November 30, 2016

MARLBOROUGH NOISE MONITORING REPORT

Introduction

A noise monitoring terminal (NMT) was deployed in the community of Marlborough from June to September 2016 to measure aircraft and community noise levels. This report is intended to provide a technical summary of the measured noise levels collected from the monitor, which was located on the roof of the Marlborough Community Hall (6021 Madigan Dr NE).

Monitoring Location & Equipment

The location was selected based on flight tracks, access and existing quiet community noise levels. Figure 1 illustrates the location compared with a typical four hour period (10am to 2pm) of southerly operations when aircraft are departing from runway 17L. During the monitoring period there were approximately 4,644 departures from runway 17L.

The equipment used was a Brüel and Kjær Model 2250 Type 1 Precision Integrating Sound Level Meter, which is one of the most accurate instruments that is suitable for environmental noise measurements. The microphone was mounted on a 1.5 m tripod and protected by a wind screen. The sound level meter was supplied with AC power and installed with a battery backup, with an email alert system that notified staff of any equipment issues in real time. The data collected provides continuous one second A-weighted sound levels (one second Leq dBA) for the monitoring period.

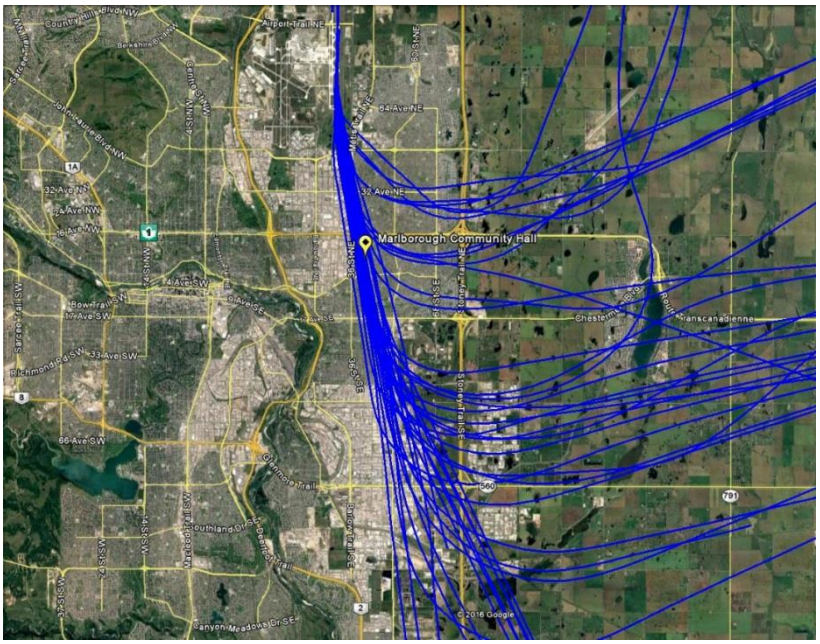


Figure 1: Portable Monitor Location

Monitoring Results

A noise event is captured when the sound level and duration exceed a predefined threshold. The NMT deployed at Marlborough was calibrated to capture noise events greater than 60dBA that lasted longer than 5 seconds.

Noise events can be either aircraft or non-aircraft related. An evaluation of the number of aircraft operations were matched with noise events recorded by the NMT. A noise event is associated with an aircraft overhead when the noise event occurs at the same time of an aircraft overflight. This allows the contribution of aircraft noise to be determined in relation to other community noise sources.

During the four month monitoring period, a total of 19,416 noise events were measured at the site. Of these 19,416 noise events, 2,632 (less than 14%) were related to aircraft movements and the remainder were associated with other community noise sources. A breakdown of the 19,416 noise events by aircraft type is provided in Table 1. Table 2 provides a breakdown of the noise events by operation, with Figure 1 providing a graphical illustration of the different operations at YYC.

