20.215.02 • August 2020

Dublin Airport Noise Compliance Report

2019

Aviation Consultants

Dublin Airport Noise Compliance Report

2019

Report

daa

Old Central Terminal Building

Dublin Airport

Co. Dublin, Ireland

To70

PO Box 85818

2508 CM The Hague, The Netherlands

tel. +31 (0)70 3922 322

fax +31 (0)70 3658 867

Email: info@to70.nl

By:

Mark Verkerk

Joost van der Ploeg

Ruud Ummels

The Hague, August 2020

Table of Contents

1 Introduction

The Aircraft Noise (Dublin Airport) Regulation Act 2019, Part 4, section 19 states that the airport shall on or before each anniversary of the date of commencement of this section, prepare and adopt a report in writing in the specified form (in this section referred to as a "compliance report") on the compliance of airport users with noise mitigation measures and operating restrictions. daa has requested To70 to draft a compliance report in accordance with the Act.

1.1 Aircraft noise regulation Act 2019

The Act states that a compliance report should include the following information:

A. particulars of failures (if any) to comply with operating restrictions due to changes in flight procedures;
B. the general criteria applied when distributing and managing traffic at the airport to the extent that those criteria may relate to noise impact;
C. the data collected by the noise measuring systems;
D. particulars of failures by airport users to comply with noise mitigation measures and, in addition to the failures referred to in paragraph (a), other failures to comply with operating restrictions (including aircraft flying off track without being directed to do so by the Irish Aviation Authority);
E. proposals to avoid or reduce the failures referred to in paragraph (a) or (d), or both such failures, including the imposition of financial penalties;
F. a non-technical summary of the matters referred to in paragraphs (a) to (e) (including an analysis of the data referred to in paragraph (c)).

This report has been produced for the calendar year 2019 (1st Jan – 31st Dec) and is based on the requirements listed above.

1.2 Report structure

A summary of this report is provided in the next chapter (**chapter 2**). The following chapter (**chapter 3**) examines the Dublin Airport operation in 2019, focusing on its traffic management and distribution which relate to noise impact. The noise measurement system and its results for 2019 are presented in **chapter 4**. The final chapter (**chapter 5**) discusses any failures to comply with operating restrictions or noise mitigation measures and proposals to avoid or reduce the failures.

2 Summary

In 2019, Dublin Airport facilitated 238,735 aircraft movements (landing or take-off). Most of the movements were conducted using Boeing 737 and Airbus A320 series aircraft (around 70%). Over 90 percent of aircraft using Dublin Airport in 2019 were the quietest types of aircraft. The airport is licensed to operate 24 hours per day and in 2019 12 percent of movements took place during the night (23:00-07:00). Runway 10/28 is operated as the primary runway, facilitating 98% of the movements in 2019. High usage of the primary runway is preferential in terms of noise impact, since its flightpaths traverse less populated areas than runway 16/34, whose flightpaths to the south are located over areas of Dublin.

Dublin airport has several noise mitigations measures in place such as the above-mentioned preferred runway usage, limitations on reverse thrust usage, departure procedures and environmental corridors. Jet airliner aircraft (category C/D) are required to fly within these environmental corridors, which are based on the runway take-off flight path areas. Aircraft must not leave the environmental corridor below 3,000ft above mean sea level or during the first 5 nautical miles while using Runways 28, 16 or 34. Departures from Runway 10 must track the runway extended centreline to 5NM before commencing turn to the north, or to 6NM before commencing turn to the south. Departures from Runway 10 can be vectored once above 3,000ft and over the sea. The corridors also apply for approaches to the reciprocal runway. The Environmental Corridors do not apply to Category A/B aircraft (light aircraft, turbo prop and Bae 146 type aircraft). ATC can vector aircraft out of the corridors as required for weather, traffic and safety reasons.

The corridors have a width of 180 metres at the departure end of the clearway, diverging at 12.5% on each side to a maximum width of 1.8km. Departures from all runways except Runway 10, must track the runway extended centreline after take-off to 5NM before commencing turn, unless otherwise cleared by ATC 3000ft above mean sea level (AMSL). Departures from Runway 10 must track the runway extended centreline to 5NM before commencing turn to the north, or to 6NM before commencing turn to the south. For departures from runway 10, there is no upper vertical limit to the corridor.

The airport maintains and operates a Noise and Flight Track Monitoring System (NFTMS), consisting of 7 Noise Monitoring Terminals (NMTs), which are installed in the area around the airport. The results from the system are used the report on noise levels around the airport and to investigate track keeping. In 2019 all NMTs were operational 99-100% of the time. The NMTs located directly under the flight paths of runway 10/28 (NMT 1, 2 and 20) recorded most aircraft noise events and also the highest noise levels per correlated aircraft-noise event. Graphs of averaged daytime noise levels (Laeq,16h), averaged night-time noise levels (Laeq,8h), average hourly noise levels and LAmax noise levels are presented for each NMT in chapter 4.

Dublin Airport is currently licensed to operate without operating restrictions, so there are no incidents of failures to comply with operating restrictions due to changes in flight procedures. Failures by airport users to comply with noise mitigation measures involves aircraft flying off track and therefore breaching the environmental corridor without being directed to do so by the IAA, Air Service Navigation Provider (ANSP). In 2019, 56 queries were sent to the ANSP, Air Traffic Service Unit (ATSU) for investigation. Weather conditions were the cause behind the majority (40) of environmental corridor breaches, ATC was responsible for 5 instances, airlines for 3. 7 were for safety reasons and 1 was not replied to by the ANSP

ATSU. Although most breaches are not investigated by the ANSP, Dublin Airport does keep track of these breaches in their NFTMS (ANSP does not employ real-time access to the NFTMS). The NFTMS recorded 1594 infringements/ breaches of the environmental corridor in 2019. This means over 99% of all category C/D movements complied with the environmental corridor.

daa is in the process of sourcing a more advanced Noise & Track Monitoring System (ANOMS), which has improved reporting capabilities. Together with the proposed introduction of a Webtrak system, in the future this will strengthen the monitoring capabilities of Dublin Airport and improve community engagement. Dublin Airport is also currently assessing environmental charges which would include noise related charges.

3 Traffic distribution and management

The noise impact around Dublin airport is affected by several factors, these include:

- Number of movements
- Types of aircraft used
- Runway usage
- Route usage

3.1 Traffic numbers

Dublin Airport is an international airport, located 10km north of Dublin City Centre. In 2019, Dublin Airport facilitated 238,735 aircraft movements (landing or take-off).

Figure 1 provides an overview of the number of movements per month. The airport is licensed to operate 365 days a year, 24 hours per day. In the winter season (Nov-Mar) Dublin Airport facilitates between 16,000 and 18,000 movements per month. In the summer season demand for air transport is higher and the number of movements facilitated by Dublin Airport rises to between 20,000 and 23,000 movements per month.

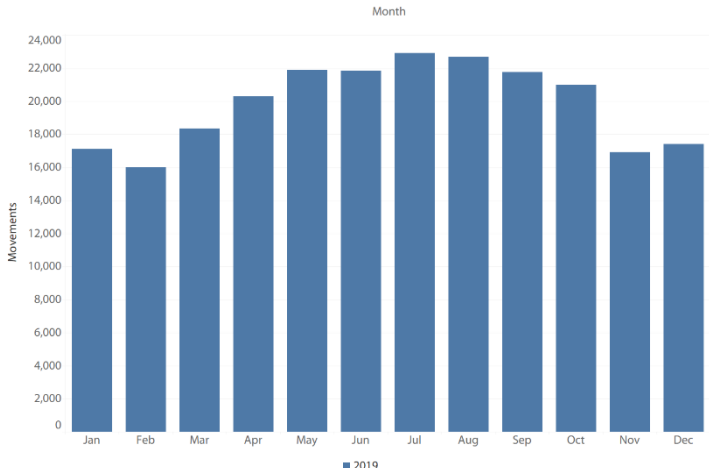

Figure 1: Movements per month in 2019

Figure 2 provides an overview of the number of movements per hour of the day. 12 percent of movements in 2019 took place during the night (23:00-07:00). Due to airline scheduling mechanisms, the majority of movements between 23:00 and 04:00 of flights are arrivals (over 75%) and between 06:00 and 07:00 the majority of movements (over 85%) are departures.

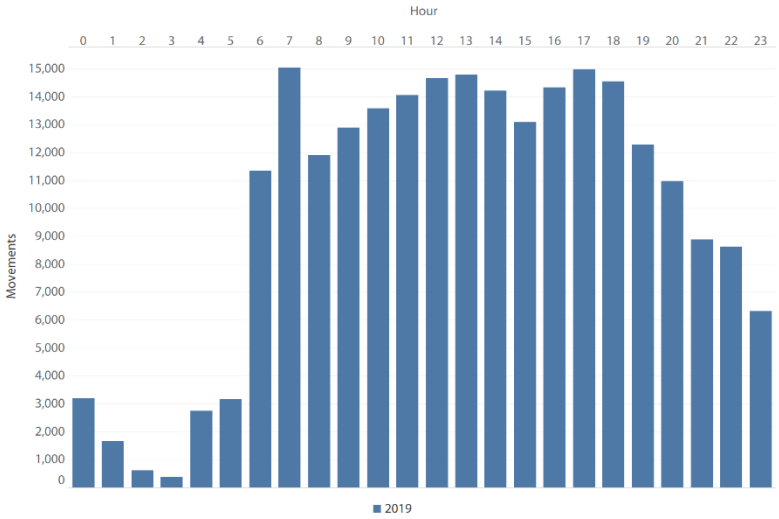

Figure 2: Movements per hour in 2019

3.2 Aircraft

The majority of movements at Dublin airport are performed using medium sized jets, with the Boeing 737 and Airbus A320 series aircraft accounting for around 70% of movements in 2019. Like other airports across Europe, noisier aircraft (referred to as Chapter 2 aircraft) are banned from operating at Dublin Airport.

As is seen in Figure 3, the majority of aircraft using Dublin Airport in 2019 were Chapter 4 and 14 compliant.

