



**Client:** Duluth Airport Authority  
**Project:** Duluth International Airport – Part 150 Noise Compatibility Study  
**To:** Tom Werner, Executive Director  
**From:** Jesse Baker, Landrum & Brown  
**CC:** Rob Adams / Philip Gwiner, Landrum & Brown; Kaci Nowicki, SEH  
**Date:** 1/22/2020

---

**Subject:** Duluth International Airport Part 150 Noise Measurement Report

As part of the aircraft noise analysis conducted for the Duluth International Airport (DLH or Airport) Part 150 Noise Compatibility Study Update, temporary noise measurements were performed at sixteen (16) sites near the Airport. Noise meters were located at different residences and public locations to capture noise from aircraft operations. Measurement staff coordinated with property owners and caretakers to gain access to the properties. Each site was selected relative to flight patterns and in response to community suggestions on locations to measure aircraft noise. Noise monitoring was conducted at all sites that were recommended by the community members.

The report is presented as follows:

- **Noise Measurement Methodology:** Provides the make, model, specifications and capabilities of the equipment used during the measurement period, describes the various locations and time periods when measurements were conducted, and describes how noise events were matched to specific aircraft operations.
- **Noise Measurement Site Map:** Map of the location of the temporary noise measurement sites and the existing permanent airport noise monitors.
- **Air Traffic Maps:** Maps of air traffic flight tracks that flew over each site during the measurement periods.
- **Noise Measurement Results:** Describes the noise measurement periods, noise monitoring sites, and aircraft noise levels at each site.

## Noise Measurement Methodology

### Equipment Type

State of the art equipment used in this program included the Larson Davis LxT sound level meters. These are Class I Precision Sound Level Meters (as defined by American National Standards Institute (ANSI) and International Electrotechnical Commission (IEC)). The equipment was calibrated in compliance with manufacturer's procedures. Microphones and recording equipment are the highest quality and are capable of recording and calculating various noise metrics. Each meter logged noise events in terms of date, time, duration and peak noise level metric Maximum Noise Level ( $L_{max}$ ).

### Noise Measurement Sites

Sites for the temporary noise measurements included single-family residences, places of worship and recreational open space. The microphones were placed in backyards if possible, to avoid non-aircraft noise sources. **Table 1**



lists the sites where the temporary noise measurement microphones were located. **Exhibit 1** illustrates the locations of the temporary noise measurement. **Exhibit 1** illustrates the location of each noise measurement site.

**Table 1** Temporary Noise Measurement Sites

| Site | Location   | City       |
|------|--|------------|
| 1    | 5560 MN-194  | Hermantown |
| 2    | 4483 Martin Rd   | Duluth     |
| 3    | 5963 Helm Rd   | Duluth     |
| 4    | 5454 Miller Trunk Rd                                     | Hermantown |
| 5    | West of Lavaque Bypass Rd and Ugstad Rd on Old Ugstad Rd | Duluth     |
| 6    | 4725 Swan Lake Rd  | Hermantown |
| 7    | 5006 Timber Hill Ct                                      | Hermantown |
| 8    | 4670 Lavaque Bypass Rd                                   | Hermantown |
| 9    | 5025 Silver Leaf St                                      | Hermantown |
| 10   | 3902 Norton Rd   | Duluth     |
| 11   | 5545 Miller Trunk Hwy                                    | Hermantown |
| 12   | 2220 Norton Rd   | Duluth     |
| 13   | 4509 Kruger Rd   | Duluth     |
| 14   | 4926 Martin Rd   | Duluth     |
| 15   | Mustang Dr south of Deuce Ave                            | Duluth     |
| 16   | 4464 Ralston Dr  | Duluth     |



## EXHIBIT 1 Temporary Noise Monitoring Sites



Source: Landrum & Brown analysis, 2020.



## Duration of Monitoring

The temporary noise monitoring was conducted for at least two (2) hours at each site. The weather during the monitoring period was clear and normal for Duluth conditions, there was periodic light snow occurring on some days. Both East and West air traffic flow were observed during the measurement dates. **Table 2** lists the dates and times of the monitoring periods at each site.

**Table 2** Temporary Noise Monitoring Duration

| Site | Measurement Date | Start Time | End Time |
|------|------------------|------------|----------|
| 1    | 11/6/2019        | 8:45 AM    | 10:00 AM |
| 1    | 11/7/2019        | 1:00 PM    | 2:00 PM  |
| 2    | 11/5/2019        | 10:45 AM   | 11:45 AM |
| 2    | 11/6/2019        | 10:30 AM   | 11:30 AM |
| 3    | 11/6/2019        | 12:00 PM   | 2:10 PM  |
| 4    | 11/5/2019        | 1:00 PM    | 2:00 PM  |
| 4    | 11/6/2019        | 1:00 PM    | 2:02 PM  |
| 5    | 11/5/2019        | 8:30 AM    | 10:30 AM |
| 6    | 11/7/2019        | 10:45 AM   | 12:45 PM |
| 7    | 11/6/2019        | 2:30 PM    | 4:30 PM  |
| 8    | 11/5/2019        | 1:05 PM    | 2:05 PM  |
| 8    | 11/7/2019        | 8:41 AM    | 9:56 AM  |
| 9    | 11/7/2019        | 8:30 AM    | 10:30 AM |
| 10   | 11/5/2019        | 2:45 PM    | 3:45 PM  |
| 10   | 11/7/2019        | 10:51 AM   | 11:52 AM |
| 11   | 11/6/2019        | 8:45 AM    | 9:50 AM  |
| 11   | 11/7/2019        | 1:00 PM    | 2:00 PM  |
| 12   | 11/5/2019        | 2:45 PM    | 4:18 PM  |
| 13   | 11/6/2019        | 2:47 PM    | 4:51 PM  |
| 14   | 11/5/2019        | 9:15 AM    | 10:19 AM |
| 14   | 11/6/2019        | 10:55 AM   | 12:00 PM |
| 14   | 11/7/2019        | 10:45 AM   | 12:00 PM |
| 15   | 11/4/2019        | 2:30 PM    | 4:30 PM  |
| 16   | 11/5/2019        | 2:30 PM    | 4:30 PM  |

Source: Landrum & Brown analysis, 2020.

## Site Description

This section describes each noise monitoring site and the measured aircraft noise events. Included is a photograph of the site and noise measurement summary table listing the date of measurement, the Operation Type (Op Type: Departure, Arrival, Overflight, or Touch-and-Go), Aircraft Type, Number of Aircraft noise events, and the maximum noise level ( $L_{max}$ ) of the loudest noise event.

**Site 1:** Located at 5560 MN-194 in Hermantown. The site is approximately 2.1 miles west of Runway End 9. This is a rural home in a semi wooded area with low background traffic noise from MN-194. The monitor was placed in the backyard of the residence on the property. The ambient sound level measured in this area was approximately 43-64 db. The ambient sound varied due to traffic, specifically trucks traveling on MN-194 and using engine brake prior to stopping at Miller Trunk Highway. **Table 3** presents a summary of the noise measurements captured at Site 1.



**Table 3 Site 1 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | $L_{max}$ (dB) |
|-----------|---------|---------------|--------------------|----------------|
| 11/6/2019 | D       | F-16          | 6                  | 93.5           |
| 11/7/2019 | D       | Prop          | 2                  | 55.7           |
| 11/7/2019 | D       | F-16          | 8                  | 96.1           |
| 11/7/2019 | D       | Jet           | 1                  | 61.9           |

Source: Landrum & Brown analysis, 2020.

**Site 2:** Located at 4483 Martin Rd, near the northeast corner of Martin Road and Rice Lake Road. The site is approximately 1.8 miles to the northeast of Runway End 21. This is an open space area that was previously used as a recreational land use. There was heavy machinery operating on 11/06/2019 near the corner of Martin Rd and Rice Lake Road. The ambient sound level was higher on 11/06/2019 due to this heavy machinery operating. Ambient sound as measured was approximately 44 dB on 11/05/2019 and 49-54 dB on 11/06/2019. **Table 4** presents a summary of the noise measurements captured at Site 2.



**Table 4 Site 2 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | $L_{max}$ (dB) |
|-----------|---------|---------------|--------------------|----------------|
| 11/5/2019 | A       | F-16          | 9                  | 108.6          |
| 11/6/2019 | A       | F-16          | 2                  | 103.7          |
| 11/6/2019 | D       | Prop          | 1                  | 77.6           |

Source: Landrum & Brown analysis, 2020.



**Site 3:** Located at 5963 Helm Road near Rice Lake. The site is approximately 4.7 miles to the northwest of Runway End 09. This is a rural home in a semi wooded area, with low background traffic noise. The ambient sound level in this area is significantly lower than levels measured at other sites due to the rural setting. Ambient sound as measured was approximately 34 dB. **Table 5** presents a summary of the noise measurements captured at Site 3.



**Table 5 Site 3 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/6/2019 | O       | Jet           | 6                  | 81.3                  |
| 11/6/2019 | D       | F-16          | 7                  | 104.2                 |

Source: Landrum & Brown analysis, 2020.

**Site 4:** Located at 5454 Miller Trunk Highway. This site is approximately 1.6 miles to the southwest from Runway End 09. This location is classified as a place of worship (Grace Lutheran Church). There was minimal background traffic noise from Miller Trunk Highway and the monitor was placed in the rear of the parking lot behind the main structure on the property. Ambient sound as measured was approximately 47.0 dB. **Table 6** presents a summary of the noise measurements captured at Site 4.



**Table 6 Site 4 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | D       | F-16          | 9                  | 121.7                 |
| 11/5/2019 | D       | Jet           | 4                  | 86.9                  |
| 11/6/2019 | D       | F-16          | 9                  | 95.4                  |
| 11/6/2019 | D       | Prop          | 2                  | 68.0                  |
| 11/6/2019 | D       | Jet           | 1                  | 64.5                  |

Source: Landrum & Brown analysis, 2020.



**Site 5:** Located on Old Ugstad Road, west of the Lavaque Bypass and Ugstad Road intersection. The site is approximately 0.8 miles from Runway End 09. The site is an open area to the west with a wooded area directly to the east. There was minimal background noise from road traffic, with occasional heavy trucks on Lavaque Bypass. The measured ambient sound level was approximately 46.0 dB. **Table 7** presents a summary of the noise measurements captured at Site 5.



**Table 7 Site 5 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | Dep     | F16           | 10                 | 122.3                 |
| 11/5/2019 | Dep     | Prop          | 5                  | 78.7                  |

Source: Landrum & Brown analysis, 2020.

**Site 6:** Located at 725 Swan Lake Road, west of Haines Road. The site is approximately 0.6 miles east of Runway End 03 and 0.7 miles southeast of Runway End 27. This site was in a wooded area with a clearing to the east of a north/south oriented tree line. There was minimal background noise from Haines Road and Swan Lake Road. However, there was a 10-knot wind during the measurement period which caused the ambient to be slightly higher than what would be observed on a non-windy day. The measured ambient sound level was 46 dB. **Table 8** presents a summary of the noise measurements captured at Site 6.



**Table 8 Site 6 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/7/2019 | A       | F-16          | 8                  | 109.7                 |
| 11/7/2019 | D       | Jet           | 3                  | 72.7                  |
| 11/7/2019 | O       | Prop          | 14                 | 83.6                  |

Source: Landrum & Brown analysis, 2020.



**Site 7:** Located at 5006 Timber Hill Court. The site is approximately 1.1 miles to the southeast of Runway End 09. The site is in a residential setting with minimal background noise from traffic. The monitor was placed in front of the homes as the property owner was not home to gain access to the rear of the home. The measured ambient sound level was approximately 42.0 dB. **Table 9** presents a summary of the noise measurements captured at Site 7.



**Table 9 Site 7 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/6/2019 | O       | Helo          | 2                  | 79.3                  |
| 11/6/2019 | D       | Jet           | 2                  | 69.5                  |
| 11/6/2019 | O       | Prop          | 6                  | 77.6                  |
| 11/6/2019 | D       | Prop          | 2                  | 71.3                  |

Source: Landrum & Brown analysis, 2020.

**Site 8:** Located at 4670 Lavaque Bypass Road. The site is approximately 0.6 miles from Runway End 09. The site is a residential house located in a wooded area with low background traffic noise. The monitor was placed approximately 120 feet behind the residence. The measured ambient sound level was approximately 38 to 50 dB, with the variation due to road noise. **Table 10** presents a summary of the noise measurements captured at Site 8.



**Table 10 Site 8 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | D       | F-16          | 7                  | 110.0                 |
| 11/5/2019 | D       | Prop          | 7                  | 80.5                  |
| 11/5/2019 | D       | Jet           | 3                  | 81.4                  |
| 11/7/2019 | D       | F-16          | 10                 | 96.4                  |
| 11/7/2019 | D       | Prop          | 8                  | 73.4                  |

Source: Landrum & Brown analysis, 2020.



**Site 9:** Located at 5025 Silver Leaf Street. The site is approximately 1.0 miles from Runway End 09. The site is in a residential setting with minimal background traffic noise. At times there was heavy machinery operating on a construction site at the adjacent lot. However, the machinery was not operating while the majority of the aircraft were observed at the site. The monitor was placed in the front yard in order to minimize the heavy machinery background noise. The measured ambient sound level was approximately 37.0 dB with no heavy machinery operating and 50.0 dB when the machinery was operating. **Table 11** presents a summary of the noise measurements captured at Site 9.



**Table 11** Site 9 Noise Measurement Summary

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | D       | F-16          | 10                 | 105.9                 |
| 11/5/2019 | O       | Jet           | 1                  | 65.7                  |
| 11/5/2019 | D       | Jet           | 1                  | 67.4                  |
| 11/5/2019 | O       | Prop          | 1                  | 75.2                  |
| 11/5/2019 | D       | Prop          | 6                  | 83.9                  |

Source: Landrum & Brown analysis, 2020.

**Site 10:** Located at 3902 Norton Road. The site is approximately 1.5 miles from Runway End 27. The site is a rural residential setting with minimal background traffic noise. The monitor was located approximately 100 feet southwest of the residence in the background area. The ambient sound level was measured at approximately 42.0 dB on 11/05/2019 and 45-55 dB on 11/07/2019. **Table 12** presents a summary of the noise measurements captured at Site 10.



**Table 12** Site 10 Noise Measurement Summary

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | A       | F-16          | 20                 | 104.6                 |
| 11/5/2019 | A       | Prop          | 4                  | 87.0                  |
| 11/5/2019 | A       | Jet           | 1                  | 87.0                  |
| 11/7/2019 | A       | F-16          | 12                 | 102.3                 |
| 11/7/2019 | A       | Jet           | 2                  | 93.7                  |
| 11/7/2019 | A       | Prop          | 6                  | 77.5                  |

Source: Landrum & Brown analysis, 2020.



**Site 11:** Located at 5545 Miller Trunk Highway. The site is approximately 2.0 miles from Runway End 09 and slightly north of the extended centerline for Runway 09/27. The site is in a semi wooded area in a clearing that was on a hill located to the north of the home on the property. The location had minimal background noise from traffic on Miller Trunk Highway due to how far the location was from the road. The measured ambient sound level was 45.0 dB. **Table 13** presents a summary of the noise measurements captured at Site 11.



**Table 13** Site 11 Noise Measurement Summary

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/6/2019 | D       | F-16          | 6                  | 107.7                 |
| 11/6/2019 | D       | Prop          | 1                  | 66.0                  |
| 11/7/2019 | D       | F-16          | 8                  | 114.2                 |
| 11/7/2019 | D       | Jet           | 1                  | 73.0                  |
| 11/7/2019 | D       | Prop          | 1                  | 69.1                  |

Source: Landrum & Brown analysis, 2020.

**Site 12:** Located at 2220 Norton Road. The site is approximately 3.0 miles from Runway End 27. The site is located in a semi wooded area in the backyard of a residence. The site was approximately 50 feet to the southwest of the residence. The location had minimal background noise from traffic on Norton Road. The measured ambient sound level was 41.0 dB. **Table 14** presents a summary of the noise measurements captured at Site 12.



**Table 14** Site 12 Noise Measurement Summary

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | A       | F-16          | 10                 | 94.8                  |
| 11/5/2019 | A       | E-6B          | 3                  | 95.2                  |
| 11/5/2019 | A       | Jet           | 5                  | 84.1                  |
| 11/5/2019 | A       | Jet           | 3                  | 84.1                  |

Source: Landrum & Brown analysis, 2020.



**Site 13:** Located at 4509 Kruger Road. The site is approximately 0.9 miles to the south, southeast of Runway End 27. The site is located in a semi wooded area in the backyard of a residence. The site was approximately 50 feet north of the residence in a clearing. The location had minimal background noise from traffic on Kruger Road. The measured ambient sound level was 45.0 dB. **Table 15** presents a summary of the noise measurements captured at Site 13.



**Table 15** Site 13 Noise Measurement Summary

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/6/2019 | A       | F-16          | 8                  | 63.5                  |
| 11/6/2019 | A       | Jet           | 2                  | 56.4                  |
| 11/6/2019 | D       | Jet           | 3                  | 57.3                  |
| 11/6/2019 | A       | Prop          | 6                  | 67.9                  |
| 11/6/2019 | D       | Prop          | 4                  | 60.7                  |

Source: Landrum & Brown analysis, 2020.

**Site 14:** Located at 4926 Martin Road. The site is approximately 1.5 miles north of the midpoint of Runway 9/27. The site is located 75 feet behind the residence in a clearing of a semi wooded area. The location had low background noise from traffic on Martin Road. The measured ambient sound level on 11/05/2019 was at 42 dB and on 11/06/2019 and 11/07/2019 the measured ambient sound level was between 38-42 dB. **Table 16** presents a summary of the noise measurements captured at Site 14.



**Table 16** Site 14 Noise Measurement Summary

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | UNK     | Prop          | 4                  | 60.1                  |
| 11/5/2019 | D       | F-16          | 5                  | 96.2                  |
| 11/5/2019 | O       | Helo          | 5                  | 81.8                  |
| 11/5/2019 | O       | Jet           | 1                  | 61.8                  |
| 11/5/2019 | D       | Prop          | 1                  | 73.0                  |
| 11/6/2019 | UNK     | Jet           | 2                  | 60.1                  |
| 11/6/2019 | A       | Prop          | 2                  | 60.6                  |
| 11/6/2019 | D       | Jet           | 1                  | 50.8                  |
| 11/6/2019 | D       | Prop          | 1                  | 61.8                  |
| 11/6/2019 | A       | Jet           | 1                  | 51.5                  |
| 11/7/2019 | A       | Helo          | 4                  | 55.2                  |
| 11/7/2019 | D       | Prop          | 3                  | 54.9                  |
| 11/7/2019 | UNK     | Jet           | 1                  | 49.8                  |
| 11/7/2019 | A       | F-16          | 12                 | 86.4                  |
| 11/7/2019 | A       | F-16          | 1                  | 50.2                  |
| 11/7/2019 | D       | Jet           | 1                  | 48.9                  |

Source: Landrum & Brown analysis, 2020.



**Site 15:** