An tÚdarás Inniúil um Thorann Aerárthaí

Aircraft Noise Competent Authority

Draft Regulatory Decision Report
Appendix C

May 2026

Report

Draft Regulatory Report

Review of Aircraft Noise Modelling for Dublin Airport

For Aircraft Noise Competent Authority

30 April 2026

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1 Introduction

1.1 Background

The Airport Noise Competent Authority (ANCA) has asked Noise Consultants Limited (NCL) to review the approach to, and standard of aircraft noise modelling carried out by consultants Bickerdike Allen Partners (BAP) on behalf of Dublin Airport's Authority (daa).

This review has been carried out having regard for ANCA's functions under the Aircraft Noise (Dublin Airport) Regulation Act 2019 ('the 2019 Act').

This review has considered noise modelling reports provided by daa since December 2023, including modelling provided as part of the Airport's Infrastructure Application (IA) planning application (Application Reference: F23A/0781).

Consideration has also been given to information provided in response to other requests for information made by ANCA since December 2023. This includes information provided in response to requests made under Section 9 of the 2019 Act, particularly where such request have provided further insight and further understanding of the adopted noise modelling methodologies.

The objective of this review is to determine the quality of the aircraft noise modelling having regard for its end use under ANCA's functions in the context of guidance.

1.2 ANCA's Functions and Associated Noise Modelling Guidance

Under ANCA's functions, aircraft noise modelling is relied on for a variety of uses. In general, ANCA utilises outputs from aircraft noise models to monitor trends in aircraft noise exposure at Dublin Airport. Under Section 21(2) of the 2019 Act, ANCA publishes the noise situation annually and provide commentary regarding the effectiveness of aircraft noise mitigation measures. The outputs of aircraft noise modelling are also used by ANCA for decision making purposes when considering noise mitigation measures and/or noise-related operating restrictions through processes described under various sections of the 2019 Act. As such, the quality and reliability of the aircraft noise modelling available to ANCA is in the interests of all stakeholders.

ANCA has previously provided daa with guidance in relation to the reporting of aircraft noise information to support and standardise how this information is provided to ANCA when discharging its functions. Further to this, ANCA has provided a 'Reporting Template' which provides the basis for aircraft noise modelling to be reported to ANCA in a standardised form.

An extract from the ANCA guidance as it relates to methodological aspects is reproduced in **Box 1** below.

Box 1: ANCA guidance on reporting noise modelling methodology

All information should be accompanied by a modelling report describing the approach and supporting evidence for modelling works, including;

- Confirmation of the noise assessment method I.e. ECAC Doc 29 4th Edition including the modelling software utilised;
- Confirmation of input datasets including:

  - Schedules / Flight Records including copies of relevant flight operations report
  - Meteorological conditions
  - Inputs to flight track assumptions including dispersions
  - Inputs to flight profile and aircraft type assumptions
  - Model Splits
- Validation Methodologies and Adjustments
  - Reporting of any validation activities including the preparation and evidencing of Customised procedures profiles; and/or
  - NPD adjustments based on noise monitoring data.
- Calculation Settings, including:
  - Grid resolutions / dynamic grid settings
  - Receptor definitions
  - Application of meteorology
  - Use of band angle
  - Ground attenuation

2 Calculation of Aircraft Noise

2.1 ECAC Doc 29 4th Edition and Legal Context

Within the context of EU Regulation 598/2014[1] (the Aircraft Noise Regulation) and EC Directive 2002/49/EC[2](END), it is necessary to undertake the calculation of aircraft noise using the methodology set out within Annex II of the END, as amended by Directive (EU) 2015/996[3] and Delegated Directive (EU) 2021/1226[4] (CNOSSOS-EU), which is the legal implementation of the calculation methodology set out in ECAC Doc 29 4th Edition 2016[5].

In Ireland, Directive 2002/49/EC is transposed into national law through the European Communities (Environmental Noise) Regulations 2018 (S.I. No. 549 of 2018), as amended by European Communities (Environmental Noise) (Amendment) Regulations 2021 (S.I. No. 663 of 2021)('the Environmental Noise Regulations' or 'the ENR').

ECAC Doc 29 4th edition is the latest version of the calculation methodology endorsed by the European Civil Aviation Conference (ECAC) and the International Civil Aviation Authority (ICAO).

The methodology is made up of several parts:

- Volume 1: Application Guide;
- Volume 2: Technical Guide; and
- Volume 3: Reference Cases and Verification Framework.

Figure 2-1 presents the various inputs and references in the modelling process as described in ECAC documents. The 'scenarios' presented in Error! Reference source not found. describe the input data required in the modelling process. This data is specific to an airport and its operation. Data such as the number of aircraft movements, their type and the specific use of arrival and departure routes along with the location and configuration of the airport and its runways form these inputs. The database element of the modelling process relates to the 'acoustic' and 'performance' of modelled aircraft types.

The 'acoustic' element of the database relates to information describing the level of noise produced by individual aircraft. Also known as 'noise data', this information is provided to aircraft noise modellers in the ICAO sponsored Aircraft Noise and Performance (ANP) database[2]. The 'noise data' is often referred to as 'Noise-Power-Distance' (NPD) information. This data provides a look-up for the level of noise that can be expected at a given power setting and distance from the aircraft. NPD data can differ depending on the noise metric that is to be computed. The ANP data is based on aircraft noise measured under standardised and controlled conditions based on flight profiles that do not necessarily represent actual airport operations.

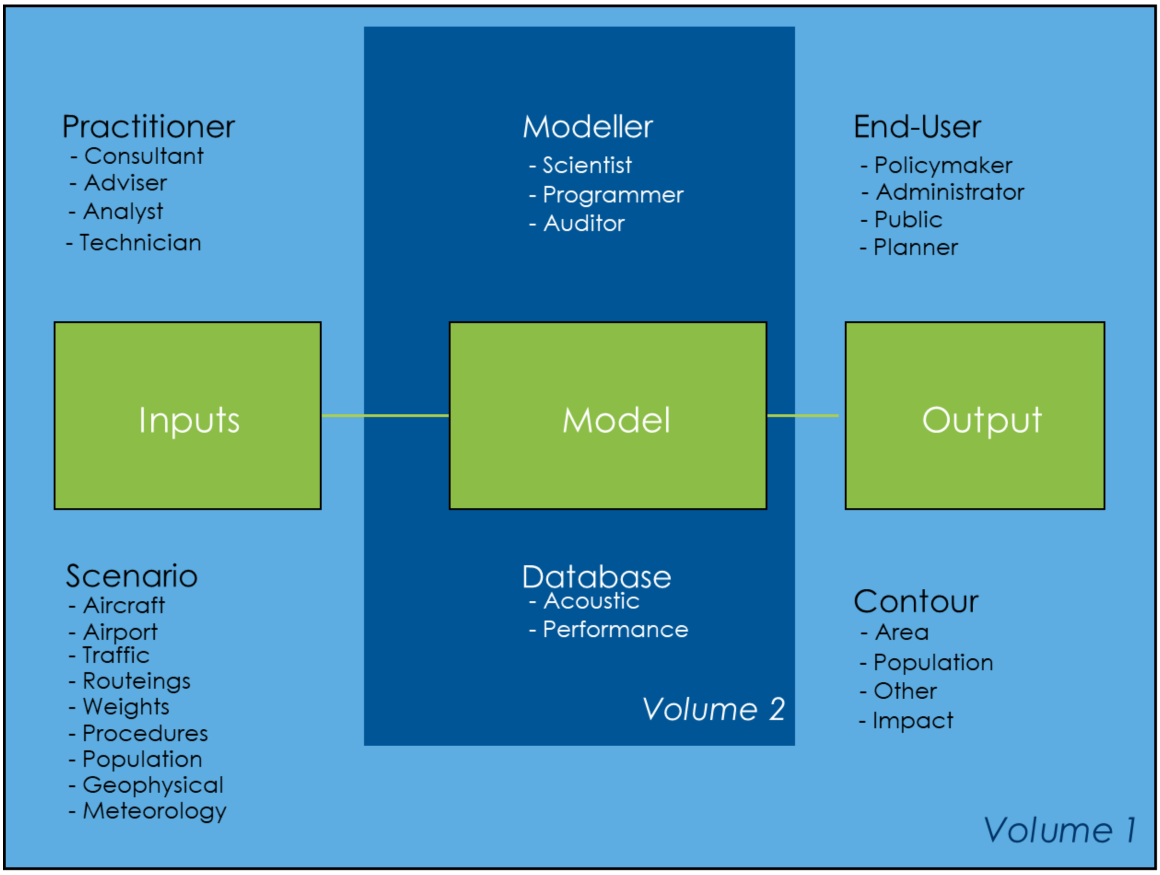
The 'performance' element of the ANP database is often refer to as 'Flight Profiles'. 'Flight Profiles' represent the vertical position and performance of an aircraft above runway level on

[1] REGULATION (EU) No 598/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC
[2] DIRECTIVE 2002/49/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL relating to the assessment and management of environmental noise
[3] COMMISSION DIRECTIVE (EU) 2015/996 establishing common noise assessment methods according to Directive 2002/49/EC of the European Parliament and of the Council
[4] COMMISSION DELEGATED DIRECTIVE (EU) 2021/1226 of 21 December 2020 amending, for the purposes of adapting to scientific and technical progress, Annex II to Directive 2002/49/EC of the European Parliament and of the Council as regards common noise assessment methods
[5] ECAC.CEAC Doc 29 4th EDITION Report on Standard Method of Computing Noise Contours around Civil Airports

departure or arrival. Flight profiles also consider the aircraft configuration i.e. engine power settings, ground speeds, climb rates, etc.