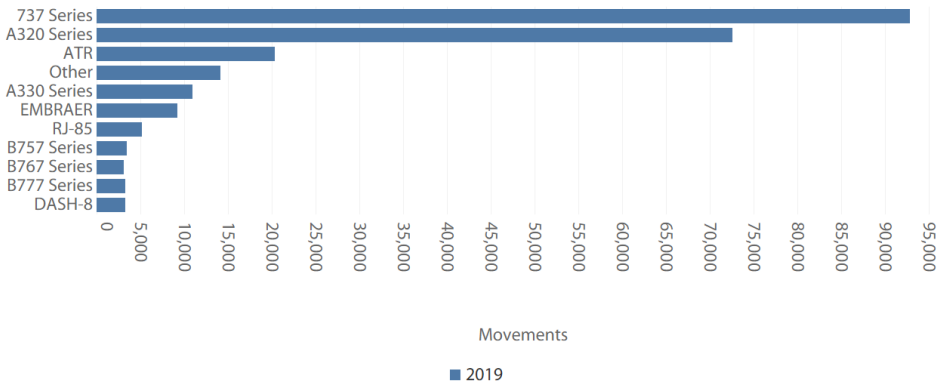

Figure 3: Movements per aircraft type in 2019

3.3 Runway layout and usage

Dublin Airport currently operates two runways: a main east-west runway 10/28 with a length of 2,637m, and a cross northwest-southeast runway 16/34 with a length of 2,072m.

Runway 10/28 is operated as the primary runway. As Figure 5 shows, 72% of all movements used this runway in westerly operation and 26% in easterly operation. Runway 10/28 is the required runway between 06:00 and 23:00 when the crosswind component is 20 kts or less. Runway 28 is the preferential runway when the tailwind component is 10 kts or less and braking action is assessed as good. Aircraft are required to use these runways except when operational reasons dictate otherwise. Between 23:00 and 06:00, runways are prioritised subject to the same wind calculation method and values as used between 06:00 and 23:00. Runway usage is also prioritised for noise abatement purposes during these hours when operation and weather conditions allow.

Runway 16/34 was used for only 2% of the movements in 2019. Runway 16/34 is only used when the crosswind component on runway 10/28 exceeds 20 knots and is expected to persist for a prolonged period of time. It is also used during dual operations for peak departures between 06:30 and 08:00 or when maintenance is conducted on runway 10/28. High usage of the primary runway is preferential in terms of noise impact, since the areas underneath its flightpaths are less populated then runway 16/34, whose flightpaths to the south are located over Dublin. Most departure operations overfly North Dublin when Runway 16 is operational. Runway 34 is rarely used for arrivals.

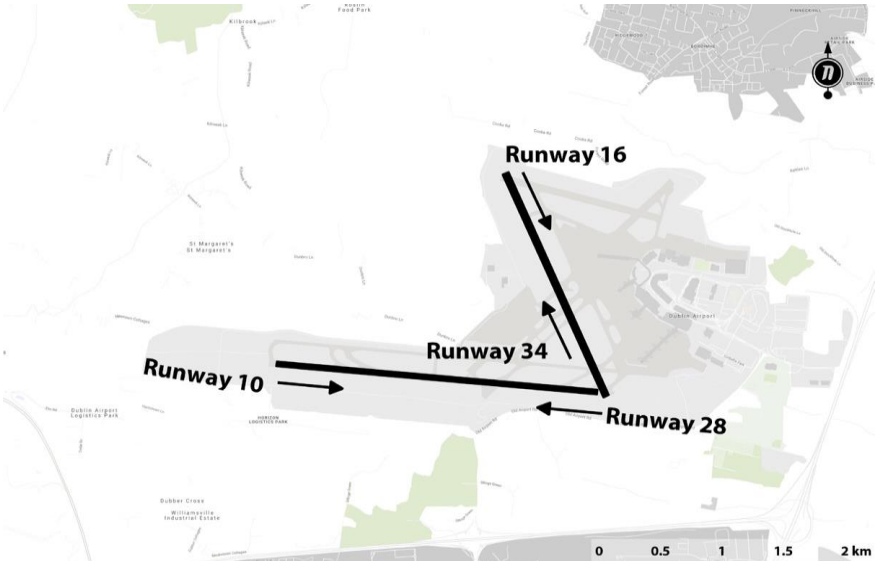

Figure 4: Runway layout Dublin Airport

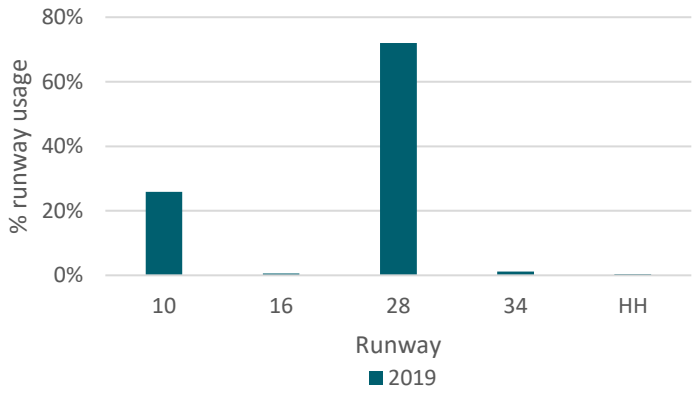

Figure 5: Runway usage 2019

3.4 Noise mitigation measures

Aircraft operators are instructed to ensure that, at all times, aircraft are operated in such a way as to cause the least disturbance practicable in areas surrounding the airport. Noise mitigation measures include:

- Preferred runway usage of runway 10/28 when conditions permit this;
- Reverse thrust should not be used during landing operations on any runway between 23:00-06:00, except where operational or safety reasons dictate otherwise;
- Take-off climb shall comply with the specified Noise Abatement Departure Procedure;
- Strict compliance with SID is mandatory;
- Compliance with environmental corridors (see below), although ATC can vector out of SIDs as required for weather, traffic and safety reasons.

Environmental corridors

Large aircraft (Category C/D) are required to fly within the environmental corridors which are based on the runway take-off flight path areas. Figure 6 provides an overview of these corridors. The corridors have a width of 180 metres at the departure end of the clearway, diverging at 12.5% on each side to a maximum width of 1.8km. Departures from all runways except Runway 10, must track the runway extended centreline after take-off to 5NM before commencing turn, unless otherwise cleared by ATC 3000ft above mean sea level (AMSL). Departures from Runway 10 must track the runway extended centreline to 5NM before commencing turn to the north, or to 6NM before commencing turn to the south. For departures from runway 10, there is no upper vertical limit to the corridor.

The corridors also apply for approaches to the reciprocal runway, except for circling approaches. The Environmental Corridors do not apply to Category A/B aircraft (light aircraft, turbo prop and Bae 146 type aircraft).

Figure 6: Overview of environmental corridors

The airport maintains and operates a noise monitoring and flight track keeping system. The results from this system are used to investigate track keeping. Track keeping investigation will be discussed in more detail in chapter 5.

4 Noise monitoring 2019

4.1 Noise monitoring stations

Dublin airport's Noise & Flight Track Monitoring Service consists of 7 Noise Monitoring Terminals (NMTs), which are installed in the area around the airport. The current system provided by Bruel & Kjaer, Envirosuite, was commissioned by daa in 2002 to monitor the noise performance of Dublin Airport.

The NMTs are set to record continuously and to trigger a noise event when two conditions are met. The first condition is the threshold level. The threshold level needs to be exceeded before recording is initiated. The threshold levels are continuously adjusted by the system to ensure maximum correlation between noise and individual operations. The second condition is the length of the recorded noise event. The recorded noise event should last for at least 10 seconds. Due to its proximity to agricultural, roads, and/or urban areas, NMTs can be triggered not just by aviation noise. It is for this reason the system is designed to correlate a noise event with an aircraft departing or landing. Similarly, the system can detect when the noise originates from a weather event, such as thunder or other stormy conditions.

Figure 7 shows the locations of the NMT's:

- NMT 1: Bay Lane, monitoring runway 28 departures and runway 10 arrivals.
- NMT 2: St. Doolaghs, monitoring runway 10 departures and runway 28 arrivals.
- NMT 3: Bishopswood, monitoring the local area.
- NMT 4: Feltrim, monitoring the local area.
- NMT 5: Balcultry, monitoring runway 34 departures and runway 16 arrivals.
- NMT 6: Artane, monitoring runway 16 departures and runway 34 arrivals.
- NMT 20: Coast Road, monitoring runway 10 departures and runway 28 arrivals.

Figure 7: NMT locations

4.2 NMT operational status 2019

Figure 8 provides an overview of the percentage of time the NMT's were operational during 2019. To ensure that Noise Monitoring Terminals keep working within specific limits, internal calibration checks are completed every 6 hours. During this short period, the NMTs are out of operation for short periods of time and do not record noise events. The graph shows that all NMT's were operational 99-100% of the time.

NMT 3 was operational for the whole year, but it was only placed in the current position starting September 2019, therefore only it's measurements from the start of September to the end of December 2019 are included in the following sections.

NMT 1 suffered damage on the 10th of March and was fully repaired on the 8th of May. Although the NMT remained operational, readings were affected during this period.

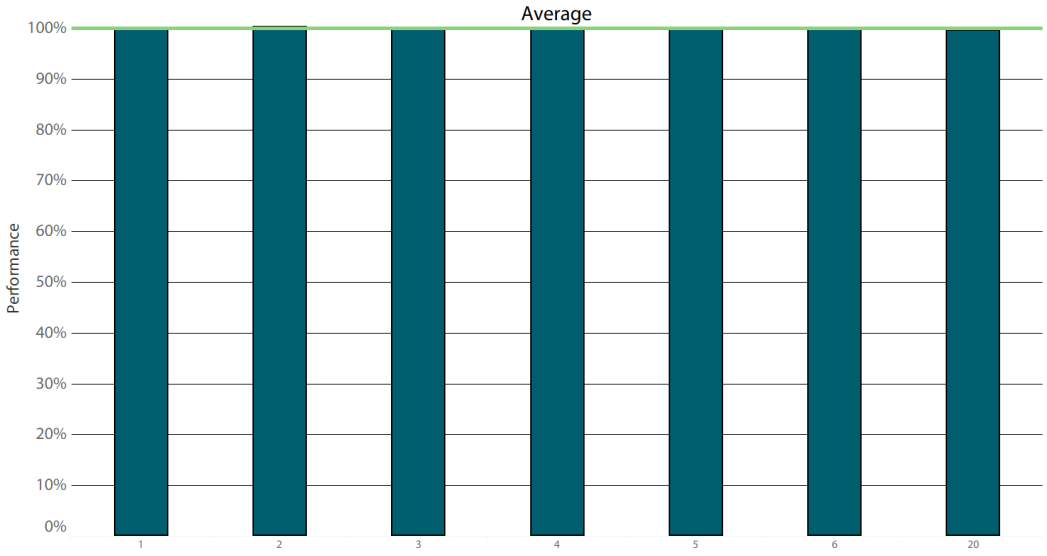

Figure 8: NMT operational status 2019

4.3 Noise events per NMT

As mentioned in the introduction, the system automatically classifies noise as aircraft noise, weather related noise or noise related to normal human activity. Due to their location relative to the airport and flightpaths, the NMTs record less or more aircraft noise. NMTs located directly under the flight paths of runway 10/28 (NMT 1, 2 and 20) mostly record aircraft noise events. NMT 6, located in North Dublin mostly records noise events related to normal human activity, due to its busy surroundings and the limited use of runway 16/34.

