of the maximum take-off weights specified for that aircraft type. If no entry is available, the noise certification levels for the next highest MTOW is to be used.

2.3.3 Appendix 3 sets out how to derive the Departure Noise Level from the sideline and flyover noise certification values to enable a QC classification to be derived from Table 1. A worked example is provided in Appendix 4.

Arrival

2.3.4 The approach noise levels on the noise certificate are used to describe the noise of arriving aircraft for all aircraft other than light propeller aircraft (see Section 2.3.10). This certificated noise level requires modification. This is because the certificated noise level appearing on the certificate is measured based on a glide slope of 3 degrees, whereas 5.5 degrees is used at LCA. This steeper approach is required to keep aircraft higher for longer for obstacle avoidance.

2.3.5 To account for this difference, the AEDT software is used to compute the approach noise level based on both a 3 degree and a 5.5 degree glide slope. The AEDT software contains an in-built database of aircraft types, flight, thrust and noise parameters. This database of information has been developed in consultation with aircraft manufacturers.

2.3.6 This computational method provides good correlation with measurements of turbofan aircraft at the different glide slopes; however it does not accurately reflect the noisiness of turboprop aircraft on steeper approaches. Data measured with noise monitors at LCA is therefore used to validate the turboprop aircraft types within AEDT.

2.3.7 The approach noise level for a given type of turbofan aircraft is derived by modelling the aircraft in AEDT using the matching or recommended built-in aircraft database entry at the approach noise certification point described in ICAO Annex 16[4]. This is done separately with a glide slope of 3 degrees and 5.5 degrees and the difference computed. This difference is then applied to the certificated (3 degree) approach noise level of the individual aircraft, obtained using the same criteria as for departing aircraft. The resulting value is equivalent to the noise certification level for that given turbofan aircraft type for a 5.5 degrees approach.

2.3.8 The approach noise level for a given type of turboprop aircraft is derived by firstly adjusting the noise profile of the most appropriate aircraft type within the AEDT to best match the approach noise level measured at LCA during a 5.5 degree approach. This aircraft type is then modelled with a glide slope of 5.5 degrees using the AEDT to

derive the noise value at the approach noise certification point described in ICAO Annex 16[4]. This resulting value is used as the approach noise certification level for that given turboprop aircraft type for the purposes of quota count classification.

2.3.9 Appendix 3 sets out how to derive the Arrival Noise Level from the approach noise level to enable a QC classification to be derived from Table 1. A worked example is provided in Appendix 4.

Light Propeller Aircraft

2.3.10 Light propeller aircraft are not subject to the same measurements as part of the certification process and therefore comparable certificated noise levels are not available. For these aircraft the following procedure is followed to estimate the certificated noise levels:

i) Determine the reference aircraft, being the lightest propeller aircraft for which suitable measurements operating at LCA are available and which is subject to the ICAO Chapter 4 certification tests.

ii) Compare the measured EPNdB noise levels taken by the LCA NMTs with those for the reference aircraft, separately for sideline (NMTs 1-4), flyover (NMTs 5-6) and approach (NMTs 5-6).

iii) Use these difference to estimate the sideline, flyover and approach noise levels for the light propeller aircraft by comparing with noise certificates for the reference aircraft.

2.3.11 These estimated noise levels are then used to confirm that the aircraft meets the maximum noise limits. Light propeller aircraft are then treated as turboprop aircraft for the purposes of determining the arrival noise level and departure noise level. A worked example is provided in Appendix 4.

2.4 Maximum Permissible Noise Levels of Aircraft

2.4.1 This section provides a procedure for controlling the noisiness of aircraft operating at the airport. The aim is to ensure that no noisier aircraft than currently operate at LCA will do so in the future.

2.4.2 The control over the maximum permissible noise levels of an aircraft operating at LCA is dictated to some extent by current UK Regulations[6] that prevent an airport from restricting operations by Chapter 4[9] aircraft. The first method of control is therefore as follows:

1) No aircraft is permitted to operate at LCA unless it complies with the noise requirements of Chapter 4.

2.4.3 In addition, to ensure consistency with the previous aircraft categorisation regime, LBN requested that upper noise limits were applied to the ANCS in order to control the noisiness of an aircraft and ensure no noisier aircraft can operate at LCA than those permitted to operate today. As a result, no aircraft will be permitted to operate at LCA unless the following conditions are met:

2) A noise certificate for the specific aircraft type shall be available which, subject to 2.3.2 for its maximum permitted weight of operation at LCA, demonstrates compliance with the following three noise certification levels[10], where the sum of all three levels does not exceed 271:

Flyover: 88.0 EPNdB

[9] Chapter 4 of Annex 16 to the Convention on International Civil Aviation, Environmental Protection, Volume 1, Aircraft Noise

[10] The positions of which are defined in Annex 16 to the Convention on International Civil Aviation, Environmental Protection, Volume 1, Aircraft Noise

Sideline: 93.5 EPNdB

Approach[11]: 98.0 EPNdB

3) Before any new aircraft type would be permitted to operate (i.e. carry passengers or operate on a commercial basis) at LCA, evidence of compliance with the above requirements shall be submitted to and approved in writing by the LBN.