Table 1: Noise Events Recorded over Monitoring Period*

Events by Type	June	July	August	September
Community	3,620	3,910	5,401	3,853
Jet Aircraft	838	442	346	283
Propeller Aircraft	253	166	150	130
Helicopters	2	9	7	6
Total	4,713	4,527	5,904	4,272

Table 2: Aircraft Noise Events by Operation

Events by Type	June	July	August	September
Arrival 35R	46	61	38	29
Departure 17L	1,004*	516	425	342
Departure 17R	30	22	30	41
Arrival 35L	2	3	0	0
Departure 11	1	0	1	0
Departure 26	2	3	3	0
Arrival 29	0	0	2	0
Unknown **	8	12	4	7

** The increase in June is due to temporary periodic closures of 17R/35L for routine maintenance.*

*** It is known that an aircraft produced a noise event, but could not be associated to a particular runway.*

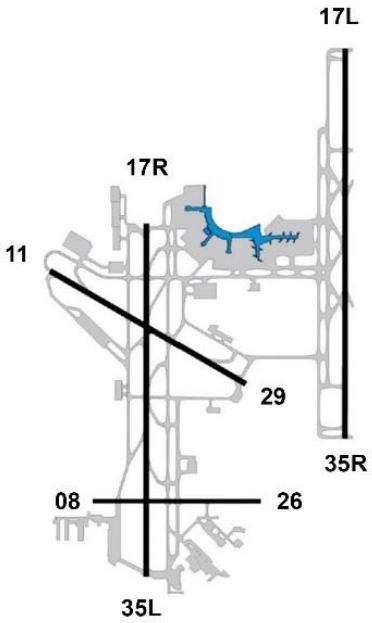


Figure 2: Runway Layout

Figure 3 through 6 provide a monthly summary of the 19,416 noise events according to the Lmax (the maximum sound level measured during a noise event). These figures show that community noise dominated the events captured between 60 dBA to 70 dBA, aircraft and community noise events were relatively equal between 70 dBA to 75 dBA and aircraft noise events caused the majority of events over 75 dBA. Figure 7 provides a scale of common noise for comparison purposes.