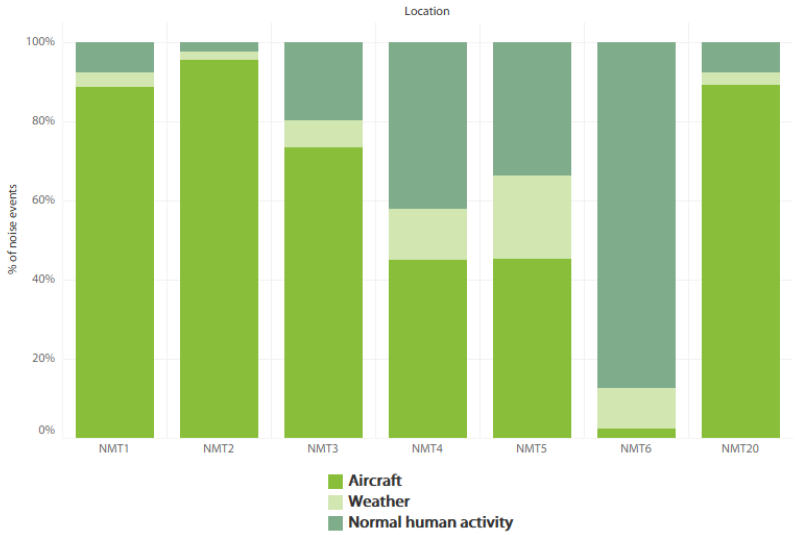

Figure 9: Noise events per NMT

4.4 Average noise levels per NMT (day)

The figures in this section present the average noise levels measured by the NMT's during daytime periods (07:00 – 23:00). Recorded noise levels during these time segments are averaged over the 16-hour period. This procedure is followed both for all noise events (total noise), and for those events that were correlated to aircraft movements. The results shown are presented per month. As mentioned before, NMT 1 readings where affected due to damage between the 10th of March and the 8th of May.