2.4.4 In addition to these aircraft noise limits, Condition 33 of the CADP1 planning permission restricts the area of the summer 57 dB(A) $L_{Aeq,16hr}$ noise contour to a maximum of 9.1 km^2. This contour limit is designed to supplement the ANCS.

[11] This relates to the specific noise certification level on approach given in the aircraft's noise certificate (which relates to an approach at 3 degrees) rather than the Arrival Level used for the Quota Count assessment which relates to an approach at 5.5 degrees.

2.5 Quota Count Budget

Quota Count Period

2.5.1 The quota count period applies throughout the operational hours of the airport as specified in the airport's entry given in the UK AIP[12]. For the purposes of an annual assessment of the quota count, the calendar year applies.

Quota Count Budget

2.5.2 LCA are required to operate within an overall noise quota budget set out in the ANCS, which limits the number of annual flight movements. Each aircraft landing or taking-off counts towards the overall quota budget at the airport. The noisier the aircraft type, the higher its QC score and the more it counts towards the total budget, resulting in fewer permitted flights within the limit. The use of 1 dB bands means that a small reduction in noise levels may result in a lower QC score, thereby incentivising the use of quieter aircraft.

2.5.3 Performance against the quota budget is calculated by multiplying the number of departures and arrivals by the respective QC scores for an aircraft and adding together the totals for each aircraft using the airport.

2.5.4 The quota budget has been designed to be equivalent to the 120,000 NFMs which LCA had permission to operate up to under the 2009 planning permission. The quota budget is reviewed periodically in accordance with Condition 19 of the CADP1 planning permission. The quota budget is:

i) 22,000 per calendar year; and
ii) 742.5 in any one week

2.5.5 Each year's total quota count will be determined based on the schedule of actual aircraft movements for the year and established QC scores. The results will be compared against LCA's permitted noise quota budget as specified in i) and ii) above.

[12] The UK Aeronautical Information Package, NATS Aeronautical Information Service

2.5.6 The ANCS does not allow noisier aircraft or a higher number of aircraft to operate at the airport than were permitted under its 2009 planning permission or the CADP1 permission. This is achieved as described in Section 2.4, by setting upper noise limits for sideline, flyover and approach together with a cumulative noise limit, the net effect of which is to ensure specific aircraft will be no noisier than currently permitted. Moreover, the number of aircraft allowed to operate at the airport is limited to 111,000 actual movements per year under the CADP1 permission.

2.6 Aircraft Eligibility

2.6.1 All aircraft operating at LCA shall be included in the quota, other than those engaged in training, positioning, aircraft testing and/or evaluation.

3.0 NOISE MONITORING

3.1 Aircraft Noise Measurement

3.1.1 Throughout each year of operation of the quota count system, noise monitoring shall be undertaken at six locations (NMTs 1 to 6) shown in Appendix 5 to record at each noise monitor the Effective Perceived Noise Level (EPNL) during aircraft departures and landings.

3.1.2 The data shall be reviewed on an annual basis to establish for each aircraft type, separately for each airline, the following information:-

- the average annual SIDELINE[13] departure noise level (in EPNdB), from NMTs 1,2 3 and 4,
- the average annual FLYOVER departure noise level (in EPNdB), from NMTs 5 and 6,
- the average annual APPROACH noise level (in EPNdB), from NMTs 5 and 6.

3.2 Annual Review

3.2.1 The results of noise monitoring determined in accordance with Section 3.1 above will be reviewed each year to check on whether, year on year, there has been any change in the average results for each aircraft type and associated airline.

[13] At LCA all aircraft types, both jet and propeller, are measured at the same "sideline" noise monitoring locations. Further explanation of "sideline" in this context is given in Appendix 5.

4.0 INCENTIVES

4.1.1 The ANCS is further supplemented by the Incentives and Penalties Scheme (IPS) as part of the Noise Management and Mitigation Strategy (NOMMS) which further encourages airlines to operate their fleets more quietly. The IPS came into operation on 18 August 2017.

4.1.2 It works by rewarding improved performance and penalising poor performance in relation to noise. LCA will partner with the airline who has the most improved noise performance each year (based on a single aircraft type) to deliver an annual Community Projects Fund. The fund will provide at least £75,000 per year and is designed to support local community initiatives. Airlines will be penalised for poor noise performance with a minimum fine of £600 per decibel exceeded over a set threshold per flight. The Incentives and Penalties Scheme will supplement the noise restrictions imposed by the ANCS by managing aircraft noise on a day to day basis whilst simultaneously benefiting the local community.

4.1.3 As part of this scheme, a league table setting out the performance of each aircraft type, by airline, relative to its previous year's performance will also be published in the airport's Annual Performance Report.