A set of 'standard' flight profiles are available to aircraft noise modellers in the ANP database[6]. The standardised flight profiles do not necessary reflect how aircraft are operated at major airports. As such, the use of standardised information can lead to a noise model not being representative of the departure and approach procedures in place at an airport.

Figure 2-1: Three parts of the ECAC Doc 29 aircraft noise impact assessment methodology (Reproduced from Figure 1-1 of ECAC Doc 29 4th Edition, Volume 1)



Due to the specific nature of the information required to support aircraft noise modelling and the calculation of noise contours, the modelling is normally undertaken in close collaboration between airports, air navigation service providers and airspace designers to facilitate access to the necessary input data. When modelling aircraft noise forecasts, airfield specialists and aircraft traffic forecasting experts are usually engaged to provide information that describes how operations may change due to interventions or developments.

The specific information required for aircraft noise modelling representative of the procedures operated has led to airports being the primary developers of aircraft noise contours. In the case of Dublin Airport, this has led to the statutory designation of the airport authority (daa) as the noise mapping body for the preparation of strategic noise maps under the ENR.

Due to the complexities involved in modelling and calculating aircraft noise, the methodology set out in ECAC Doc 29 4th Edition is implemented in a software environment. There are various software tools

[6] Available at: https://www.easa.europa.eu/en/domains/environment/policy-support-and-research/aircraft-noise-and-performance-anp-data (Accessed: 6 March 2026)

that implement the ECAC Doc 29 methodology. The US Federal Aviation Authority (FAA) Aviation Environmental Design Tool (AEDT) software is internationally recognised and implements ECAC Doc 29 along with several adaptions. The AEDT software is accompanied by a Technical Manual which describes how the ECAC document has been implemented along with details of the adaptions.

2.2 Aircraft Noise Modelling Guidance

ECAC Doc 29, Volume 1 recognises that input data (or scenario data) can be gathered from a range of different data sources. Different data sources may have different levels of accuracy or precision, and where data is unavailable, the modelling may need to adopt assumptions. Volume 1 therefore sets out principles for good modelling practices set around quality control and end user needs. The practices described in Volume 1 also introduce and discuss the validation of aircraft noise model inputs and outputs set around the needs of the end-user.

There is general recognition within Volume 1 that aircraft noise modelling uncertainties arise from approaches adopted in developing and transforming noise model inputs as part of the modelling process. The modelling process is summarised in **Figure 2-2**, which is reproduced from Figure 9-1 of Volume 1.

Figure 2-2: Noise Modelling Process

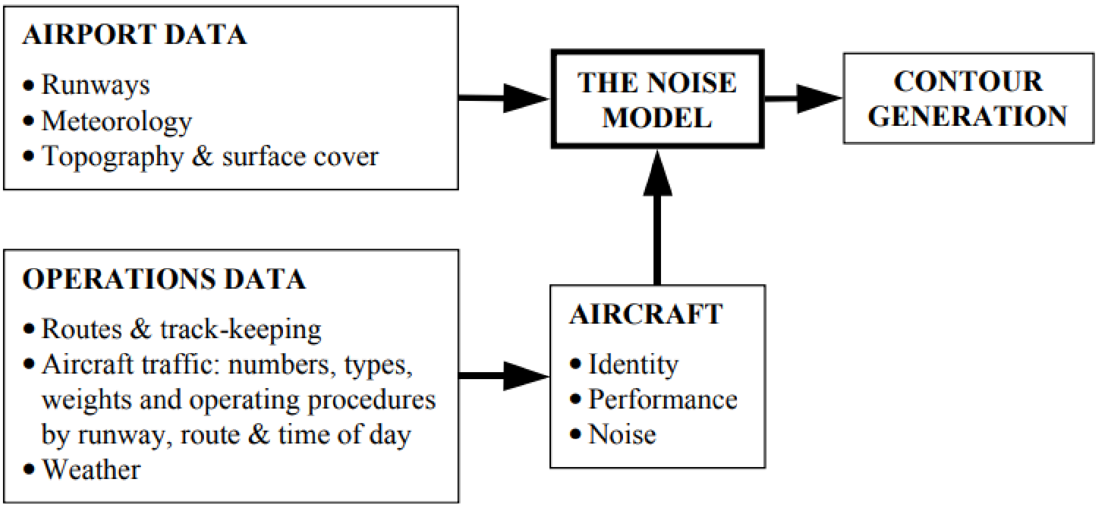


Figure 9-1: The noise modelling process

Volume 1 presents approaches for addressing uncertainties by advising on input data quality and wider data processing techniques. Volume 1 also advises on good practice modelling approaches and recommends certain modelling approaches based on the availability of input data.

Recognising end-user needs, additional guidance on the application of the ECAC Doc 29 methodology has also been provided by the UK Civil Aviation Authority (CAA). This guidance has been prepared to reflect the UK CAA's role as a regulator. This additional guidance includes:

- CAP 1616i: Environmental Assessment Requirements and Guidance for Airspace Change Proposals[7];

[7] Available here: Environmental Assessment Requirements and Guidance for Airspace Change Proposals

- ERCD Report 1006 Measurement and Modelling of Aircraft Noise at Low Levels[8]; and
- CAP 2091 Policy on Minimum Standards for Noise Modelling[9]

These documents set out guidance on how an aircraft noise models shall be prepared as part of processes overseen by the UK CAA. Although these documents have no direct relevance in Ireland, as the requirements described in Annex II of the END take primacy, they are collectively helpful in describing considerations as they relate to aircraft noise modelling quality and sophistication.

2.3 Model Quality

Volume 1 recognises that the reliability of an aircraft noise model and the resulting calculations is dependent on the:

1) Quality of the input data;
2) The reliability of the noise calculation engine; and
3) The accuracy of respective databases

There is general recognition within Volume 1 that a calculated noise output can be no more reliable than the inputs to the model, and with the steps adopted in processing input data key to determining the model's reliability.

Volume 1 does not define measurable quality thresholds for aircraft noise modelling. Instead, the guidance lists the factors that should be considered when determining the quality goals for noise modelling based on the importance, status and significance of its end use. These factors are:

- The scope and purpose of the study;
- Legal and regulatory requirements;
- Performance criteria;
- Data and data source authentication; and
- Validation of the tools used for the study.

Volume 1 encourages end-users of the noise modelling and the model practitioner to agree a validation plan from the outset of the study.

As part of the Noise Abatement Objective for Dublin Airport 2022, ('the 2022 NAO') ANCA set requirements for how the noise modelling shall be validated. The 2022 NAO states that:

"In order to measure performance, these metrics shall be completed using a noise model prepared in accordance with the methodology described in Directive 2015/996 (European Civil Aviation Conference (ECAC) Doc.29 4th Edition or as amended). The noise model shall be validated using local noise and track keeping performance data from Dublin Airport's systems."

The 2022 NAO does not prescribe methodologies or approaches for validating the Airport's noise model. Instead, the 2022 NAO makes clear that the noise model shall be validated based on the best available data, namely noise and track keeping obtained from the Airport's systems.

[8] Available here: ERCD Report 1006 Measurement and Modelling of Aircraft Noise at Low Levels
[9] Available here: CAA Policy on Minimum Standards for Noise Modelling

The 2022 NAO made direct reference to the legal and regulatory requirements for aircraft noise modelling as described in methodologies set out in Directive 2015/996. The Directive, as amended, forms Annex II of the END[10] and is transposed under the ENR in Ireland, reproduces the ECAC Doc.29 methodology and carries over certain recommendations on noise modelling approaches. CNOSSOS-EU also provides a Quality Framework which addresses the accuracy of input data and values while providing statements in relation to the reliance of assumptions in the noise modelling process.

The Quality Framework for aircraft noise modelling outlined in CNOSSOS-EU applies to the modelling of aircraft noise emissions. Section 2.6.2 of CNOSSOS-EU states that:

"All input values affecting the emission level of a source shall be determined with at least the accuracy corresponding to an uncertainty of ± 2dB(A) in the emission level of the source (leaving all other parameters unchanged)."

The Quality Framework also advises against the use of assumptions or 'default values' within the noise modelling process unless it is accepted that use of real data could lead to 'disproportionately high costs'. In this context, Appendix I of CNOSSOS-EU provides an example referring to the use of assumed flight paths instead of modelling ground tracks derived from radar data. This reference is carried over from ECAC Doc 29.

A further consideration given in CNOSSOS-EU are the use and application of 'default values' that are used to determine aircraft noise performance. This relates to the use and application of 'flight profiles' and 'noise data' held in the ICAO sponsored Aircraft Noise and Performance (ANP) database[2]. The ANP database at the time of its publication is reproduced in Appendix I of CNOSSOS-EU. To this end, the Directive states that:

"In cases where input data provided in Appendix F to Appendix I are not applicable or cause deviations from the true value that do not meet the conditions presented under 2.1.2 and 2.6.2, other values can be used, provided that the values used and the methodology used to derive them are sufficiently documented, including demonstrating their suitability. This information shall be made publicly available."

CNOSSOS-EU therefore recognises that the use of default values may not be appropriate in all situations where this may lead to the modelling of aircraft noise emissions falling beyond the thresholds described by the CNOSSOS-EU Quality Framework i.e. ± 2dB(A). Where other values describing 'flight profiles' and 'noise data' are adopted, CNOSSOS-EU is clear that this must be accompanied by sufficient documentation.

In the UK, the UK CAA also recognises this in the context of the use of the AEDT software. The UK CAA CAP1616a publication states that:

"AEDT is a very comprehensive aircraft noise model but the accuracy of its outputs is dependent on the quality of input data and the way in which the model is used. <u>The default settings for the model may not be appropriate under particular circumstances and therefore use of those default settings may generate inaccurate results.</u>"

The CAP1616a document also states that:

"For nearly all aircraft types, the AEDT default departure profile uses maximum thrust generating the maximum climb rate. Use of maximum thrust on take-off is not a typical mode of operation for most civil jet aircraft. Engine maintenance considerations dictate a lower thrust setting on take-off than

[10] Consolidated text: Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02002L0049-20210729

that typically assumed by AEDT. Thus the default profile can alter the modelled distribution of noise exposure on the ground compared to normal operation – i.e. in some locations it may overestimate noise exposure, while underestimating in other locations"

This guidance is taken further in CAA publication CAP2091. This document represents UK CAA policy on the minimum acceptable level of sophistication of noise modelling and associated outputs that are to be provided to and used by the CAA in carrying out its duties as a regulator. The document defines categories of increasing aircraft noise model sophistication. These categories which range from Category A requiring the most sophisticated modelling to Category E for the least sophisticated, are assigned based on the scale of an airport's noise impact measured by the number of people in relevant noise contours. CAP2091also sets an expectation for the modelling category in other context. This includes whether the airport has been historically modelled to a high sophistication or whether the airport subject to noise management directions under legislation.

CAP2091 defines the basis upon which aircraft noise models shall be prepared for each category. Building on the guidance described in Volume 1, CAP2091 defines requirements and considerations with respect to aircraft noise performance data, namely 'noise data' and 'flight profiles', and the data upon which aircraft arrival and departure tracks are modelled.

The most sophisticated noise modelling required under CAP2091 requires noise data and flight profiles to be based on the ANP but adapted to reflect measurements at airport local noise monitoring terminals and local track-keeping data obtained from radar respectively.

ANCA's Noise Abatement Objective for Dublin Airport 2026 ('the 2026 NAO') has provided further guidance in relation to noise modelling as part of a guidance note attached to the 2026 NAO. This guidance note provides further directions in relation to noise model sophistication with specific considerations required for the modelling of:

- Aircraft ground tracks (with respect to modelled mean track centrelines and dispersion);
- Flight profiles;
- Noise data; and
- Evidence of validation

3 Key Areas of Review

Having regard for the model quality considerations set out in **Section 2**, NCL has focussed on the following elements of the noise modelling prepared and reported on behalf of daa by Bickerdike Allen Partners:

- Choice of aircraft noise modelling software and associated study settings;
- Modelled aircraft types and movements;
- Runway use modelling;
- Modelled routes and dispersion;
- Departure route usage;
- Flight Profiles;
- Noise Data; and
- Evidence of Validation.

Consideration has also been given to the demographic datasets that have been used to support the calculation of noise exposure statistics. The review is presented in **Section 4**.

It should be noted that the review does not consider any specific scenario or forecast. Instead, the review has considered the modelling approaches adopted by BAP. The review has therefore considered differences in approach when modelling a situation (e.g. the noise that occur in a given year) as well as any forecasts (i.e. the noise that is forecast in the future under a given scenario or proposal).

For this review NCL has utilised information provided across a range of reports and reporting templates that were submitted to ANCA by the Applicant.

4 Review of the Applicant's Modelling Approach

4.1 Documents Considered

This review has considered the descriptions of the approaches adopted in modelling aircraft noise across a series of documents prepared by Bickerdike Allen Partners and reported to ANCA since December 2023. These include, but are not limited to the following:

- Dublin Airport Infrastructure Application - Initial Response to ANCA Request for Further Information, November 2025;
- Bickerdike Allen Partners, A11524_09_RP011_1.0, Dublin Airport Infrastructure Application EXISTING SITUATION – ANCA Request, November 2025;
- Bickerdike Allen Partners, A11524_09_RP010_1.0, Dublin Airport Infrastructure Application SCENARIO F: ACP NRRA AIR NOISE ASSESSMENT – ANCA Request, November 2025; and
- Bickerdike Allen Partners, A11469_10_RP006_1.0, NOISE MODELLING REPORT– ANCA Request 07 FEB 2025, Tranche 2.

4.2 Choice of Noise Model

Since December 2023, noise modelling prepared on behalf of the daa and reported to ANCA has utilised the Federal Aviation Authority (FAA) Aviation Environmental Design Tool (AEDT) software.

The modelling received has utilised either version 3e or version 3f of AEDT representing the latest versions of the AEDT software available at the time of modelling. Both versions of AEDT are compliant with ECAC.CEAC Doc 29 4th Edition and therefore aligns with the requirements of the ENR.

Although the AEDT versions utilised at the time were the most recent version of the software, these versions did not always hold the most recent versions of the Aircraft Noise and Performance Database (ANP)[11] which can be utilised by aircraft noise modellers for use with ECAC.CEAC Doc 29. However, this is not problematic providing that the model has been subject to a form of validation to account for new aircraft types and/or changes to the flight profile and noise data held or the modellers review the ANP against the AEDT database at the commencement of their study. As a validation exercise on the 'flight profile' and 'noise data' has been completed as part of the modelling, this is not a concern.

It should be noted that on 28 January 2026, the FAA released version 4a of AEDT. This version of AEDT continues to implement ECAC.CEAC Doc 29 4th Edition for the purposes of aircraft noise calculation. The main update in this respect relates to the updating of the software's noise data and flight profiles to reflect the latest ANP.

4.3 AEDT Study Settings

The documentation reviewed by NCL indicates that the noise modelling has utilised default weather settings for Dublin Airport assuming all-soft ground terrain for lateral attenuations. This is considered appropriate given a validation exercise has taken place. Such a validation exercise will address the effects of weather on flight profiles and measured noise levels.

[11] EUROCONTROL database v2.3

Terrain data has also been incorporated into the study. This is again considered appropriate and in line with best practice, such as guidance set out by the UK CAA[12] which states that terrain adjustments must be included in aircraft noise calculations.

The documentation confirms that the airfield layouts including the location of runways have been taken from the Airport's AIP[13]. From NCL's review of noise contours and associated noise grids in the vicinity of the airfield boundary, we have no concerns with the airfield layouts adopted in the modelling.

NCL notes that specific consideration has been made to the start of departure roll locations and associated displaced landing thresholds incorporated into the modelling. With respect to start of roll locations, this is considered best practice as the use of different runway intersections and runway access taxiways (RATS) by different aircraft types will affect modelled flight profiles.

4.4 Aircraft Types and Movements

All modelling provided to ANCA has included an extensive list of aircraft movements and aircraft types which have been included in each and any modelling scenario or situation. This has been provided in detail and completed within the aircraft noise reporting templates[14] issued by ANCA to daa. This includes historic records of aircraft movements by period and by aircraft type and as part of forecasts.

The documentation reviewed by NCL confirms that for the majority of modelled aircraft types, aircraft have been assigned a corresponding noise performance type as held within the ANP database[15]. Where this has not been possible as an aircraft type is not represented in the ANP database, 'substitutes' have been adopted based on the aircraft's size and engine details. It should be noted that both the ANP database and AEDT can provide recommended substitute types. The assignment of the noise performance for each aircraft types has been used as the basis of the flight profile and noise data validation exercise described in **Section 4.8** onwards.

Helicopters and military aircraft have not been included in the modelling. This is in keeping with CNOSSOS-EU[16].

The noise modelling has excluded activities such as taxiing, engine testing and the use of auxiliary power units. The modelling reports note that this is allowable under CNOSSOS-EU providing that such activities "*do not materially contribute to the noise contours*". This is an appropriate interpretation of CNOSSOS-EU, and it is noted that such activity has been captured in ground noise modelling and assessment work which has been provided as part of assessments presented in the Environmental Impact Assessment Report (EIAR)[17] for the purposes of considering the impact of the Airport's Infrastructure Application (planning reference: F34A/0781).

Having regard for this information and the associated noise exposure statistics reported within the EIAR aircraft noise arising from runway operations and aircraft in the landing and take-off cycle is dominant. We note the potential for some locations to the immediate north and south of Dublin Airport to experience comparable levels of noise from departing and landing aircraft on the runway to the levels of noise that may be experience from aircraft ground operations. However, these cases are very limited and do not materially affect the overall noise exposure contours or reported exposure statistics.

[12] Paragraph 5.9, CAP1616i
[13] EIDW AD 2.24-1, dated 23 February 2023.
[14] A11524_03_CA150_2.0 ANCA Reporting Template 40mppa Nov 2023.xlsx
[15] Aircraft Noise and Performance Database, https://www.aircraftnoisemodel.org
[16] Para 2.7.5, EU Directive 2015/996
Dublin Airport Infrastructure Application Environmental Impact Assessment Report, Volume 4 – Appendix 9-2, December 2023, Section 9-2.3.9

4.5 Runway Use

Runway usage has a significant influence on the distribution of aircraft noise around an airport, particularly at high levels of noise exposure where noise impacts are dictated by flight paths directly under approaches and departures to specific runways.

Further from an airport, approach and departure routes tend to converge as aircraft transition into the wider aviation network. Through conditions of planning attached to Dublin Airport's North Runway Planning Permission, the Airport is required to operate a system of preferential runway use during the day (0700-2300 local time) with operations restricted to the Airport's South Runway during the night (2300-0700 hrs local) save for exceptional circumstances.

The North Runway Relevant Action seeks to amend night-time runway restrictions set under the NRPP to enable use of the North Runway alongside the South Runway between the hours of 2300-0000 hrs (local) and 0600-0700 hrs (local) with only the South Runway being used between the hours of 0000-0600 hrs (local).

In addition to preferences and restrictions on runway use, as aircraft take off and land into the prevailing winds, the amount of time the airport uses its runway in different directions can vary from year to year.

In combination, the degree to which an airport's runways are used over a period is referred to as the runway 'modal split'.

Under ENR, the actual situation that occurred must be presented for the purposes of preparing strategic noise maps and noise action plans. Whilst this describes the noise situation that has occurred, as the modal split can vary from year to year this can complicate noise exposure comparisons. As the effects of aircraft noise on health and quality of life are a consequence of long-term exposure, some regulators request that a noise situation and relevant forecasts are provided based on a modal split that has occurred over a period of several years. This is sometimes referred to as the 'standardised' modal split.

ANCA requires forecasts to be based on a modal split derived over a period of 10 years. For the most recent noise situation report to ANCA by daa for 2024, the modelling has provided contours for actual and a long-term modal split based on a 10-year average. This approach was also adopted in the reporting of the noise situation in 2023. The presentation of actual and standardised modal splits in annual noise contour reports is commonplace in the UK, particularly at noise-regulated airports.

ANCA has requested historical runway usage information to help verify the modal split assumptions adopted in the noise modelling. Further to this, the aircraft noise reporting template[18] provided by ANCA to daa provides for runway usage information to be reported to allow the modal split of any modelled noise situation or forecast to be presented alongside the reported noise exposure datasets.

NCL has reviewed this data and is satisfied that the 10-year modal split assumptions relied on in the modelling and noise exposure information provided to ANCA are representative. In addition, situations and forecasts provided that reflect various runway usage scenarios are also representative of existing planning conditions, restrictions, proposals or scenarios provided either by daa or prepared at the request of ANCA.

Due to the sensitivity of runway use in modelling noise exposure statistics, it is recommended that modelling reports clearly demonstrate the derivation of standardised modal splits.

[18] A11524_03_CA150_2.0 ANCA Reporting Template 40mppa Nov 2023.xlsx

4.6 Modelled Routes and Dispersion

The location and dispersion of arrival and departure routes is a critical part of an aircraft noise model and directly affects the location of receptors exposed to various levels of aircraft noise.

The location on the ground that an aircraft overflies is referred to as the 'ground track'.

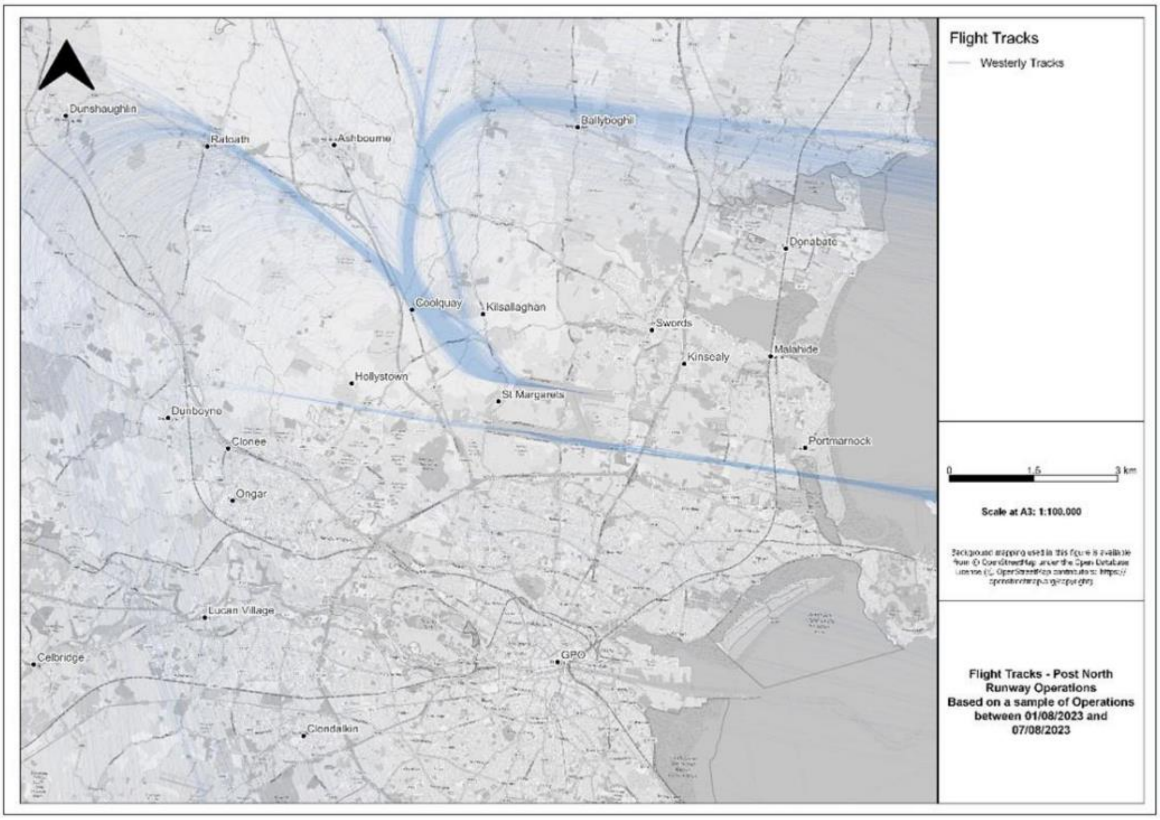
As outlined in Section 2, the modelling of routes aircraft operate and their associated ground tracks is a matter which is subject to guidance both within ECAC Doc 29 and CNOSSOS-EU, but has also been the subject of guidance prepared by other regulators.

Whilst the airspace design of an airport will prescribe routes to and from each runway, due to a range of factors, including aircraft navigation systems, interventions from air traffic control and prevailing weather conditions and wind directions, aircraft do not fly the same ground track for each arrival or departure. Instead, aircraft will tend to operate within corridors which are defined by the arrival and departure routes and are influenced by these factors.

Such corridors are more commonplace for departing aircraft. This is principally due to arriving aircraft being lined up on a runway heading for landing which reduces variation in ground track locations. In some cases where the airspace and associated corridors for have been designed for noise abatement purposes, these corridors are referred to and often designated as 'Noise Preferential Routes' or 'NPRs'.

Over time, the ground track locations at an airport emerge and typically present as patterns. These patterns are presented across Figures 7 – 10 in the Section 2.3 of the Dublin Airport Noise Action Plan 2024 – 2028. These figures show changes in the ground tracks before and after the opening of the North Runway and an airspace change in February 2023. Figure 10 of the NAP is reproduced in Figure 4-1 for context.

Figure 4-1: Dublin Airport – Westerly Tracks Post-North Runway (reproduced from Figure 10 of the Noise Action Plan for Dublin Airport 2024 – 2028)



As outlined above, the noise modelling of aircraft ground tracks is a key consideration. Central to this is how ground tracks are represented in a noise model. Volume 1 of ECAC Doc 29 discuses several approaches and data sources that be used to model ground tracks with Section 7.6 of Volume 1 describing three conceptual approaches. Each approach effectively allows for the modelling of ground tracks to be carried out through a statistical representation or alternatively directly from radar or simulated data.

When modelling ground tracks as a statistical representation, Volume 1 recommends that these representations are defined by determining a 'nominal backbone track' i.e. the centre of the distribution of the ground tracks, or as defined by a procedure. This is then supplemented by a series of 'sub tracks' which can be used alongside the 'nominal backbone track' to represent the distribution or dispersion of aircraft around the backbone track. This is illustrated in Figure 4-2 which is reproduced from Figure 7-2 of Volume 1.

Figure **4-2**: Example of a statistical ground track modelling (reproduced from Figure 7-2, Volume 1, ECAC Doc 29)

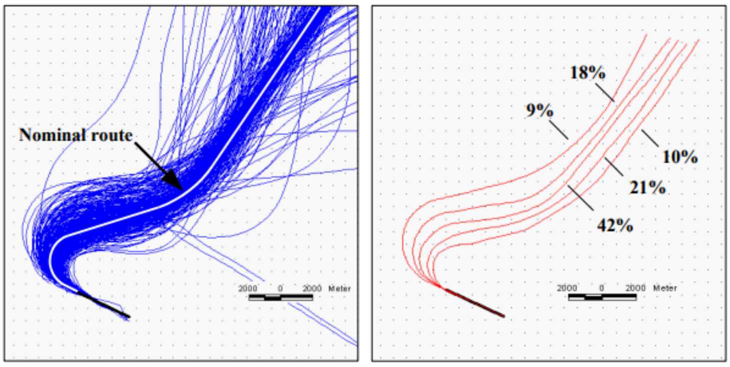


Figure 7-2: Radar tracks of individual departures (left) and average tracks of the same situation with the percentage of movements (right).

This guidance is carried through into CNOSSOS-EU which states that:

"It is common practice to treat the data for a single route as a sample from a single population; i.e. to be represented by one backbone track and one set of dispersed subtracks"

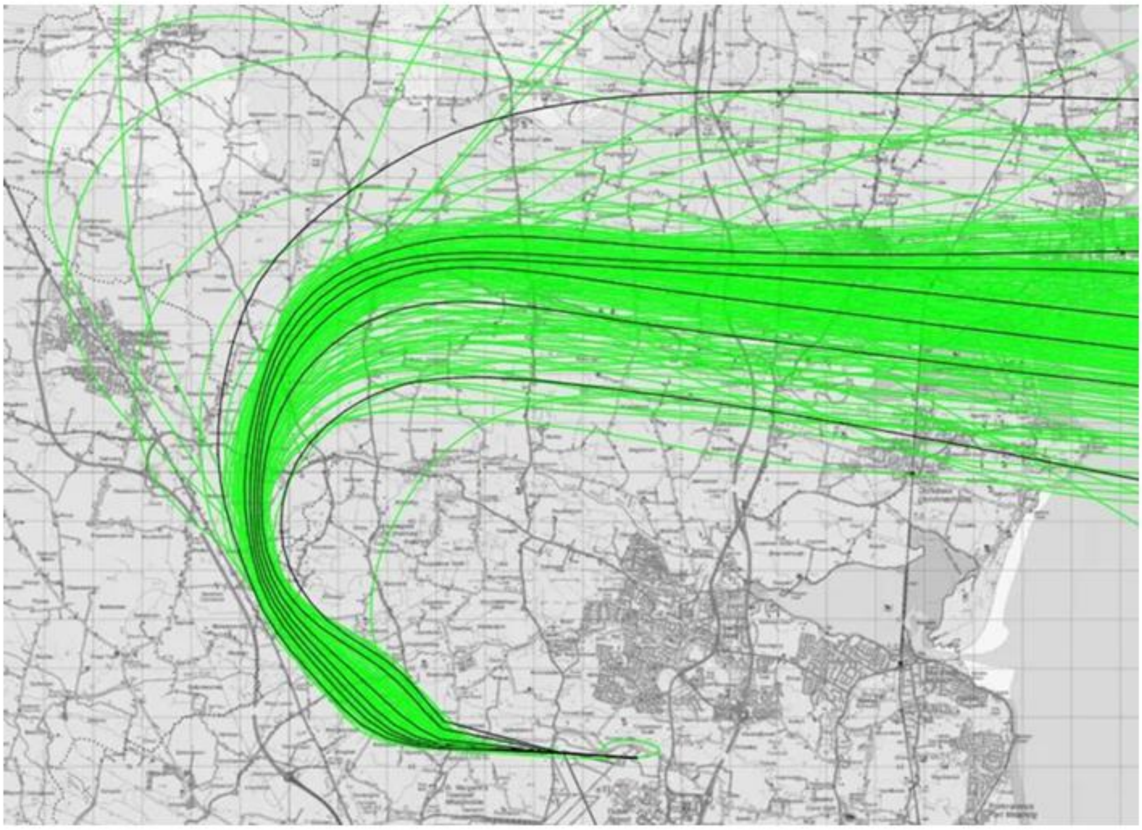
Through the 2022 NAO, ANCA set an expectation that noise modelling would be based on local noise and track keeping data. From review of the modelling reports received by ANCA it is apparent that the ground track modelling is based on track keeping data. The modelling reports provided by daa to ANCA have provided insight on the methodology adopted.

The modelling reports indicate that the North Runway and South Runway arrival routes have been modelled as straight-out alignments. Arrivals are represented by seven routes at each end of the straight-out centreline. These intend to capture the broad swathe of approach directions from which aircraft vector onto the final approaches from the point merge. The modelling reports indicate that aircraft operations within the model have been distributed equally across the seven routes. NCL recognises that the main centrelines appear to provide a proxy to the mean flight track from the density shown in the radar track data, the lateral dispersion applied within the model may not necessarily reflect the observed dispersion patterns as the dispersion applied is uniform rather than being calculated empirically from the radar track data. From review of various noise contours and radar data, the locations of where such assumptions have been applied are unlikely to affect reported noise exposure within the 45 dB L_{den} and 40 dB L_{night} contours. In the case of westerly arrivals, the locations where such assumptions have been made are in the Irish Sea. In the context of easterly arrivals, the modal split for Dublin Airport means that these contours are mostly influenced by final approaches and therefore the noise contours are relatively insensitive to these assumptions.

A similar approach has been applied to the modelling of each departure route with an example from the modelling reports presented in

Figure 4-3 for context. The modelling has considered this for each departure route by extracting and analysing ground track data as it applies to each route. This process is described in the modelling reports and defines the process through the creation of 'Route Groups' i.e. ground tracks identified from the radar data that can be grouped to represent a particular departure route from the airport. Each departure route leads to a point where the aircraft join the aviation network and are handed to an 'en route' controller. This point is usually defined as the 'gate'.

Figure 4-3: Example of departure ground track modelling



NCL acknowledges based on the example provided that the backbone tracks and overall dispersions adopted in the modelling are broadly consistent with the radar track data. The lateral dispersion and the location of the modelled departure sub tracks incorporated within the modelling have been derived using the standard percentile distributions as defined in Volume 2, Appendix C of ECAC Doc 29. The approach adopted is compliant with established guidance set out in ECAC Doc 29 and has been applied to all departure routes. As such the adopted approach can be considered representative.

It is important that the derivation of ground tracks is regularly reviewed. Changes in fleet mix, aircraft navigation equipage and coding can result in changes in ground tracks which may require updates to be made to the noise modelling. It is recommended that such reviews are carried out periodically.

4.7 Departure Route Usage

The routes that aircraft use and are assigned on departure are usually determined by destination and how that destination is served in the aviation network and through which network gate it must enter through.

Through review of the modelling reports and a corresponding review of the aeronautical charts available for Dublin Airport, all network gates are referred to and referenced in the modelling. Eight departure routes have been modelled with associated ground tracks.

The adopted approach to modelling departure route use is subject to whether the modelling is reporting an existing situation or providing a forecast.

Where an existing situation has been presented, the modelling is based on route use as it occurred and is available from radar data. This is appropriate and the most accurate approach.

For forecasting purposes, a noise model must estimate route use based on the destinations of aircraft provided by an airport in their forecast schedules. This requires assumptions to be made on likely aircraft routing from each runway. ECAC Doc 29 does not recommend how this shall be achieved but only that the modelling practitioner should *"obtain from the end-user formal acceptance of them. In return, the practitioner should advise the end user about the impact of possible data deficiencies and uncertainties."*.

The modelling reports describe the adopted approach. When forecasting, route use has been based on observed route use derived from radar data. The modelling reports indicate that this has been assigned based on a combination of aircraft size, runway and the headed direction of the aircraft. From our review of the modelling reports, the headed direction is likely to have been determined from the destinations provided with forecast flight schedules however this not specifically stated. The information provided by the modelling reports indicates where several routes may be used to serve a particular departure direction from a runway, aircraft movements have been distributed according to a percentage split between routes. This approach is considered appropriate.

As with the modelling of ground tracks it is important such assumptions and derivations when forecasting are reviewed as changes in the wider aviation network can impact on departure route use. Further clarity could be provided in the modelling reports to confirm that the modelling of departure route use as part of forecast is based on destinations.

4.8 Flight Profiles

As outlined in Section 2, flight profiles are an important input to an aircraft noise model with guidance and criteria set across a range of documents. In the context of Dublin Airport, the 2022 NAO requires that the noise model is validated using local noise and track keeping systems. The 2026 NAO Report provides further guidance to this effect.

The validation of an aircraft noise model with respect to flight profiles involves modelling flight procedures as defined by the ECAC Doc 29 methodology so that they best reflect local flight performance as observed from radar data. Whilst the ANP defines 'default' profiles and procedures, these may not reflect local flight performance or how airlines operate their aircraft. For example, most 'default' profiles defined by the ANP assume continuous climb operations with arrival profiles assuming a period of level flights. This may not reflect local airspace design or ATC interventions.

Modelled flight procedures are required by the ECAC Doc 29 methodology used as part of the calculation to determine the altitude and speed of an aircraft and estimate engine thrust along the departure or landing. These parameters are then used to calculate levels of aircraft noise on the ground. As such, the quality of the calculated noise levels are dependent on the representativeness of the modelled procedures.

In the case of departure profiles, different profiles are used to describe different aircraft departure weights. The same aircraft can perform differently on departure subject to its take-off weight. A heavier aircraft will generally depart at a lower rate of climb. ECAC Doc 29 introduces the concept of 'stage length' when considering different aircraft departure climb rates. ECAC Doc 29 provides a set of default 'stage lengths' which provide a proxy for take-off weights that are assigned to different trip (or stage) length ranges. This concept allows departure profiles and take off weights to be grouped or assigned based on the length of flight assuming that increased trip lengths will require aircraft to carry more fuel resulting in increased take-off weight.

The preparation of flight procedures within the ECAC Doc 29 methodology is more complex than indicating aircraft altitude and speed. Procedural profiles also require inputs and assumptions to be provided regarding aircraft engine settings, aerodynamic configurations including flap settings, and other factors such as approach angles. As such, the process of developing flight profiles can be time consuming and often requires the processing of large volumes of radar data.

The modelling reports reviewed by NCL demonstrate a strong understanding of the processes required in developing flight profiles. Evidence is provided that the modelling has had regard for observed aircraft flight performance using radar data and has considered wider airspace design and ATC considerations including advice obtained from the Irish Aviation Authority (IAA).

The following sections provide an overview and commentary on the modelling approaches adopted in preparing the arrival and departure profiles.

4.8.1 Arrival Profiles

The modelling reports indicate that the modelled arrival profiles are based on those available within the AEDT database. The modelling reports also indicate that a review of the AEDT arrival profiles has been carried out alongside radar data with advice provided by the IAA regarding descent procedures.

Dublin Airport operates continuous descent approaches (CDA). This procedure seeks to minimise sections of level flight. CDA operations do not mean that level flight is entirely removed during an aircraft approach. Instead, CDA seeks only to minimise level flight. To capture this, when monitoring CDA performance, metrics are developed that will classify an approach as a CDA providing the period of level flight is below certain length.

In the case of Dublin Airport, daa state that the flight track monitoring system is configured so that it *"detects and measures descent profile and CDO from 5,500ft (above ground level) or below. Descending flight which involves more than one section of level flight greater than 2.5 nautical miles in length following descent from an altitude of 5,500ft is considered as non-CDO."*[19]

The Annual Compliance Report prepared by daa under Section 19 of the 2019 Act for 2023 indicates that overall CDA performance was 77% in 2023.

The modelling report indicates that no level flight sections have been modelled and instead, approach profiles are based on AEDT defaults with any level flight sections removed. The profiles assume a 3-degree approach angle. The use of a 3-degree approach angle aligns with the approach angles in operation at Dublin Airport.

The need to include level flight in the approach profiles is a modelling decision based on both the frequency of occurrence and the influence they may have on calculated noise levels.

For westerly arrivals, the modelling and resultant noise exposure data will be insensitive to such assumptions as aircraft will be fully established on the ILS as they cross the coast and would generally be descending at a 3-degree angle. As such, any level flight segments that may occur would be primarily over the Irish Sea and would therefore not affect calculated noise exposure statistics other than the area of certain noise contours.

For easterly arrivals, a much greater proportion of an aircraft's approach to Dublin occurs over land. However, easterly approaches occur much less frequently than westerly approaches due to the

[19] Section 7.3, Annual Compliance Report 2023 (30 August 2024)

prevailing winds reflected in the corresponding modal split. For context, the modal split reported for the 10 years to 2023 is provided in Table 4-1.

Runway	Direction of Air Traffic	Arrivals	Departures
10L/10R	Arrivals from the west and departures to the east	22.6%	22.6%
28L/28R	Arrivals from the east and departures to the west	76.4%	76.4%
16	Arrivals from the north and departures to the south	0.71%	0.71%
34	Arrivals from the south and departures from the north	0.29%	0.29%

Table 4-1: Modal Split reported for the period 2013 to 2022

From review of the 45 dB L_{den} and 40 dB L_{night} noise contours across a range of modelled situations and forecasts, we conclude that the influence of easterly arrivals on the overall noise contours will relate to sections of the arrival profiles limited primarily to final approaches where aircraft will be fully established on the ILS and level flight is highly unlikely.

In conclusion and when taking in account the sensitivity of arrival profiles on the overall noise contours and associated noise exposure statistics, the modelling approach for arrival profiles is proportionate.

4.8.2 Departure Profiles

The modelling reports provide a detailed description of a phased approach to preparing departure procedure profiles in line with observed radar data. The documented approach confirms that consideration has been given to both aircraft altitude and speed.

In summary, the approach adopted by the modellers is to compare radar profiles for altitude and speed against the default profiles available in AEDT and if necessary, make these representative of the mean profile as calculated from the radar. This involves, where required:

- Adjusting take-off thrusts to provide greater correlation with the initial climb phase of departure;
- Adjusting climb profiles;
- Maintaining flap settings as per AEDT defaults adjusting only thrust settings to best align modelled speed and altitude profiles with radar data; and
- Further adjusting thrust values to match altitude and speeds observed on radar during acceleration phases of departure

From our experience, such adjustments are common when amending departure procedural profiles to reflect observed operations.

The methodology reported indicates that this process has been carried out for each runway end. This is appropriate as different runways, and operating directions may have different departure characteristics.

The modelling reports indicate that this process has been carried out for the majority of aircraft types in operation at Dublin Airport. Example modelled profiles are provided comparing modelling profiles against radar data. These are reproduced in Figure 4-4 to Figure 4-6 for reference.

Figure 4-4: Example Aircraft Altitude by Track Distance Plot

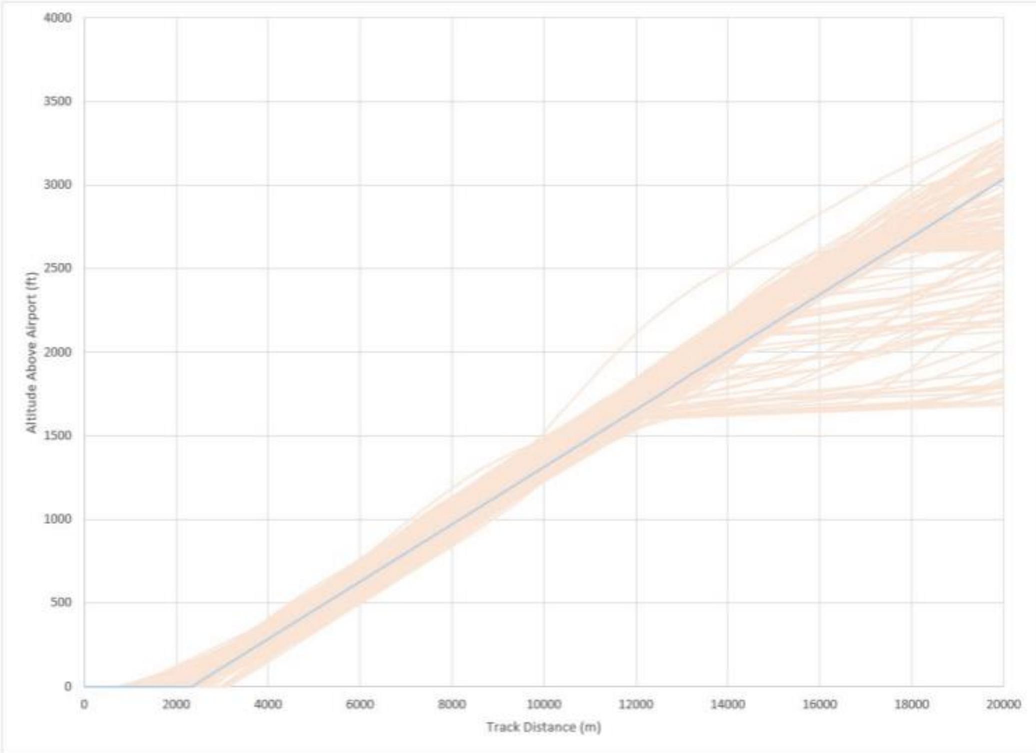


Figure 4-5: Comparison of modelled altitude and mean altitude

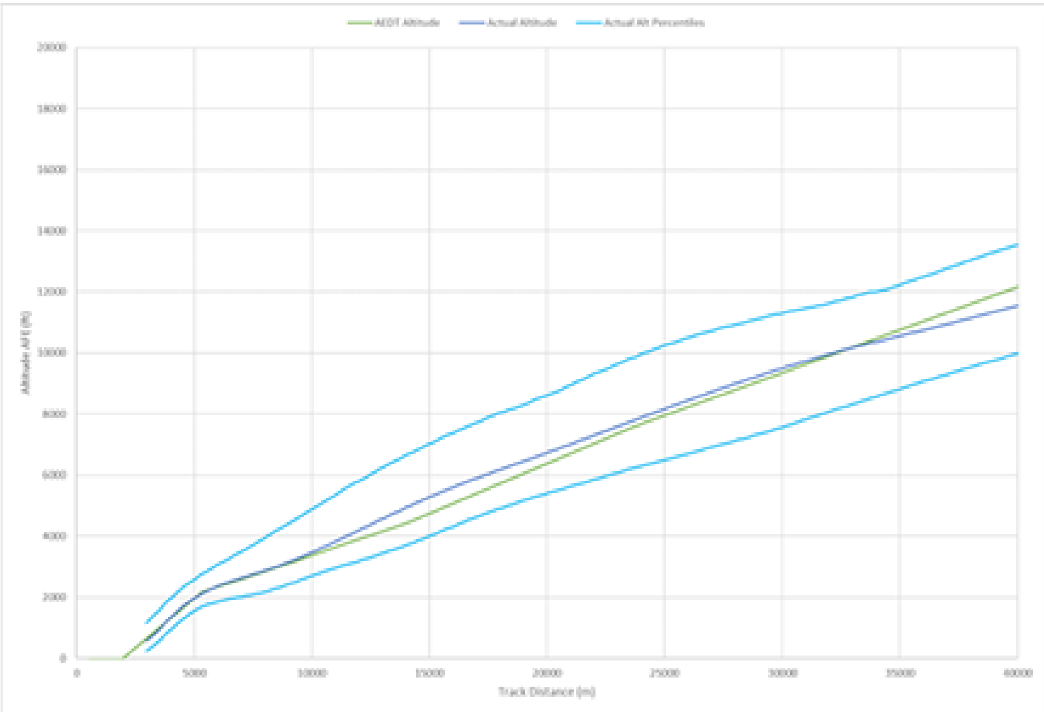
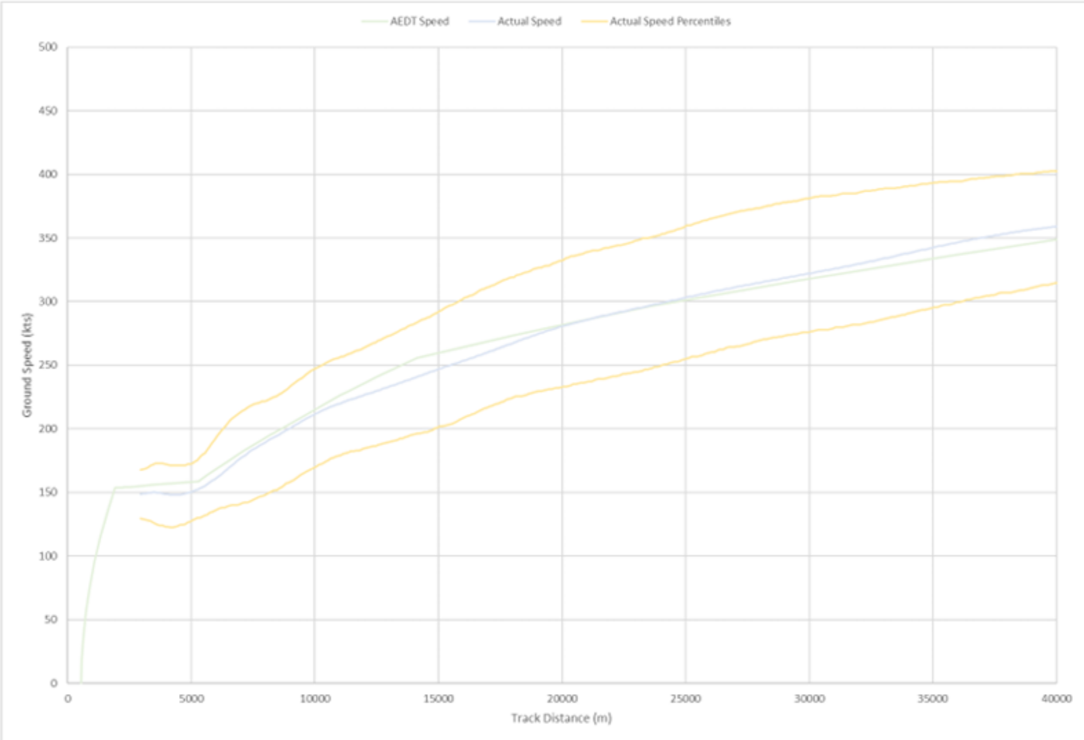


Figure 4-6: Comparison of modelled ground speed and mean ground speed



It is acknowledged that as not all flight profiles are identical, a judgement is required as to how this shall be represented in the modelling. As shown in Figure 4-5 and Figure 4-6 the modelling reports indicate that modelled flight profiles are made representative of the mean altitude and ground speeds. This has been demonstrated by presenting the upper and lower percentiles of the departure altitudes and ground speeds observed from the radar data.

The modelling reports confirm that as part of preparing flight profiles, the profiles have been extended beyond 10,000ft. This is point at which most flight profiles in the ANP end. The modelling reports indicate that the flight profiles have been extended to 30,000ft. It is stated that this is appropriate given the study area required to model aircraft noise down to levels of 40 dB L_{night} and 45 dB L_{den}. We agree this is appropriate however from our experience, flight profiles extended beyond 10,000ft may not function as expected and should be reviewed prior to use.

From the modelling reports it is not clear whether departure profiles have been developed for each departure stage length. The reports indicate this to be case however this is not specifically confirmed.

4.8.3 Summary

Based on the modelling approaches described and the evidence presented NCL concludes that the modelling of departure flight profiles follows best practice. As indicated, NCL is of the opinion that the modelling of approach profiles is appropriate given the local circumstances at Dublin Airport and location in relation to the Irish Sea and modal split and the corresponding influence of this on noise exposure statistics.

It is however recommended that further detail be provided to indicate the volume of data available in preparing flight profiles, and clear confirmation that this has been applied for each aircraft/stage length combination.

4.9 Noise Data

The preparation of radar-based flight profiles and ground tracks will result in improved operational representation within the aircraft noise model. However, in isolation this does not guarantee that modelled aircraft noise levels are representative of measured levels around the airport.

In the context of CNOSSOS-EU, emission levels should correspond to an uncertainty of ± 2dB(A) as advised by the Quality Framework. In the context of aircraft noise, this can only be established through comparison of measured and modelled aircraft event levels.

The 2022 and 2026 NAO require aircraft noise modelling to be validated using noise and track keeping data. Most major airports operate noise and track keeping systems. These systems operate by tracking and storing the locations of aircraft as detected by the airport's radar and correlating any aircraft noise measurements registered at the system's noise monitoring terminals (NMTs) with aircraft and their flight tracks. The systems also store aircraft information allowing data such as the aircraft registration, operator and type to be reviewed against the measured level and flight track. These systems have a range of uses however the data gathered can provide a resource for validating aircraft noise models.

The 2022 and 2026 NAO set the expectation that such a validation is carried out and reported for Dublin Airport. The validation process is typically carried out in two parts: firstly, ground track and flight profile validation to ensure that modelled operations are representative (as discussed in Section 4.8); followed by noise data validation which is achieved by making adjustments to the noise emission data for each modelled aircraft type having regard for relevant measured noise levels.

As outlined in Section 2, the ANP provides 'Noise-Power-Distance' information for different aircraft types. This provides a look-up for the level of noise that can be expected at a given aircraft engine power setting and distance from the aircraft. The distance and power settings are derived from ground tracks and flight profiles. The validation of the noise data for each aircraft type involves adjusting NPD data with the objective of narrowing the difference measured and modelled values.

The modelling reports provide a detailed description of the NMT validation methodology confirming that adjustments to NPD data are derived by comparing logarithmic average SEL values measured for each aircraft type across a range of stage lengths at the NMTs against the corresponding modelled levels considering the proportion of different stage lengths for the given type. It should be noted that this exercise has also been applied to L_{Amax} aircraft event levels however in this case an arithmetic average has been used. We consider this appropriate.

There is no prescribed way to perform such a validation exercise and there are various levels of complexity that can be applied when seeking to adjust NPD data to reflect measured noise levels such as whether:

- The NMT locations and their number allow for a noise data validation to take place e.g. proximity to flight paths;
- The validation is based on actual radar tracks or mean ground tracks – in practice the use of radar tracks correlated with measurements provides a greater degree of precision as lateral differences in ground tracks and their corresponding proximity to NMTs is represented in the validation exercise;
- Any filtering has been carried out with respect to measured aircraft noise levels – this can be a key consideration as measurements taken during adverse weather conditions may detrimentally affect measured aircraft event levels. Furthermore, some noise data validation exercises will filter measured aircraft events should they be measured beyond a certain elevation angle; and

- If the validation has considered a single adjustment to the NPD applied over all values, or whether adjustments have been made and interpolated from specific points on the NPD. This decision is dependent on the availability and coverage of NMTs with respect to their corresponding position on the NPD.

The modelling reports demonstrate that measurements at up to 10 NMTs have been used to support the validation exercises since December 2023. The NMTs represent locations under different departure and arrival routes and consider different operating directions.

It is unclear from the modelling reports whether radar track data correlated to measured aircraft event levels has been used for validation purposes. As this is not stated, we assume that modelled ground tracks have been used. Either method can provide the basis of a noise data validation, however validation from radar tracks is considered more precise.

The modelling reports do not specifically describe any filtering that has been applied to the NMT datasets. This is not necessarily problematic however in our experience this may result in measured logarithmic average SEL values that slightly overstate the measured levels that would occur in more reproducible conditions. If such filtering has been applied, then the details of this should be reported.

The modelling reports state that the output of the noise data validation is a single adjustment to the NPD data for each aircraft type. In the most recent modelling report reviewed by NCL, 19 aircraft types have been validated representing the majority of aircraft operations by type at Dublin Airport in 2023 and 2024. Given the location of the NMTs to departure routes there may be sufficient information to apply more discrete adjustments to the NPD datasets than derive single aggregate adjustments.

In response to information requests from ANCA, the modelling reports have provided comparisons of modelled and measured average aircraft event levels at different NMTs for different runway and aircraft operations (i.e. arrivals or departures). In reviewing these comparisons, we note that for most NMTs and aircraft types there is close alignment between the measured and post-validated modelled events with most comparisons demonstrating an uncertainty well within the ± 2dB(A) as advised under the CNOSSOS-EU Quality Framework. This is a positive indication that the noise modelling can be considered representative of measured levels.

4.10 Modernised and Next Generation Aircraft Types

It is noted that some forecasts provided by the daa extend into the 2040s. The next generation of aircraft are referred to a 'Generation 3' or G3 types. Many of these types will replace the current G2 generation of aircraft, such as the 737max.

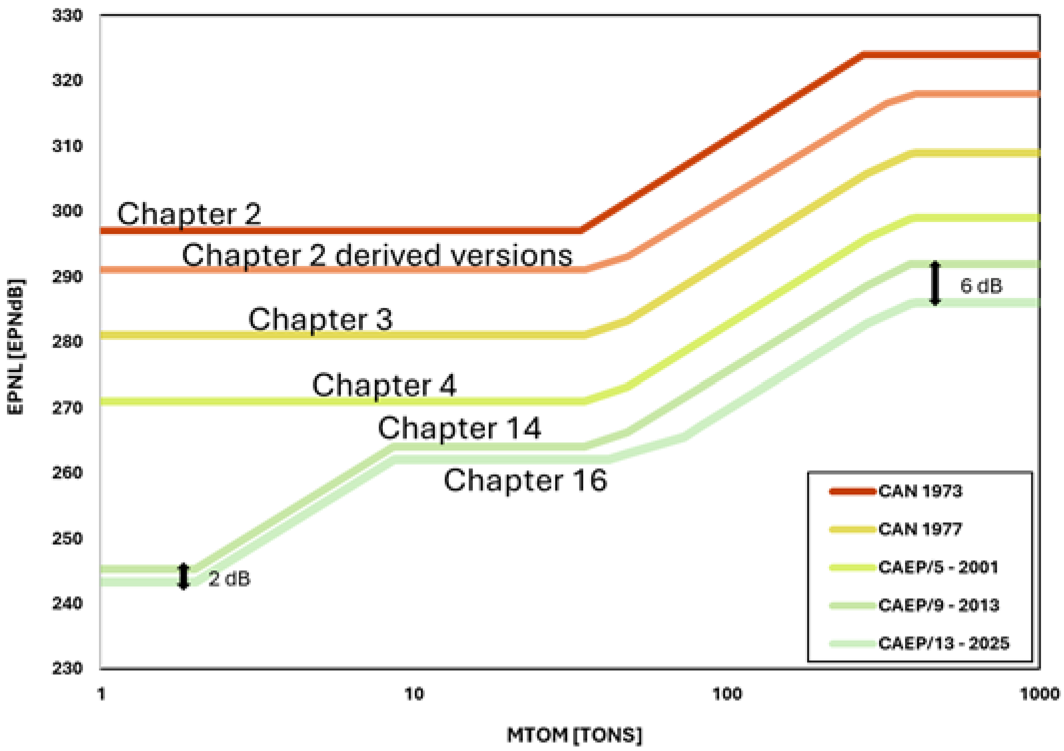
All aircraft are certified against standards that are set internationally by ICAO. The primary reason for noise certification is to ensure that aircraft entering service are designed to incorporate the latest noise reduction technologies. These standards are therefore a key contributor in progressively reducing noise emissions from airport operations. These standards take the form of noise limit values and are defined in Volume I of Annex 16 to the Convention on International Civil Aviation.

These noise limits are referred to as 'chapters' with the limits and the way in which aircraft are certified to the limits varying by aircraft type. The Committee on Aviation Environmental Protection (CAEP) assists the ICAO in developing and formulating the 'chapters'.

The latest 'chapter' and associated noise limits are referred to as Chapter 16. For the first time, the Chapter 16 standard sets a dual new binding standard for noise and fuel efficiency (to reduce carbon emissions). The Chapter 16 noise limits are applicable to new aircraft designs as of 2029 with the fuel efficiency elements to take effect at the end of 2031.

Figure 4-7 illustrates the progression of the ICAO noise chapters over time.

Figure 4-7: Cumulative Noise Limit Evolution under ICAO Noise Chapters (source: ICAO)



The reduction in limits required by Chapter 16 compared to the previous Chapter 14 standards are smaller compared to the progressive stringency introduced between previous chapters. It is generally recognised that most current generation aircraft already exceed the Chapter 14 noise limits and may already comply with Chapter 16.

In line with the progression demonstrated in Figure 4-7 it is likely that new aircraft entering service in the mid to late 2030s will likely be designed to the chapter beyond the latest Chapter 16. It is unclear whether the trends in noise reduction over previous chapters will continue or not. As the Chapter 16 standard now formally recognises interdependencies between aircraft fuel efficiency and noise, as such it is likely these trade-offs will influence future chapters.

From our review of the forecast received by ANCA, G3 aircraft are forecast to feature at Dublin Airport in the 2040s with most forecasts in the 2030s featuring aircraft that are already in operation.

We note that where G3 aircraft types have been considered, the modelling has assumed that noise levels of new aircraft types will be quieter than the existing types they will replace. The modelling assumes improvements of 0.05 dB per year on arrival and 0.2 dB per year on departure. We advise caution on the use of a single assumption when forecasting noise emissions from G3 types. We would instead encourage that future aircraft noise performance is the subject of detailed technology forecasts and the development of scenarios to reflect uncertainty in this area.

4.11 Population and Demographic Assessment Method

Noise exposure assessment requires the consideration of the location and number of noise sensitive receptors located around an airport. The methodology described for the considerations of this has relied on data obtained from GeoDirectory 2023 Q3 as a basis. The approach to estimating population is stated to be consistent with that used as part of the noise mapping of the Airport under the ENR. This is based on the Small Areas Population Statistics (SAPS) published by the Central Statistics Office (CSO), and GeoDirectory delivery point data from Ordnance Survey Ireland (OSi).

The exposure assessments provided with forecasts include an assessment of how population may increase in the future as a result of consented developments and lands currently zoned for residential development. This is considered appropriate.

5 Conclusion

Noise Consultants Limited has reviewed the modelling approaches adopted by consultants Bickerdike Allen Partners (BAP) on behalf of daa. This review has focussed on modelling and associated modelling reports received by ANCA since December 2023. The review has considered key areas that contribute towards the quality of the noise modelling having regard for wider guidance, modelling approaches described in relevant standards and legislation and their associated Quality Framework.

The review identifies that the modelling has been carried out in line with best practice based on the data available to the modellers.

ANCA requires that the noise model of Dublin Airport be validated based on the best available data, namely noise and track keeping obtained from the Airport's systems. It is our opinion that best available data is being utilised in the preparation of the noise modelling which is based on data obtained from the Airport's noise and track keeping systems.

The modelling reports demonstrate that observed activity is reflected in the modelling through the preparation of radar-based ground tracks and flight profiles. The modelling reports demonstrate that noise data has been validated using measurements obtained from the Airport noise monitoring terminals. In combination, the modelling reports evidence that these validation activities result in modelled levels that fall within a modelled uncertainty margin defined by the CNOSSOS-EU Quality Framework. Comparisons of modelled and measured noise levels in the modelling reports indicate that in practice modelled aircraft event levels for the most prevalent aircraft types are well within this margin.

The review highlights that in line with the requirements of CNOSSOS-EU the reports state where flight profiles and noise data has been adjusted to reflect observed data, which is clearly reported along with the methodologies adopted. The review also highlights that such adjustments may need to be routinely reviewed to reflect operational changes or as and when new data becomes available. Wider guidance from ECAC Doc 29 also recommends that validation activities are agreed between the practitioner and end-user. Given these factors it is recommended that ANCA agree a modelling report template that can report all considerations in a consistent manner and allow any changes in the modelling to be identified periodically.

Based on our review, NCL considers the modelling to be of a sufficient quality to respond to ANCA's policy requirements as set by the NAO and for end-use as part of ANCA's functions under the 2019 Act.