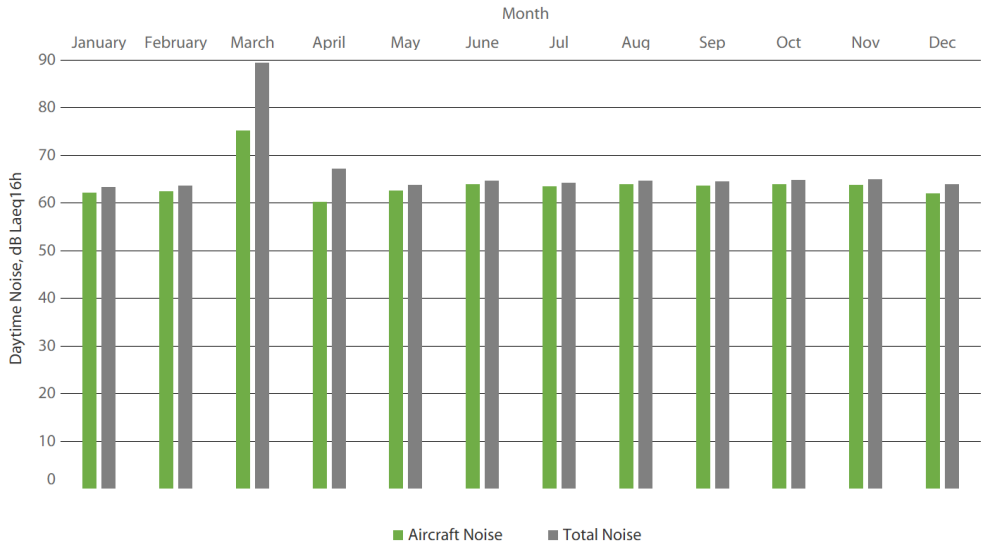

Figure 10: Averaged daytime noise levels NMT1 2019

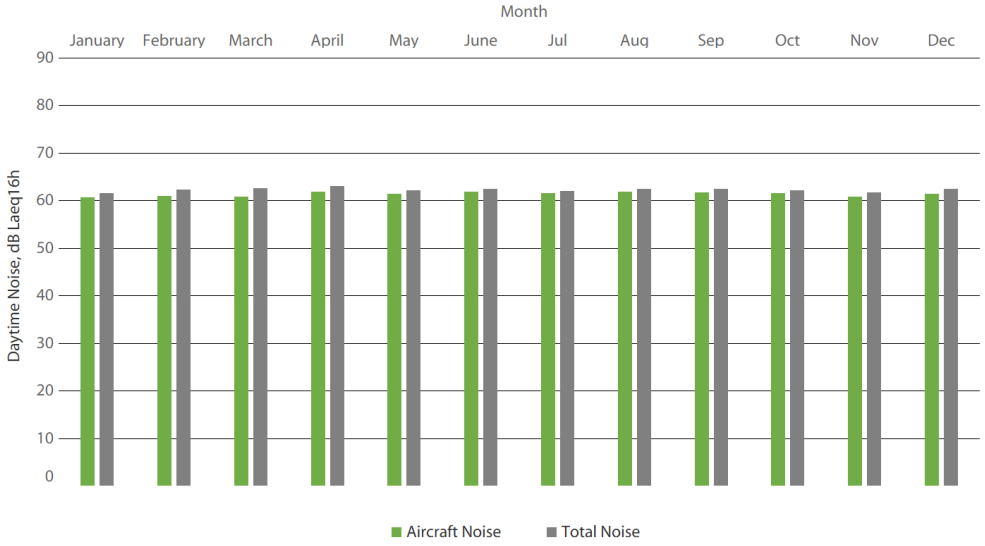

Figure 11: Averaged daytime noise levels NMT2 2019

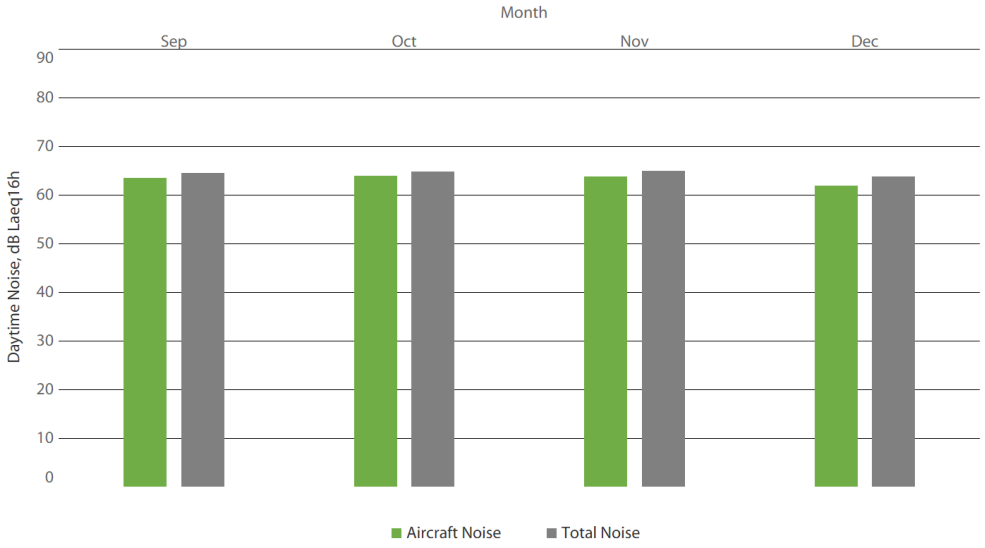

Figure 12: Averaged daytime noise levels NMT3 2019

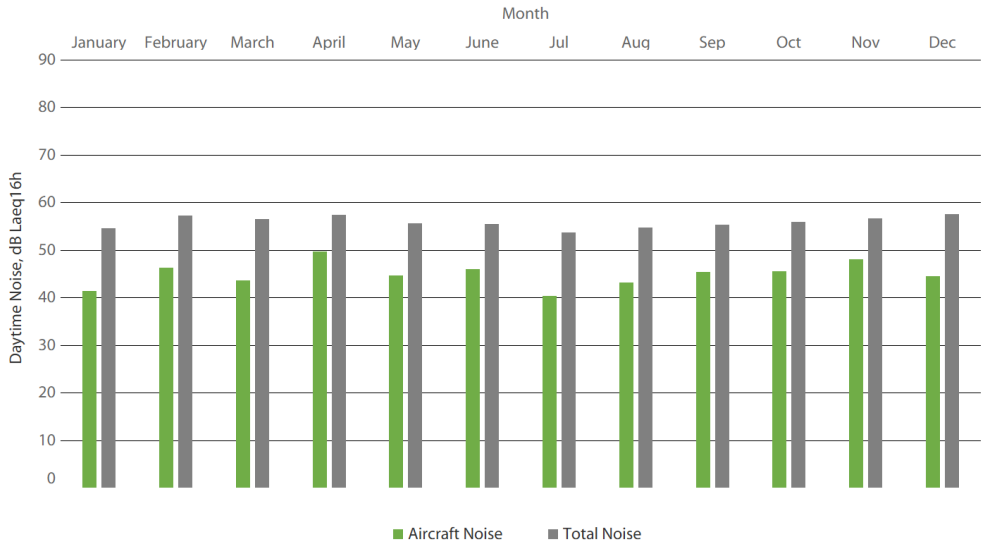

Figure 13: Averaged daytime noise levels NMT4 2019

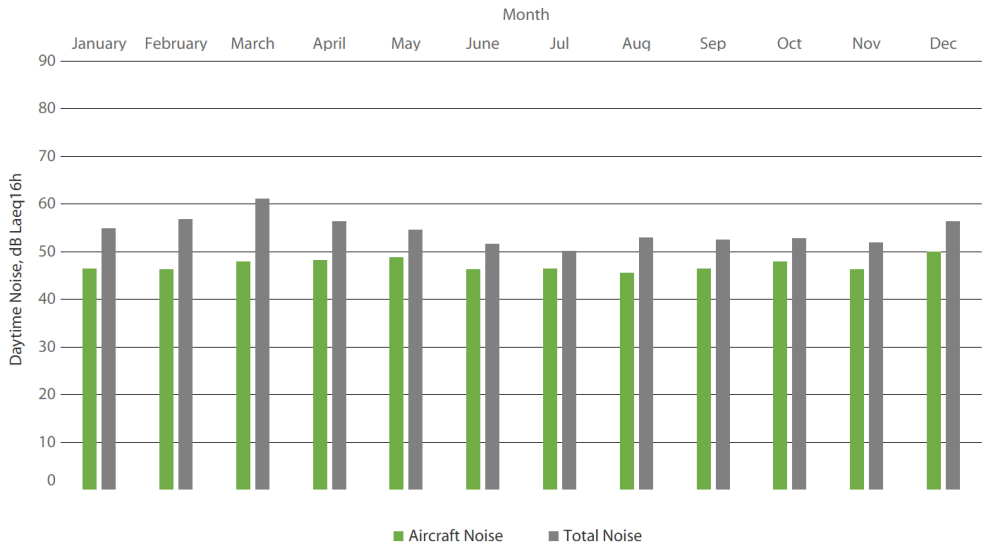

Figure 14: Averaged daytime noise levels NMT5 2019

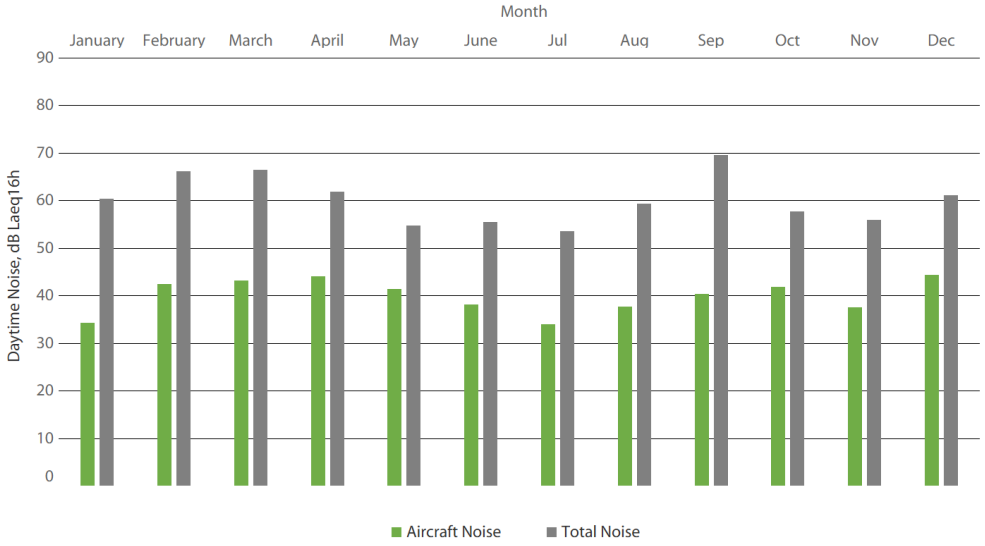

Figure 15: Averaged daytime noise levels NMT6 2019

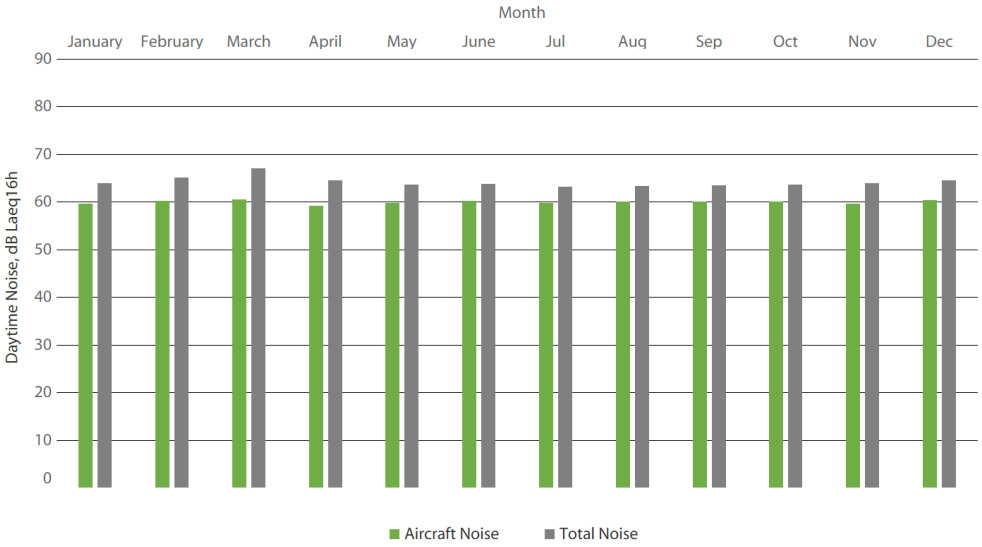

Figure 16: Averaged daytime noise levels NMT20 2019

4.5 Average noise levels per NMT (night)

The figures in this section present the average noise levels measured by the NMT's during nighttime periods (23:00 – 07:00). Recorded noise levels during these time segments are averaged over the 8-hour period. This procedure is followed both for all noise events (total noise), and for those events that were correlated to aircraft movements. The results shown are presented per month.

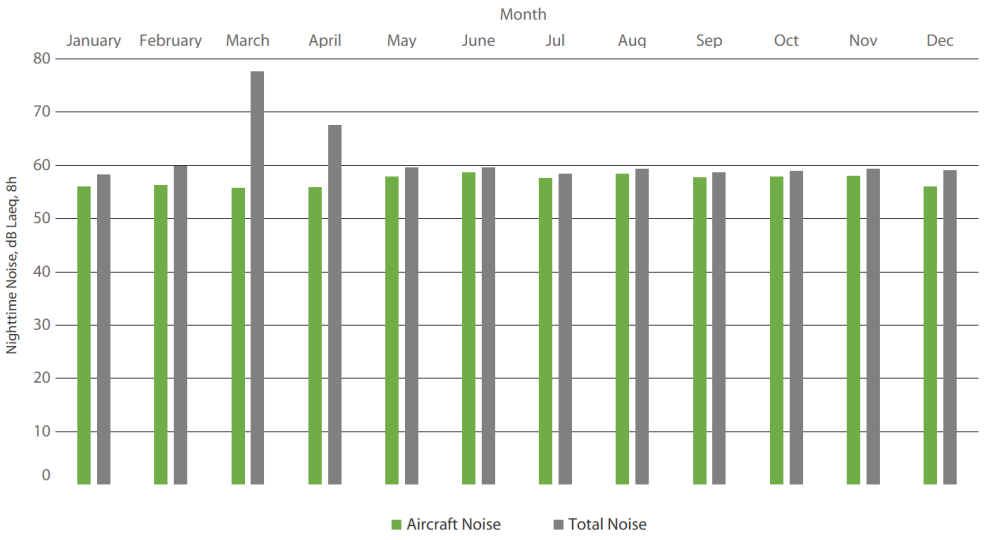

Figure 18: Averaged night-time noise levels NMT1 2019

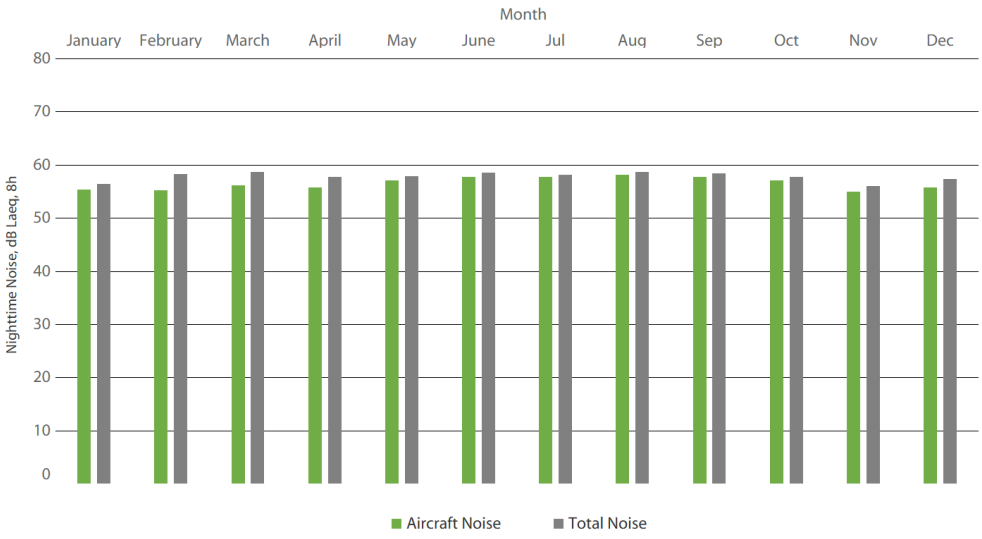

Figure 17: Averaged night-time noise levels NMT2 2019

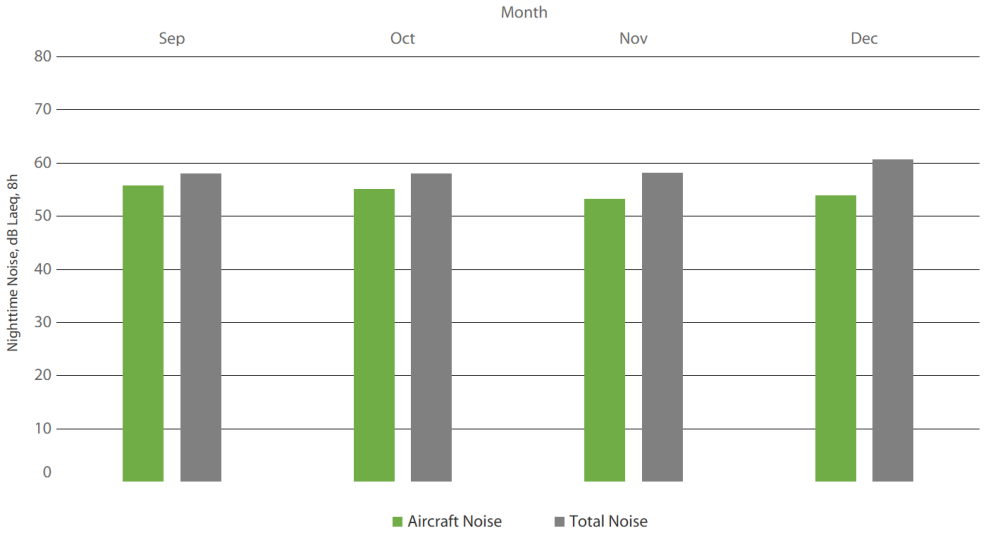

Figure 19: Averaged night-time noise levels NMT3 2019

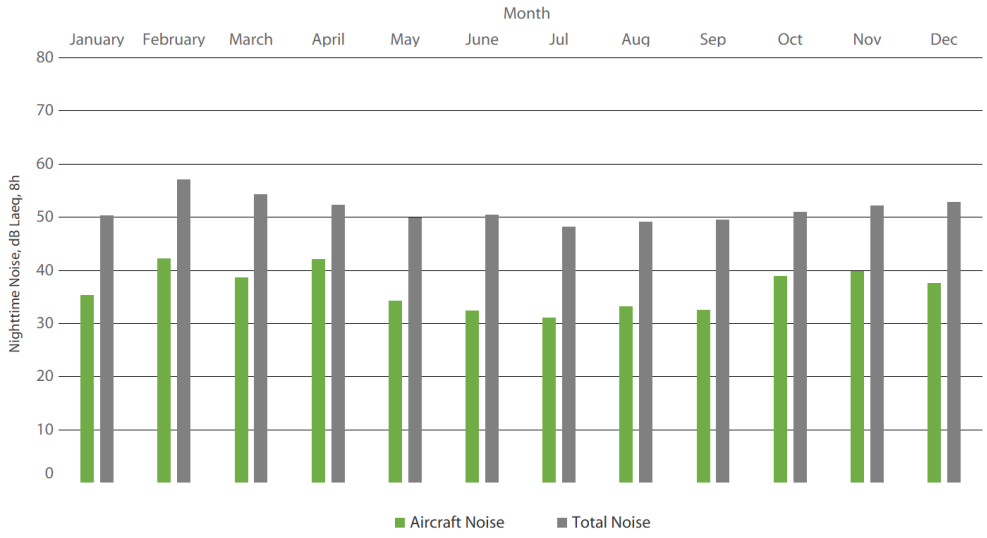

Figure 20: Averaged night-time noise levels NMT4 2019

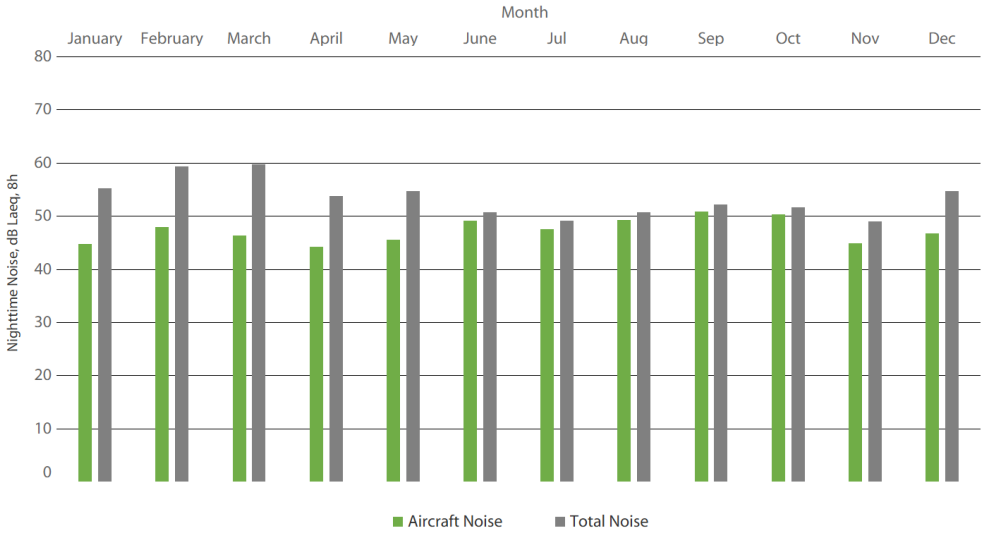

Figure 22: Averaged night-time noise levels NMT5 2019

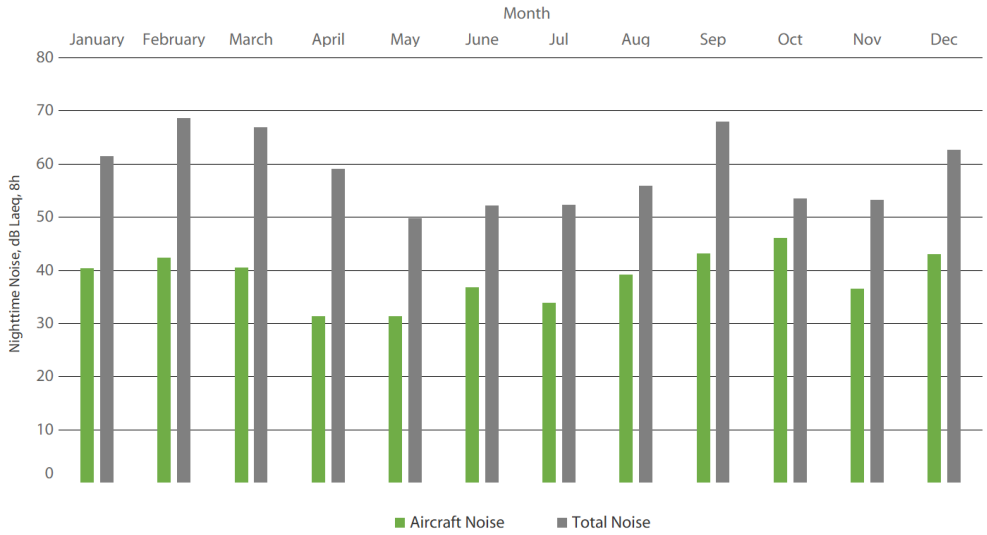

Figure 21: Averaged night-time noise levels NMT6 2019

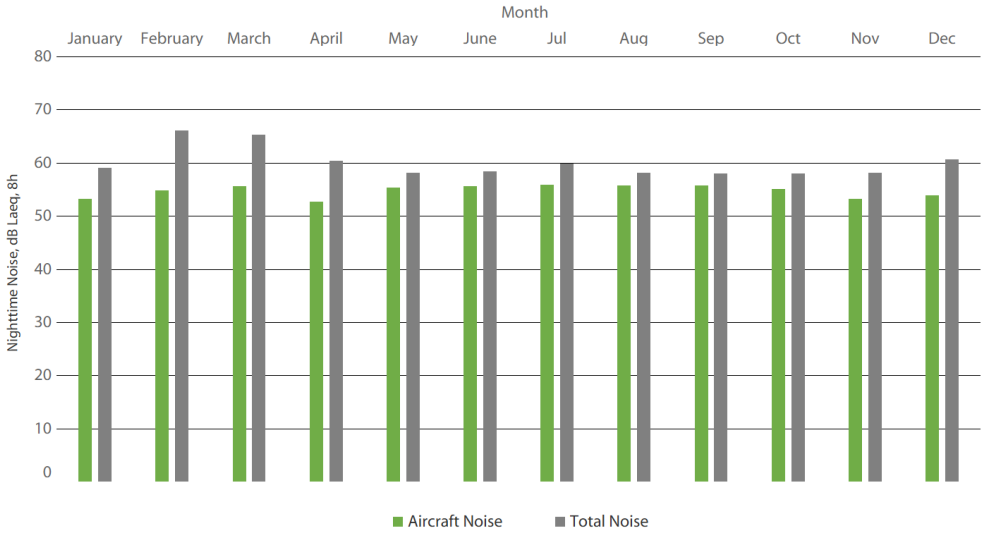

Figure 23: Averaged night-time noise levels NMT20 2019

4.6 Average hourly noise levels per NMT

The figures in this section present the average noise levels measured by the NMT's per hour of the day. Both noise levels of all noise events (total noise), and for those events that were correlated to aircraft movements are presented.

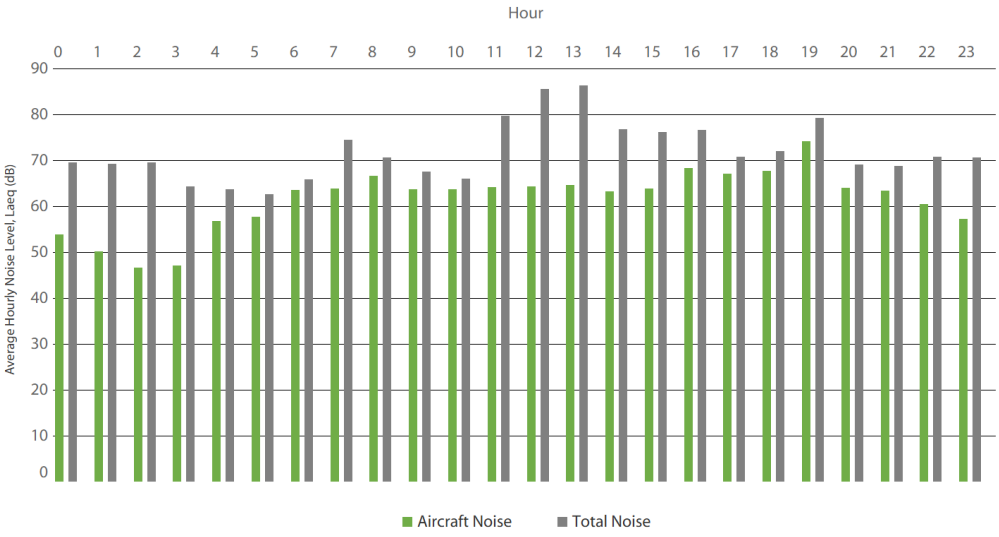

Figure 24: Average hourly noise levels NMT1 2019

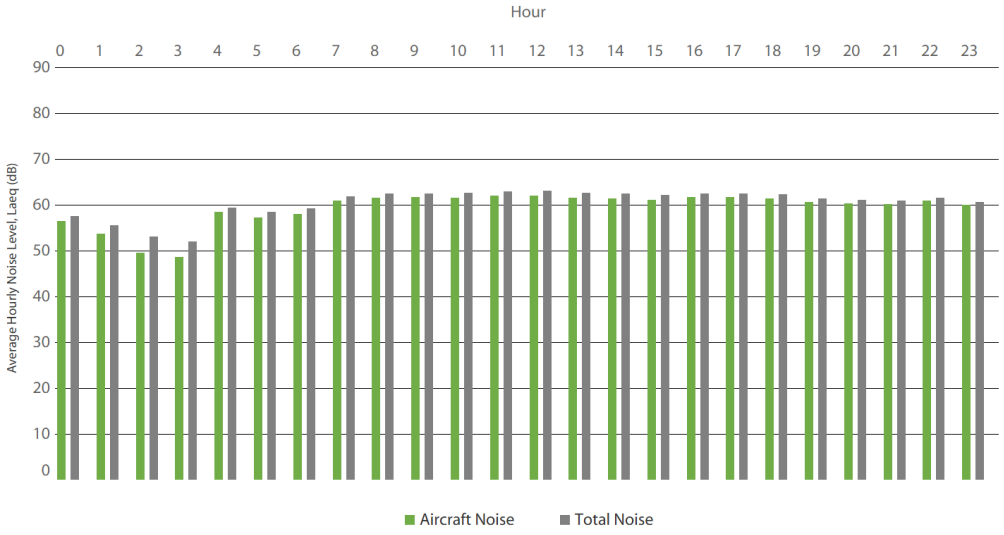

Figure 25: Average hourly noise levels NMT2 2019

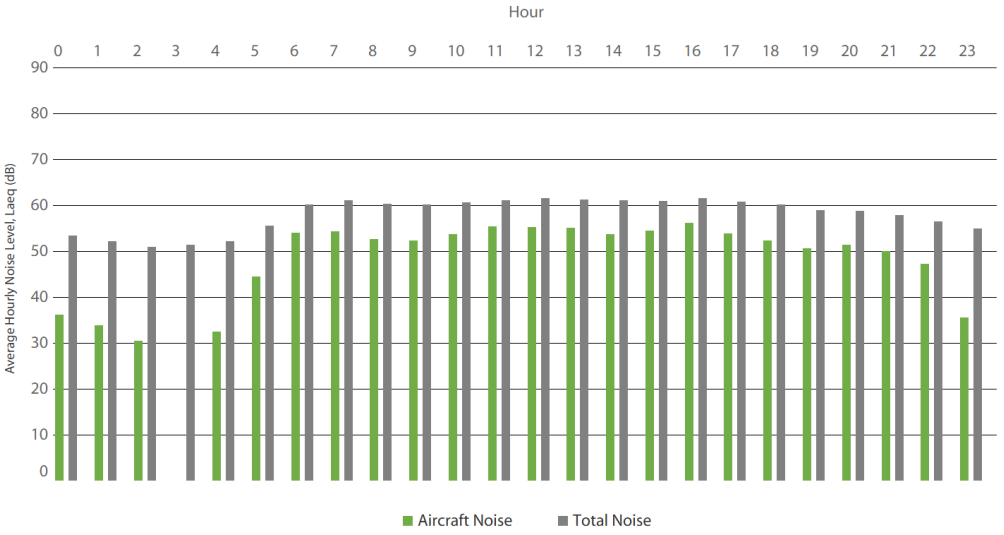

Figure 26: Average hourly noise levels NMT3 2019

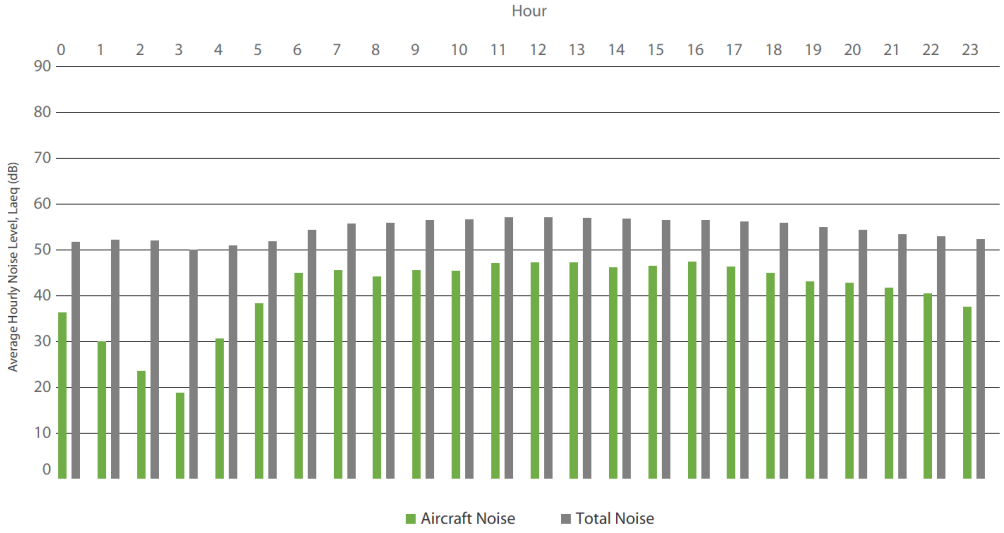

Figure 27: Average hourly noise levels NMT4 2019

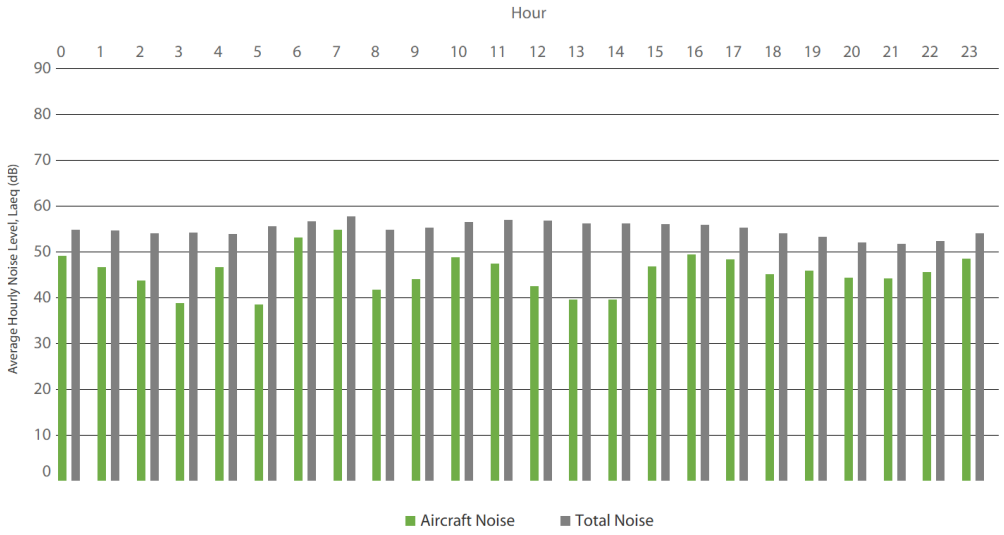

Figure 28: Average hourly noise levels NMT5 2019

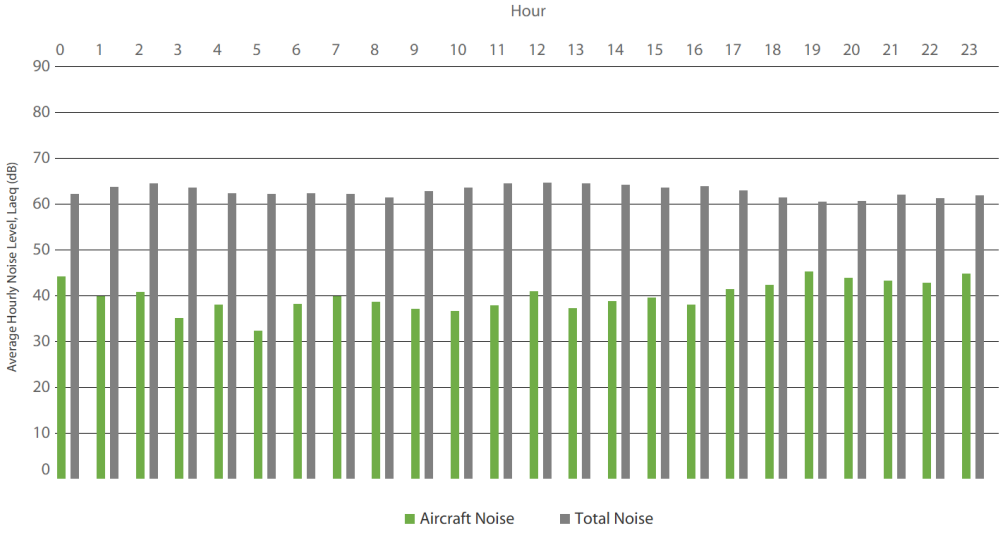

Figure 29: Average hourly noise levels NMT6 2019

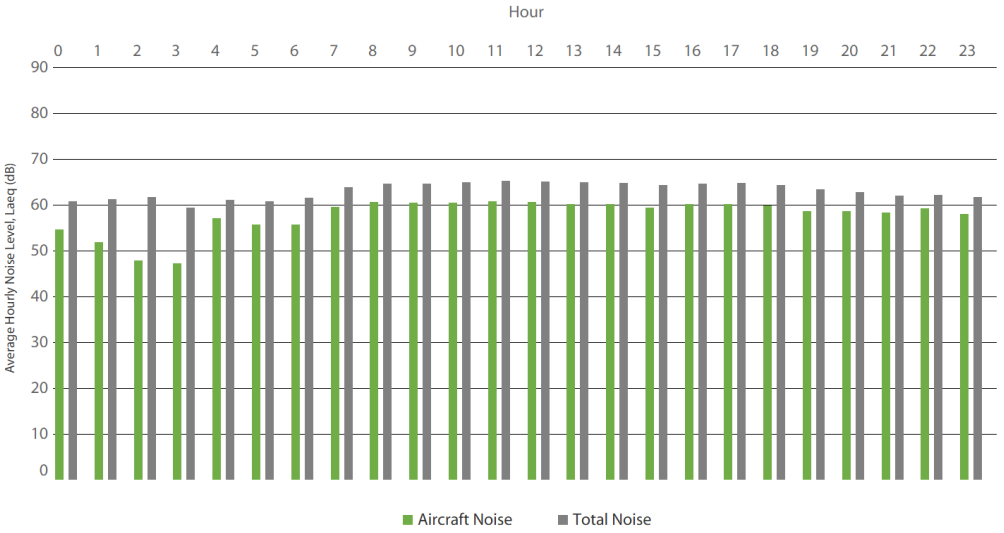

Figure 30: Average hourly noise levels NMT20 2019

4.7 LA_{max} noise levels per NMT

The figures in this section show the LA_{max} distribution for aircraft noise per NMT. LA_{max} indicates the maximum recorded noise level per correlated aircraft-noise event. The distribution is calculated by determining the number of occurrences per 3 dB bracket.