5.0 REPORTING

5.1 Quarterly Report

5.1.1 A report on the ANCS shall be submitted to LBN on a quarterly basis which sets out the daily and weekly quotas attributable to the actual aircraft movements at the airport. The values will be compared with the permitted weekly and annual quota budgets (refer to Section 2.5) to identify if and when any limits are approached or exceeded.

5.1.2 A summary of this report shall be presented to the London City Airport Consultative Committee (LCACC) through the Airspace and Environment Sub-Committee (AESC).

5.2 Annual Noise Monitoring Report

5.2.1 The results of noise monitoring will be reviewed at the end of each calendar year and submitted to LBN by the 31st March each year for approval in writing. They are also presented to LCACC though the AESC. A check will be made on whether, year on year, there has been any change in the average results for each aircraft type and associated airline. This information from the noise monitoring system will be used to undertake assessments, as occurs at other airports operating similar quota count systems, to check whether the quota count classifications used for each aircraft type are appropriate. No changes in quota count classification would be permitted without written approval from LBN.

5.2.2 A report will also be produced as part of the Annual Performance Report that records the results of the assessments undertaken as part of the quota count regime, including but not limited to:-

- The quota counts used for each aircraft type during the calendar year in question;
- The total annual quota arising from aircraft operations during the calendar year;
- The results of noise monitoring undertaken during the calendar year, expressed for each aircraft and airline as averages in relation to sideline,

flyover and approach noise levels as determined in accordance with Section 3.1 above;

- The quota counts to be used for each aircraft for the forthcoming calendar year; and
- The expected total annual quota for the forthcoming year.

6.0 REVIEW PROCESS

6.1.1 The ANCS will be reviewed periodically in accordance with Condition 19 of the CADP1 planning permission to ensure that it continues to provide an equitable method of aircraft categorisation at LCA.

6.1.2 Condition 19 requires reviews to be undertaken as follows:

i) Not later than 12 months from the date of the introduction of the ANCS; and

ii) Not later than 4 years from the date of its introduction and every 5th year thereafter.

6.1.3 The reviews (including any revised form of ANCS and the timeframe for its implementation) shall be submitted to LBN within 3 months of such review dates for written approval and the revised ANCS shall be implemented as approved in accordance with the approved timeframe and maintained thereafter.

6.1.4 The first two reviews have now been completed, therefore subsequent reviews will take place every 5 years.

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APPENDIX 1

CONDITIONS 18 AND 19 OF THE CADP1 PLANNING PERMISSION

18. Aircraft Noise Categorisation Scheme

a) Prior to the first beneficial use of the Development an Aircraft Noise Categorisation Scheme shall be submitted to and approved in writing by the Local Planning Authority; and
b) such an Aircraft Noise Categorisation Scheme shall be implemented as approved and thereafter the Airport shall be operated in accordance with the approved Aircraft Noise Categorisation Scheme or any review thereof that has been approved in writing by the Local Planning Authority; and
c) subsequent to implementation of the approved Aircraft Noise Categorisation Scheme (except in the case of immediate emergency to aircraft and/or persons on board), no aircraft shall land at or take off from the Airport unless the type of aircraft has first been categorised in accordance with the approved Aircraft Noise Categorisation Scheme; and
d) the Aircraft Noise Categorisation Scheme shall be based on and include (but not be limited to):
   i. a Quota Count System in use for night noise at other UK designated airports;
   ii. the use of the Integrated Federal Aviation Authority Integrated Noise Model Version 7 or later version adjusted for the specific characteristics of London City Airport;
   iii. a Quota Count classification in 1dB steps;
   iv. a programme of parallel operation with the Noise Factored Scheme;
   v. an overall Quota Count budget for each calendar year;
   vi. a maximum permitted noise level or Quota Count classification; and
   vii. the noise exposure permissible as a result of Quota Count Budget for annual Aircraft Movements, which shall be:

- equivalent to 120,000 Noise Factored Movements per calendar year (as determined in accordance with the Noise Factored Scheme set out in Appendix 2);
- no worse than the airborne aircraft noise effects assessed in the UES; and
- in accordance with Condition 33 (noise contour area)

The approved Aircraft Noise Categorisation Scheme will supersede the Noise Factored Movement Scheme, immediately upon the written approval by the Local Planning Authority of the review of the Aircraft Noise Categorisation Scheme after 12 months of its introduction in accordance with Condition 19, and subsequently the total realised Quota Count at the Airport shall not exceed the approved Quota Count Budget in any calendar year.

Reason: In the interests of limiting the number of Aircraft Movements in order to protect the amenity of current and future occupants and neighbours and with regard to saved Policy EQ47 of the London Borough of Newham Unitary Development Plan (adopted June 2001 and saved from 27 September 2007 by direction from the Secretary of State and not deleted on adoption of the Core Strategy on 26 January 2012), Policy 7.15 of the London Plan (consolidated with alterations since 2011 and published March 2015), and Policies SP2 and SP3 of the Newham Core Strategy (adopted 26 January 2012).