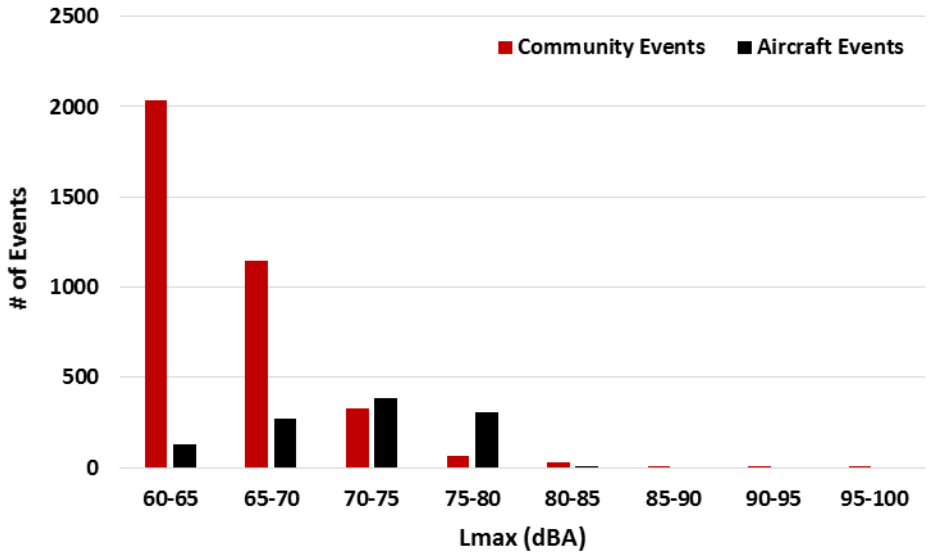


Figure 3: Comparison of Aircraft and Community Noise Events in June

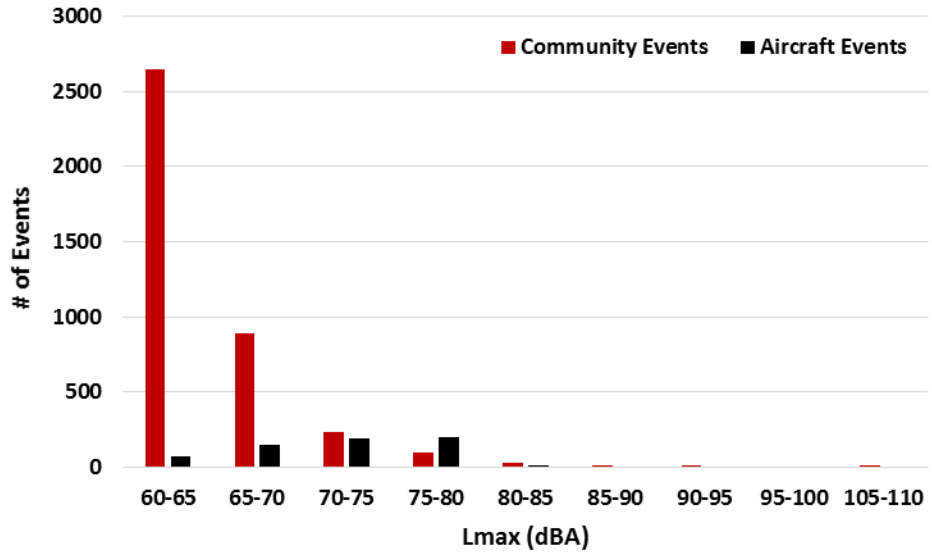


Figure 4: Comparison of Aircraft and Community Noise Events in July

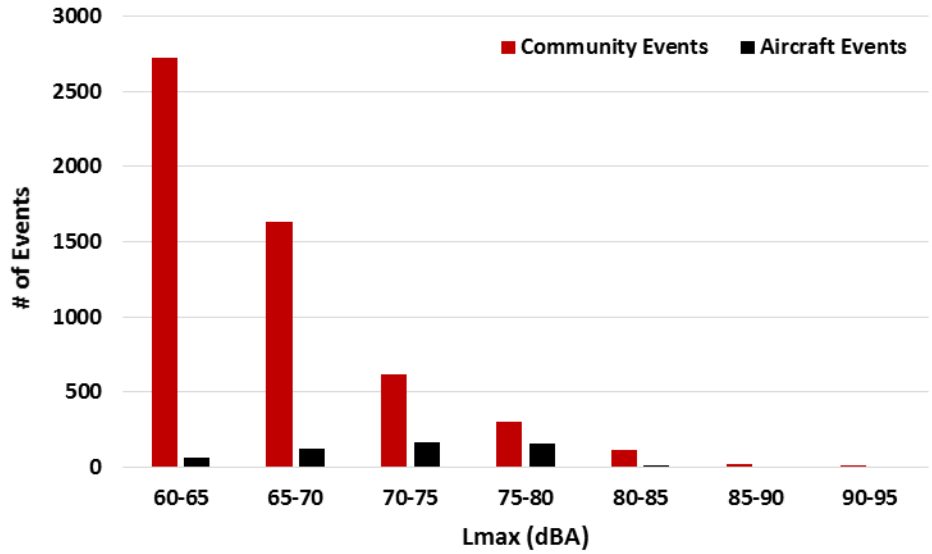


Figure 5: Comparison of Aircraft and Community Noise Events in August

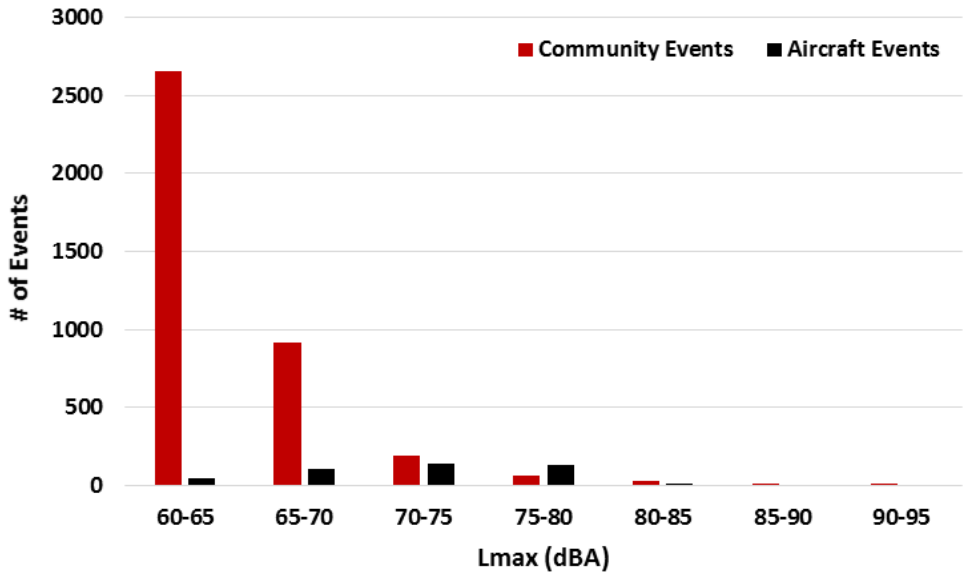
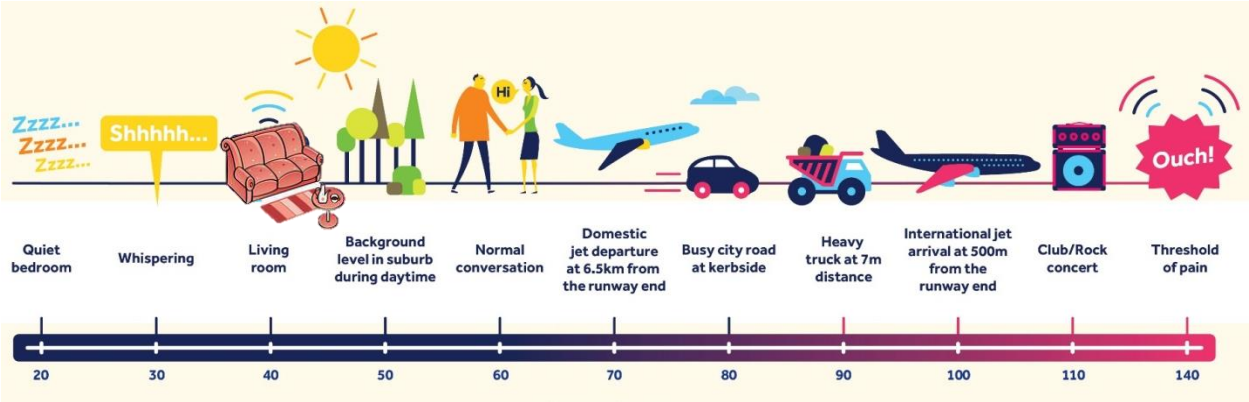


Figure 6: Comparison of Aircraft and Community Noise Events in September



Source: Melbourne Airport, http://melbourneairport.com.au/about-melbourne-airport/planning/aircraft-noise/how-is-noise-generated.html

Figure 7: Typical Sound Levels

Average Sound Level (Leq) and Average Aircraft Day-Night Sound Level (DNL)

Equivalent Continuous Sound Pressure Level, or Leq, is the preferred method to describe sound levels that vary over time, resulting in a single decibel value which takes into account the total sound energy over the period of time of interest.

The Leq measured over the monitoring period are summarized in Table 3.

Table 3: Sound Levels (Leq) over Monitoring Period

Monitoring Period L_{eq}	June	July	August	September
Community	55.1	55.7	56.0	55.3
Aircraft	50.0	47.3	45.9	45.7

The Day-Night Sound Level (DNL) is a 24-hour noise metric that includes both day and night noise measurements in which noise events occurring at night (between 10 PM and 7AM) are penalized by 10 dBA. The dBA 'penalty' is intended to account for greater community annoyance with night-time noise.

The DNLs over the monitoring period are summarized in Table 4.

Table 4: Day-Night Sound Level (DNL) over Monitoring Period

Monitoring Period DNL	June	July	August	September
Community	59.4	60.0	61.0	59.9
Aircraft	51.6	50.0	47.3	46.9

Over the monitoring period, the majority of aircraft noise events recorded were from fixed-wing aircraft departures. The Lmax (maximum sound levels) recorded during aircraft noise events were within the range of recorded community noise event maximum sound levels. During this monitoring period, the community maximum sound level recorded was 105.5 dBA and the aircraft maximum sound level was 84.7 dBA. The daily sound levels (both Leq and DNL) from aircraft noise events were found to be well below the daily community noise level.