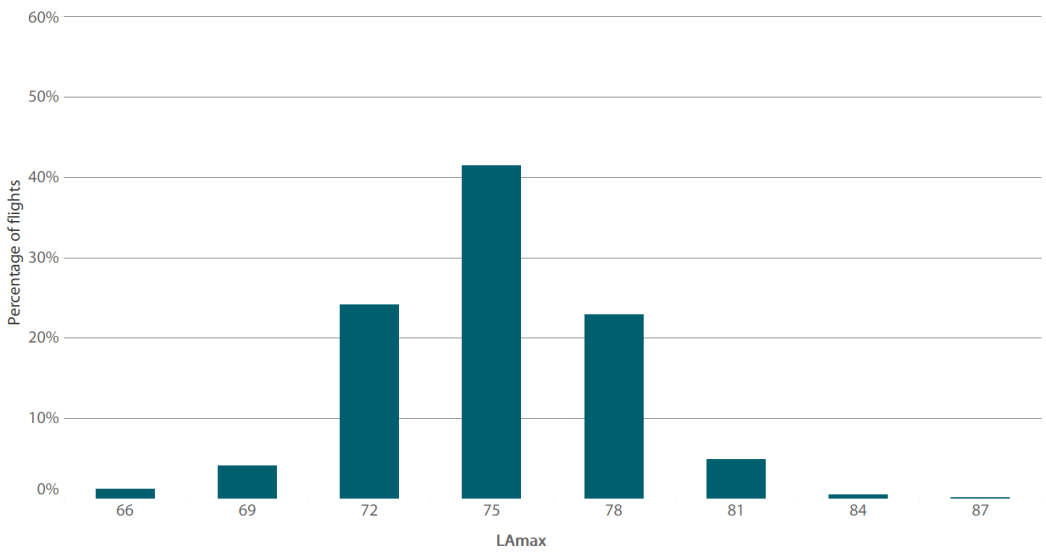

Figure 31: LA_{max} levels distribution for NMT1 2019

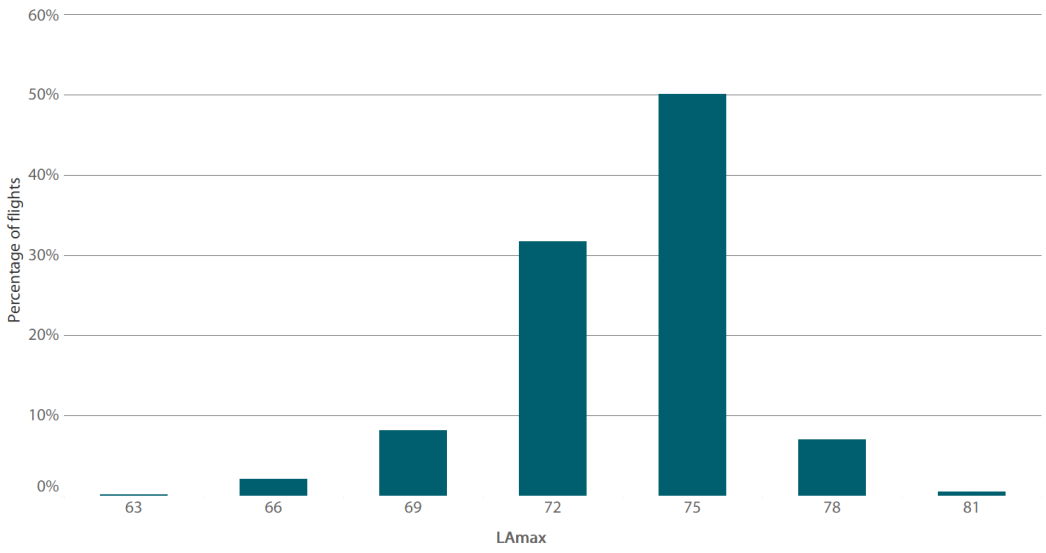

Figure 32: LA_{max} levels distribution for NMT2 2019

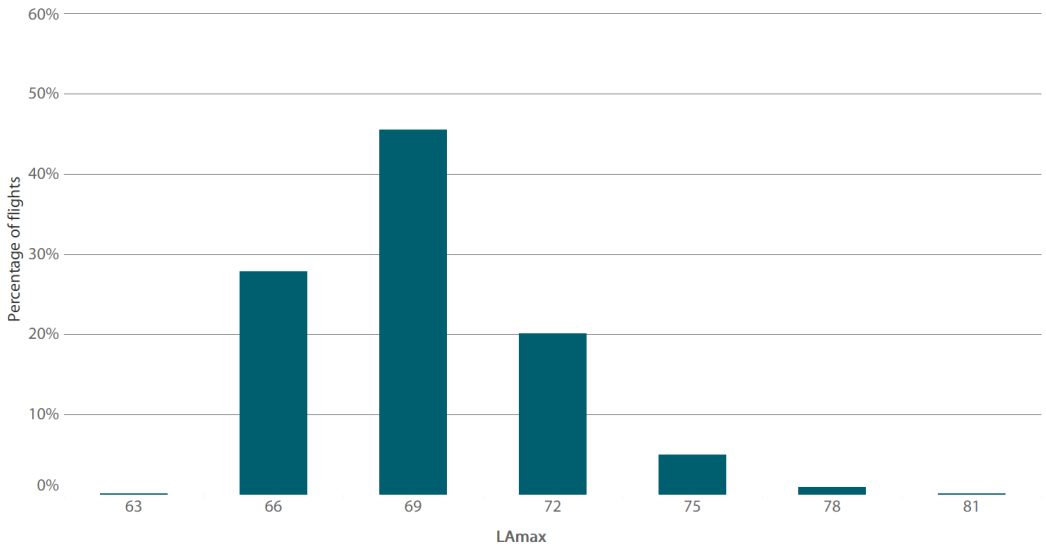

Figure 34: LA_{max} levels distribution for NMT3 2019

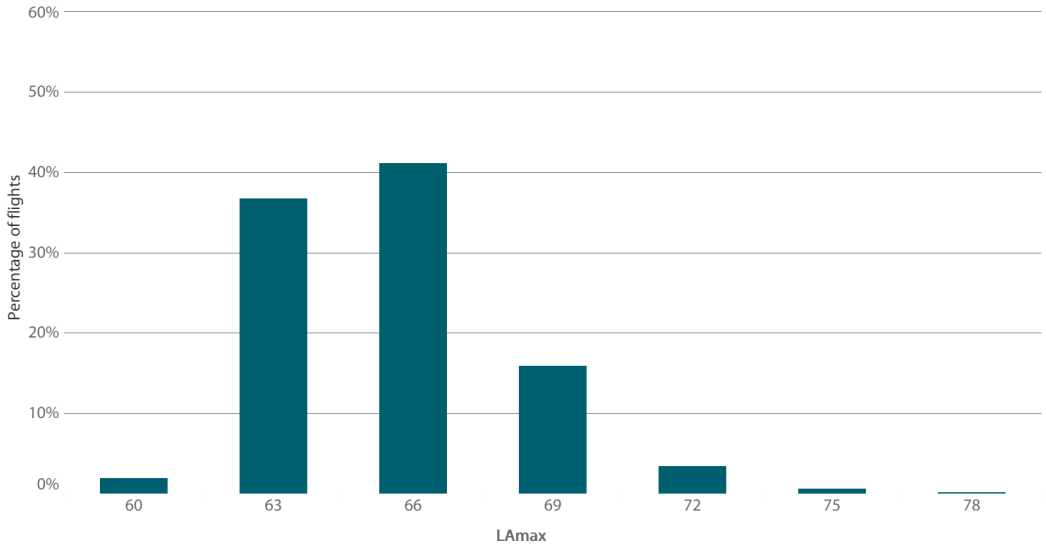

Figure 33: LA_{max} levels distribution for NMT4 2019

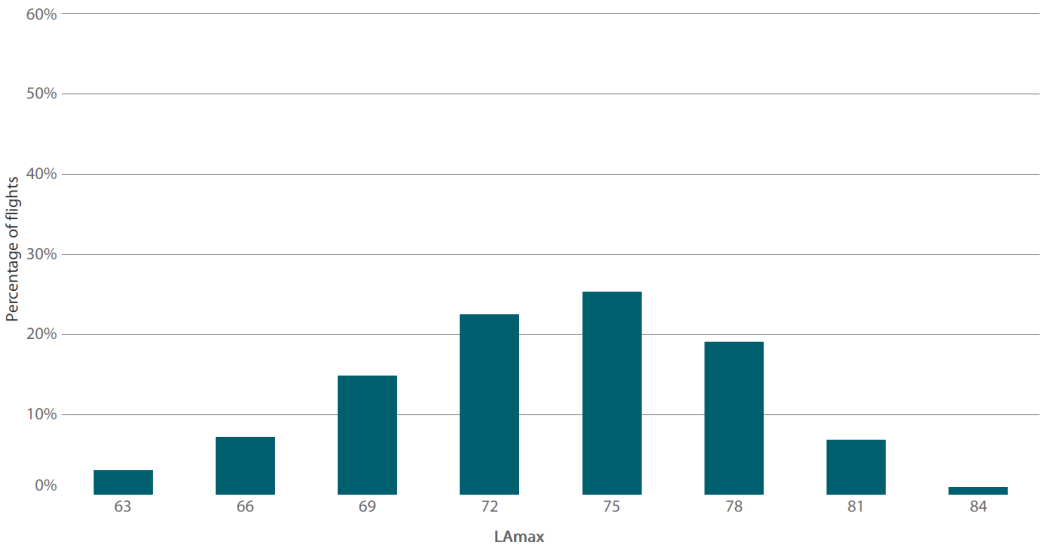

Figure 36: LA_{max} levels distribution for NMT5 2019

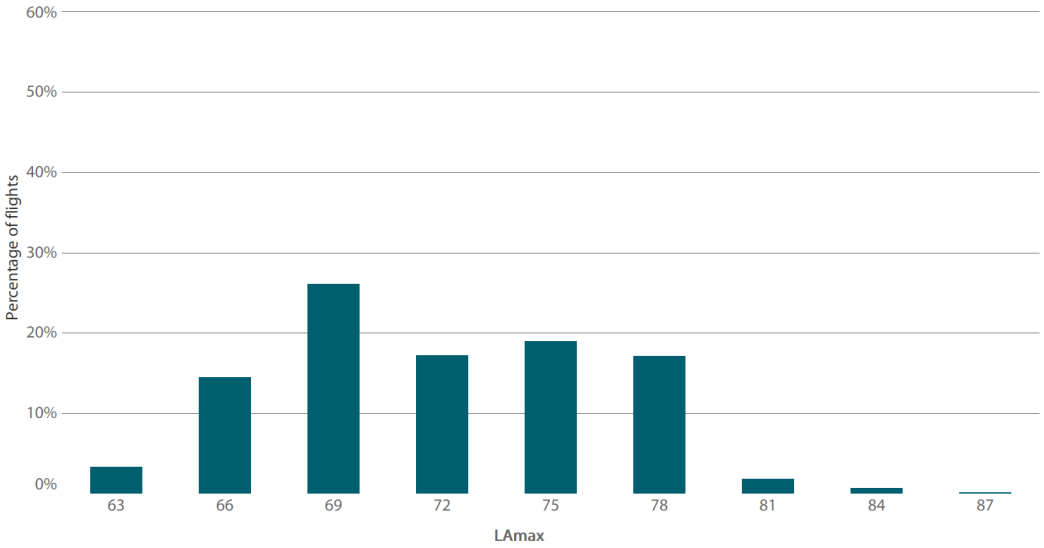

Figure 35: LA_{max} levels distribution for NMT6 2019

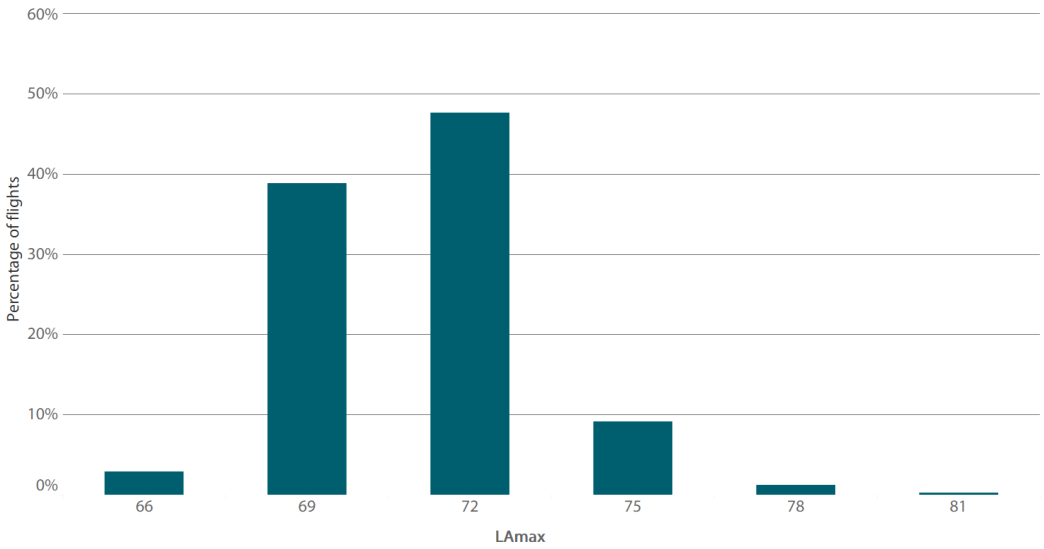

Figure 37: LA_{max} levels distribution for NMT20 2019

5 Compliance failures

5.1 Compliance with operating restrictions

Dublin Airport is currently licensed to operate without operating restrictions, so there are no incidences of failures to comply with operating restrictions due to changes in flight procedures to report on.

5.2 Compliance with noise mitigation measures

This section will go into detail on failures by airport users to comply with noise mitigation measures, specifically aircraft flying off track without being directed to do so by the ANSP Air Traffic Service Unit (ATSU i.e. Dublin ATC). There are four environmental corridors at Dublin airport, one for every runway direction. Corridors are defined by lateral and longitudinal restrictions. Paragraph 3.4 provides a detailed description of the corridors.

5.2.1 Complaint procedure

Residents can file a complaint with Dublin airport via phone, internet or post. Each complaint is logged and issued with a unique complaint reference number. The Noise and Flight Track Analyst then investigates each individual complaint using the Noise & Flight Track Monitoring System. In the case of "off track" complaints the analyst examines the radar track data to see if the aircraft in question has breached the environmental corridor. If there is no breach a letter is sent to the complainant explaining the outcome.

If it is found that an aircraft has breached the environmental noise corridor a letter is sent to the complainant confirming this and the details of the breach are then forwarded to the ANSP ATSU for further investigation.

As part of the ANSP ATSU's investigation they will examine under what conditions, if any, the flight crew of the aircraft was given permission to exit the environmental corridor early. If the airline is responsible for the breach of the environmental corridor a letter is sent to the Chief Pilot or Flight Operations Manager of the airline seeking an explanation for the actions of their flight crew. The result of the ANSP ATSU's investigation is relayed to the Noise and Flight Track Analyst who then forwards on the results to the complainant. The complainant is informed of the progress at each stage of the investigation.

5.2.2 ANSP ATSU investigations

As mentioned, the ANSP ATSU only investigates flights that breach the environmental corridor if the aircraft is the subject of a complaint from a member of the public. In 2019, 56 queries were sent to the ANSP ATSU for investigation. Figure 38 provides an overview of the causes of environmental corridor breaches identified in the ANSP ATSU's investigations.

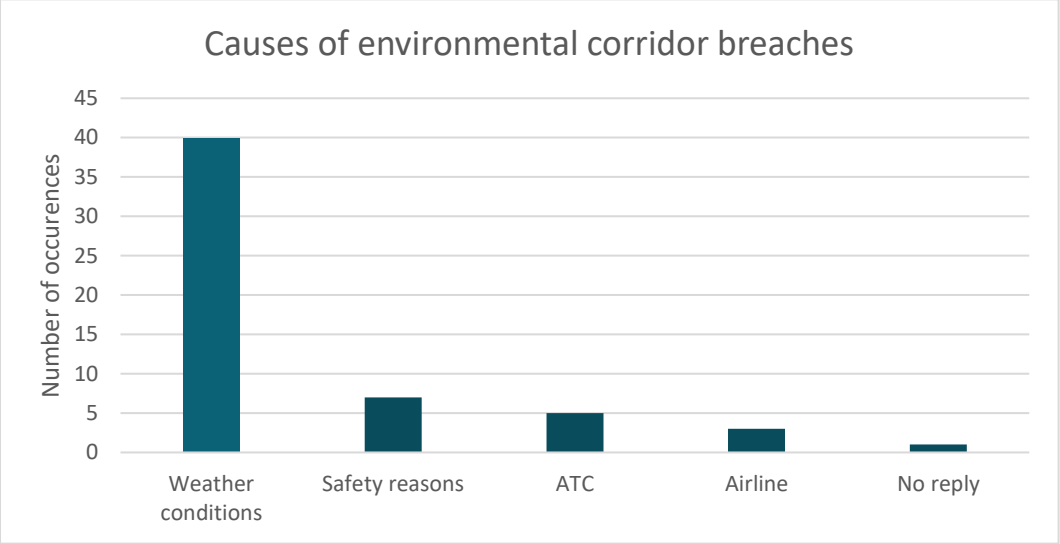

Figure 38: Number of environmental corridor breaches per cause

5.2.3 Track keeping statistics

Although most breaches are not investigated by the ANSP ATSU, Dublin Airport does keep track of these breaches in their Noise & Flight Track Monitoring Service. The ANSP ATSU does not have real time access to this system. The NFTMS recorded 1594 infringements/ breaches of the environmental corridor in 2019. This means over 99% of all category C/D movements complied with the environmental corridor. Figure 39 provides an overview of the breaches per month in 2019.

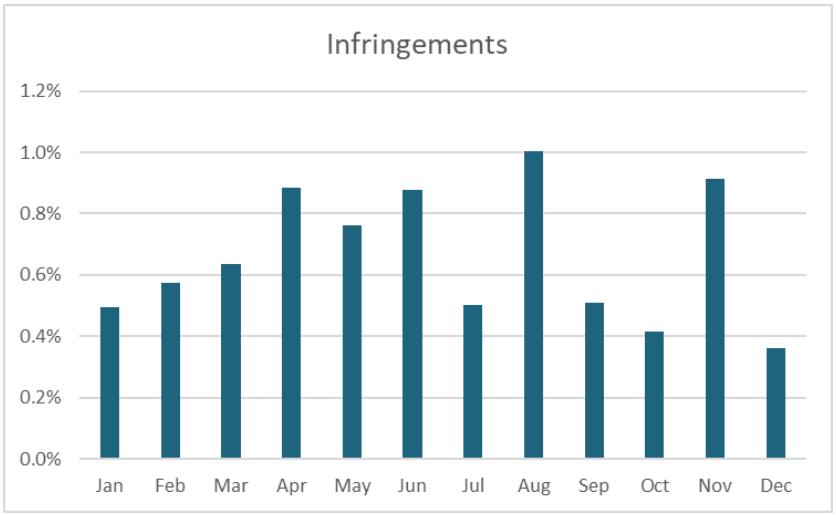

Figure 39: Breaches of the environmental corridor in 2019

5.3 Proposals for monitoring and increasing compliance

The previous paragraph shows that breaches of the environmental corridor occur with 0.7% off all category C/D movements. Potential measures to decrease the number of breaches of the environmental corridor include:

- **Pre-flight communication:** The environmental corridors are defined in the AIP. Additional information about the corridors and reminders of their importance can be provided to flight crews by distributing flyers to airlines and displaying information in crew areas.
- **Post-flight feedback:** the ANSP ATSU only investigates a query if an aircraft is the subject of a complaint from a member of the public. However, all infringements are recorded in the NFTMS. The daa may use this information to communicate monthly statistics with airlines and use these statistics to start conversations with airlines who frequently breach the environmental corridors. When such conversations are not showing effects, a more public form of presenting the statistics per airline can be considered (such as the introduction of League Tables for compliance with light procedures).
- **Advanced monitoring:** daa is in the process of sourcing a more advanced Noise & Track Monitoring System (ANOMS), which has improved capabilities. This process will also include the provision of additional NMTs at appropriate locations. This system will strengthen the monitoring capabilities of the daa, which will help to increase monitoring and compliance tracking.
- **Flight reporting software:** daa is looking at the possibility of introducing a Webtrak system, which is a (near) live flight reporting system that gives members of the public the ability to self-investigate and report their own noise complaints. An internal trial of the system is planned for the second half of 2020.
- **Financial incentives:** Dublin Airport is currently assessing environmental charges which would include noise related charges. The development of proposals is ongoing and will require consultation with the airlines prior to finalisation and implementation.