19. Review and Reporting on the Approved Aircraft Noise Categorisation Scheme

Following implementation of the Aircraft Noise Categorisation Scheme approved pursuant to Condition 18:

a) a report shall be submitted to the Local Planning Authority annually on 1 June or the first working day thereafter as part of the Annual Performance Report on the performance and/or compliance with the approved Aircraft Noise Categorisation Scheme during the previous calendar year; and
b) the approved Aircraft Noise Categorisation Scheme shall be reviewed not later than the 1st and 4th year after its introduction and every 5th year thereafter. The reviews shall be submitted to the Local Planning Authority within 3 months of such review dates for written approval and implemented in accordance with an approved timeframe and maintained thereafter.

Reason: In the interests of limiting the number of Aircraft Movements in order to protect the amenity of current and future occupants and neighbours, and with regard to saved Policy EQ47 of the London Borough of Newham Unitary Development Plan (adopted June 2001 and saved from 27 September 2007 by direction from the Secretary of State and not deleted on adoption of the Core Strategy on 26 January 2012), Policy 7.15 of the London Plan (consolidated with alterations since 2011 and published March 2015), and Policies SP2 and SP3 of the Newham Core Strategy (adopted 26 January 2012).

APPENDIX 2

GLOSSARY OF ACOUSTICAL AND AVIATION TERMS

GLOSSARY OF ACOUSTICAL AND AVIATION TERMS

General

Sound

This is a physical vibration in the air, propagating away from a source, whether heard or not.

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2×10^{-5} Pascals) and the threshold of pain is around 120 dB.

The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Environmental Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

Statistical Term	Description
$L_{Aeq, T}$	The most widely applicable unit is the equivalent continuous A-weighted sound pressure level (LAeq, T). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.
L_{A90}	The level exceeded for 90% of the time is normally used to describe background noise.
$L_{Amax,T}$	The maximum A-weighted sound pressure level, normally associated with a time weighting, F (fast), or S (slow)
PNL	Perceived Noise Level (PNL), in units of PNdB, is an instantaneous measurement of noise corrected for the typical human response to aircraft noise, based on the equal loudness contours.
EPNL	Effective Perceived Noise Level (EPNL), in units of EPNdB, is a single number evaluator of the subjective effects of aircraft noise in human beings. it is derived from a series of instantaneous PNL values over the duration of an event and corrected for spectral irregularities, also known as tonal effects.

Ambient Noise

Usually expressed using $L_{Aeq,T}$ unit, commonly understood to include all sound sources present at any particular site, regardless of whether they are actually defined as noise.

Background Noise

This is the steady noise attributable to less prominent and mostly distant sound sources above which identifiable specific noise sources intrude.

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law. In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB.

Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.

Factors Affecting Sound Transmission in the Open Air

Reflection

When sound waves encounter a hard surface, such as concrete, brickwork, glass, timber or plasterboard, it is reflected from it. As a result, the sound pressure level measured immediately in front of a building façade is approximately 3 dB higher than it would be in the absence of the façade.

Screening and Diffraction

If a solid screen is introduced between a source and receiver, interrupting the sound path, a reduction in sound level is experienced. This reduction is limited, however, by diffraction of the sound energy at the edges of the screen. Screens can provide valuable noise attenuation, however. For example, a timber boarded fence built next to a motorway can reduce noise levels on the land beyond, typically by around 10 dB(A). The best results are obtained when a screen is situated close to the source or close to the receiver.

Meteorological Effects

Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradients are variable and difficult to predict.

Aviation Terms

Air Transport Movements

Air transport movements are landings or take-offs of aircraft engaged on the transport of passengers, cargo or mail on commercial terms. All scheduled movements, including those operated empty, loaded charter and air taxi movements are included.

NPR

Noise preferential route – departure flight ground tracks to be followed by aircraft to minimise noise disturbance on the surrounding population.

Dispersion

Due to the effect of the wind, aircraft speed, and pilot choice differing aircraft tracks about the nominal track are flown; this is known as dispersion around a nominal track.

Start of Roll

The position on a runway where aircraft commence their take-off runs.

Threshold

The beginning of that portion of the runway usable for landing.

Radar Vectoring

Aircraft are provided by Air Traffic Control with various instructions which result in changes of heading, altitude and speed. The controller affects safe separation from other traffic by use of radar.

Nominal Tracks

Using recognised international design techniques, tracks across the ground can be delineated for departing and arriving aircraft. These tracks are nominal because they can be influenced by the wind, ATC instructions, the accuracy of navigational systems and the flight characteristics of individual aircraft. In UK it is usual to permit a 1500m swathe to be established about the nominal track for the purposes of assessing whether an aircraft has stayed on track.

AAL

Height of aircraft above aerodrome level.

Altitude

Height of aircraft above sea level.

Night Period

The period from 23.00 to 07.00 hours.

Night Quota Period

The period from 23.30 to 06.00 hours.

Noise Classification (QC Value)

This means the noise level band in EPNdB, for take-off or landing, as the case may be, for the aircraft. The bands are identified as QC/0.5, QC/1, QC/2, QC/4. QC/8, QC/16, and are 3 dB wide.

Quota Count

This means the amount of the quota assigned to one take-off or to one landing by an aircraft, this number being related to its noise classification.

Noise Footprint

A noise contour which joins points on the ground which receive the same maximum noise level from the nearby airborne aircraft; often for night studies 90 dB(A) SEL is the level used.

APPENDIX 3

DERIVATION OF DEPARTURE AND ARRIVAL LEVEL FOR QUOTA COUNT ASSESSMENT

Derivation of Departure and Arrival Level for Quota Count Assessment

The basic principles of how to calculate the departure and arrival level as part of the Night Noise Quota Counts that are in place at Heathrow, Gatwick and Stansted Airports are described in a report prepared by the Civil Aviation Authority[14].

These principles are adopted in the LCA Quota Count Scheme with some slight modifications and are as follows:-

i) The noise classification of aircraft into 1 EPNdB wide QC categories or bands is based on certificated and calculated Effective Perceived Noise Level (EPNL, in units EPNdB).

ii) The Departure Noise Level is determined from the aircraft's noise certification values (EPNLs) for sideline and flyover based on the following equation:

Departure Noise Level = (Sideline EPNL + Flyover EPNL)/2

iii) The Arrival Noise Level is determined from the approach noise level derived as described in Section 2 above and the equation:

Arrival Noise Level = Approach Noise Level EPNL – 9

iv) For propeller aircraft with maximum take-off weight (MTOW) not exceeding 5700 kg (i.e. those not subject to such criteria) and older propeller aircraft also not subject to these criteria are classified according to assumptions based on available noise data.

v) The Departure Noise Level and (separately) the Arrival Noise Level are matched in Table 1 with the relevant noise band to determine the associated quota count (QC) classification for the specific aircraft type.

The terms "sideline" and "flyover" appear in this ANCS and also in LCA's Noise Management and Mitigation Scheme (NOMMS) but carry different meanings in each. Appendix 5 provides an explanation of these terms in the context of both the ANCS and the NOMMS.

[14] ERCD Report 0204 Review of the Quota Count (QC) System: Re-Analysis of the Differences Between Arrivals and Departures

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APPENDIX 4

WORKED EXAMPLES OF QUOTA COUNT CALCULATIONS

In this section three example calculations are presented.

Turbofan aircraft – Embraer E190

An Embraer E190 aircraft is to arrive and depart LCA. The airport has 11,000 quota counts remaining in the annual quota budget and 60,000 aircraft movements remaining from the annual limit.

The aircraft has the following certificated noise levels, taken from its noise certificate:

- Flyover: 81.9 EPNdB
- Sideline: 91.7 EPNdB
- Approach: 92.5 EPNdB
- Sum: 81.9 EPNdB + 91.7 EPNdB + 92.5 EPNdB = 266.1 EPNdB

The first check is whether the certificated noise levels are within the maximum permissible:

- Flyover: 88.0 EPNdB
- Sideline: 93.5 EPNdB
- Approach: 98.0 EPNdB
- Sum: 271 EPNdB

The aircraft does not exceed any of these limits.

The departure noise level is then calculated:

$$Departure\ Noise\ Level = \frac{Sideline\ Noise\ Level + Flyover\ Noise\ Level}{2}$$

- Departure noise level: (81.9 EPNdB + 91.7 EPNdB)/2 = 86.8 EPNdB

The arrival noise level is then calculated:

The aircraft is modelled using AEDT to determine the approach noise level using a 3 degree and a 5.5 degree approach. This gives an approach noise level of 93.3 EPNdB for the 3 degree approach and 87.9 EPNdB for the 5.5 degree approach, a difference of 5.4 EPNdB. This is applied to the certificated approach noise level of 92.5 EPNdB to give a resulting approach noise level of 87.1 EPNdB.

$$Arrival\ Noise\ Level = Approach\ Noise\ level - 9\ EPNdB$$

- Arrival noise level: 87.1 EPNdB – 9 EPNdB = 78.1 EPNdB

These values are then looked up in Table 1 for the corresponding quota counts.

- Arrival quota count: 78.1 EPNdB is in the 78.0 – 78.9 EPNdB noise band and has a quota count value of 0.05.
- Departure quota count: 86.8 EPNdB is in the 86.0 – 86.9 EPNdB noise band and has a quota count value of 0.315.

The arrival and departure of this aircraft therefore corresponds to a total quota count of 0.05 + 0.315 = 0.365 and 2 aircraft movements (1 arrival and 1 departure).

The remaining quota count budget is then reduced by 0.365 and the remaining number of movements allowed until the end of the year is reduced by 2.

Turboprop aircraft – ATR 42

An ATR 42 aircraft is to arrive and depart LCA. The aircraft has the following certificated noise levels, taken from its noise certificate:

- Flyover: 76.6 EPNdB
- Sideline: 80.6 EPNdB
- Approach: 92.4 EPNdB
- Sum: 76.6 EPNdB + 80.6 EPNdB + 92.4 EPNdB = 249.6 EPNdB

The first check is whether the certificated noise levels are within the maximum permissible:

- Flyover: 88.0 EPNdB
- Sideline: 93.5 EPNdB
- Approach: 98.0 EPNdB
- Sum: 271 EPNdB

The aircraft does not exceed any of these limits.

The departure noise level is then calculated:

$$Departure\ Noise\ Level = \frac{Sideline\ Noise\ Level + Flyover\ Noise\ Level}{2}$$

- Departure noise level: (76.6 EPNdB + 80.6 EPNdB)/2 = 78.6 EPNdB

The arrival noise level is then calculated:

The aircraft is modelled using AEDT to determine the approach noise level using a 5.5 degree approach after adjusting the noise profile of the most appropriate aircraft type within AEDT to match the approach noise level as measured at LCA during a 5.5 degree approach. This gives an approach noise level of 93.9 dB EPNdB.

$$Arrival\ Noise\ Level = Approach\ Noise\ level - 9\ EPNdB$$

- Arrival noise level: 93.9 EPNdB – 9 EPNdB = 84.9 EPNdB

These values are then looked up in Table 1 for the corresponding quota counts.

- Arrival quota count: 84.9 EPNdB is in the 84.0 – 84.9 EPNdB noise band and has a quota count value of 0.2.
- Departure quota count: 78.6 EPNdB is in the 78.0 – 78.9 EPNdB noise band and has a quota count value of 0.05.

The arrival and departure of this aircraft therefore corresponds to a total quota count of 0.2 + 0.05 = 0.25 and 2 aircraft movements (1 arrival and 1 departure).

The remaining quota count budget is then reduced by 0.25 and the remaining number of movements allowed until the end of the year is reduced by 2.

Light propeller aircraft – Piaggio P180

A Piaggio P180 aircraft is to arrive and depart LCA. This is a light propeller aircraft and so its noise certificate does not contain the flyover, sideline and approach noise levels and the light propeller procedure is followed.

1. Determine the reference aircraft, being the lightest propeller aircraft for which suitable measurements at LCA operating at LCA which is subject to the ICAO Chapter 4 certification tests.

The reference aircraft is currently the ATR 42.

2. Compare the measured EPNdB noise levels taken by the LCA NMTs with those for the reference aircraft, separately for sideline (NMTs 1-4), flyover (NMTs 5-6) and approach (NMTs 5-6).

This process is followed on the basis of measurements taken in the period January 2019 to November 2021 in Table 2 below.

LCY Measurement Point	ATR 42 Level, EPNdB	P180 Level, EPNdB	Difference, EPNdB
Flyover (NMTs 5-6)	81.9	86.6	+4.7
Sideline (NMTs 1-4)	89.8	92.5	+2.7
Approach (NMTs 5-6)	88.4	91.0	+2.6

Table 2: Measurement Comparison, ATR42 and P180

3. Use these difference to estimate the sideline, flyover and approach noise levels for the light propeller aircraft by comparing with noise certificates for the reference aircraft.

This is set out in and Table 3 below.

ICAO Chapter 4 Measurement Point	ATR 42 Certificated Level, EPNdB	P180 Estimated Level, EPNdB
Flyover (NMTs 5-6)	76.6	81.3
Sideline (NMTs 1-4)	80.6	83.3
Approach (NMTs 5-6)	92.4	95.0

Table 3: P180 Estimated Certificated Noise Levels

These estimated levels are then used for the procedure set out for other aircraft.

- Flyover: 81.3 EPNdB
- Sideline: 83.3 EPNdB
- Approach: 95.0 EPNdB
- Sum: 81.3 EPNdB + 83.3 EPNdB + 95.0 EPNdB = 259.6 EPNdB

The first check is whether the certificated noise levels are within the maximum permissible:

- Flyover: 88.0 EPNdB
- Sideline: 93.5 EPNdB
- Approach: 98.0 EPNdB

- Sum: 271 EPNdB

The aircraft does not exceed any of these limits.

The departure noise level is then calculated:

$$Departure\ Noise\ Level = \frac{Sideline\ Noise\ Level + Flyover\ Noise\ Level}{2}$$

- Departure noise level: (81.3 EPNdB + 83.3 EPNdB)/2 = 82.3 EPNdB

The arrival noise level is then calculated:

The aircraft is modelled using AEDT to determine the approach noise level using a 5.5 degree approach after adjusting the noise profile of the most appropriate aircraft type within AEDT to match the approach noise level as measured at LCA during a 5.5 degree approach. This gives an approach noise level of 95.0 dB EPNdB.

$$Arrival\ Noise\ Level = Approach\ Noise\ level - 9\ EPNdB$$

- Arrival noise level: 95.0 EPNdB – 9 EPNdB = 86.0 EPNdB

These values are then looked up in Table 1 for the corresponding quota counts.

- Arrival quota count: 86.0 EPNdB is in the 86.0 – 86.9 EPNdB noise band and has a quota count value of 0.315.
- Departure quota count: 82.3 EPNdB is in the 82.0 – 82.9 EPNdB noise band and has a quota count value of 0.125.

The arrival and departure of this aircraft therefore corresponds to a total quota count of 0.315 + 0.125 = 0.440 and 2 aircraft movements (1 arrival and 1 departure).

The remaining quota count budget is then reduced by 0.44 and the remaining number of movements allowed until the end of the year is reduced by 2.

APPENDIX 5

EXPLANATION OF "SIDELINE" AND "FLYOVER" POINTS IN THE NOMMS AND ANCS

The terms "sideline" and "flyover" are used in the NOMMS[15] and ANCS[16] to describe a point or location where aircraft noise is either measured or assessed. In the NOMMS, the terms are used to describe locations where London City Airport's (LCA's) fixed noise monitors are located. In the ANCS, the terms are used to describe noise certification points prescribed by the International Civil Aviation Organisation (ICAO). Although the terms "sideline" and "flyover" used in the NOMMS and ANCS are identical, they are not in the same position. To avoid confusion, this note provides a short description of the location of the sideline and flyover points for both the NOMMS and ANCS.

NOMMS uses a number of fixed noise monitors to determine noise levels from departing and arriving aircraft at the airport. For historic reasons the location of these monitors are categorised as either *sideline* or *flyover* locations depending on where they are with respect to the flight path of departing or arriving aircraft. The results are used primarily for noise management purposes through a Penalties and Incentives Scheme.

The ANCS categorises and assesses aircraft by using noise certification data determined in accordance with procedures set out by ICAO. Each aircraft operating in the UK has a noise certificate describing its noise emissions under carefully controlled conditions, at three noise certification points. These certification levels are indicators of aircraft noise performance and are determined at three points in accordance with prescribed international procedures. These procedures also use the terms *sideline* and *flyover* for two of these three points (the third is the *approach* point).

NOMMS - noise monitor locations

A continuous noise monitoring system was first installed and became operational at the Airport in 1992. A system of this type has been in place ever since that time and was upgraded in 1999 when a flight track monitoring system was also installed. The noise and flight track monitoring system was further updated in 2013. Historically, this noise and flight track monitoring system (NFTM) comprised four fixed noise monitors. These four monitors known as NMTs 1 to 4 are all located close to the Airport.

Under the NOMMS, two new fixed noise monitors (NMTs 5 and 6) and a mobile noise monitor are incorporated within the NFTM.

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[15] NOMMS – Noise Management and Mitigation Strategy

[16] ANCS – Aircraft Noise Categorisation Scheme

The six fixed noise monitors shown in Figure 2 are used to measure noise levels during an aircraft departure. These measured noise levels are used to determine the Sideline Noise Level and Flyover Noise Level for comparison with limits set in relation to the airport's Penalties and Incentives scheme which forms part of the NOMMS. The Sideline Noise Level and the Flyover Noise Level are compared against the fixed penalty limit and credit thresholds to determine whether a credit or penalty should be applied to the operator of the aircraft.

As NMTs 1 and 2, and 3 and 4 lie on either side of the flight path of a departing or an arriving aircraft these are designated as "sideline" locations. For aircraft departures on Runway 27, the Sideline Noise Level is determined from the arithmetic average of the maximum noise level ($L_{Amax,S}$) measured at NMT 1 and 2.

For aircraft departures on Runway 09, the Sideline Noise Level is determined from the arithmetic average of the maximum noise level ($L_{Amax,S}$) measured at NMT 3 and 4.

As NMTs 5 and 6 lie approximately underneath the flight path of a departing aircraft these are designated as "flyover" locations. For aircraft departures on Runway 27, the Flyover Noise Level is determined from the maximum noise level ($L_{Amax,S}$) measured at NMT 5. For aircraft departures on Runway 09, the Flyover Noise Level is determined from the arithmetic average of the maximum noise level ($L_{Amax,S}$) measured at NMT 6.

The locations of NMTs 1 to 6 are shown in Figure 2.

Figure 2: NOMMS - Location of Noise Monitoring Terminals

ANCS - noise certification level positions

The ANCS uses a Quota Count (QC) system as a means of limiting the noise generated by aircraft movements in a transparent and easily administered manner. It operates in a similar manner to the Night Noise Quota Count scheme used at the designated airports such as Heathrow, Gatwick and Stansted, and used at other UK airports such as Manchester. The QC system at LCA however would apply during the daytime, not the night-time. LCA seek to be the first airport to operate a daytime QC system in the UK. As is the case for the Night Noise Quota Count scheme, the QC system is based on aircraft noise certification data where each aircraft type is allotted a QC value based on the noise generated by the aircraft type on departure and arrival under prescribed certification conditions[17].

[17]. Based on the certificated operating weight or maximum permitted operating weight at LCA or on evidence presented to LBN which demonstrates to their satisfaction, confirmed in writing, that the aircraft is capable of operating at its permitted MTOW at LCA within the noise constraints applicable at the airport.

Certification levels, determined in accordance with prescribed procedures under ICAO Annex 16[18] and given in terms of the Effective Perceived Noise Level (EPNL), are used within the ANCS for a variety of reasons, including:

- to comply with UK Regulations[19]
- they are reliable and independently verified indicators of aircraft noise performance;
- they are freely available for practically every relevant aircraft type[20].

Certificated noise levels for departing and arriving aircraft are determined under carefully controlled conditions at three positions:

- For jet-powered aeroplanes, 450 metres sideline at noisiest point during an aircraft departure. For propeller aircraft, depending on when the aircraft was certificated, the point on the extended centre line of the runway 650 metres vertically below the climb-out flight path at full take-off power (referred to as Sideline or Lateral point);
- 6500 metres from start of roll, directly beneath the departing aircraft (referred to as Flyover point);
- 2000 metres from runway threshold, directly beneath the arriving aircraft (referred to as Approach point).

Figure 3, reproduced from ERCD 0205[21], illustrates these three noise certification points below.

[18] Annex 16 to the Convention on International Civil Aviation, Environmental Protection, Volume 1, Aircraft Noise

[19] Aerodrome (Noise Restrictions) (Rules and Procedures) Regulations 2003

[20] European Aviation Safety Agency (2016) *Aircraft type certificate data sheets*, [Online], Available: http://www.easa.europa.eu/certification/type-certificates/aircraft.php [6/09/2016].

[21] ERCD Report 0205 Quota Count Validation Study: Noise Measurements and Analysis, Civil Aviation Authority

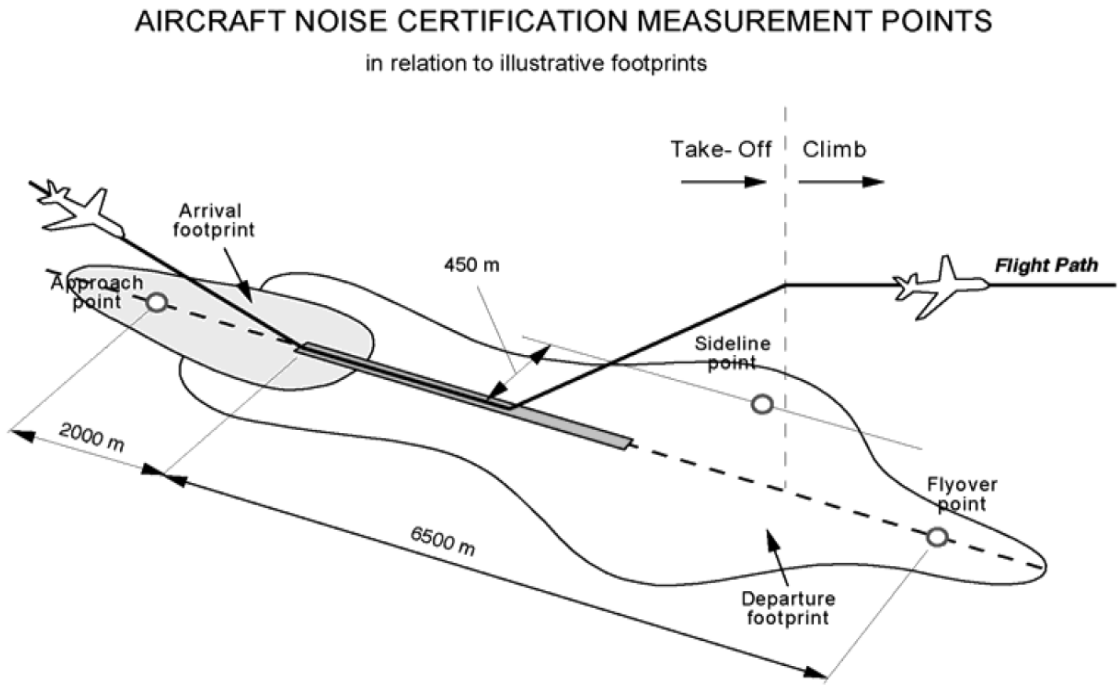

Figure 3: Aircraft noise certification measurement points

Figure 3 is reproduced from ERCD 0205[4]. The sideline point shown is for jet-powered aircraft. For propeller aircraft, depending on when the aircraft was certificated, the sideline position may be the point on the extended centre line of the runway 650 m vertically below the climb-out flight path at full take-off power. For reasons given in ERCD 0205, the use of a different measurement position for sideline noise from propeller aircraft is because of practical difficulties in measuring sideline noise at the 450 m sideline point required for jet-powered aircraft. ERCD found that the results obtained in the two locations are practically the same.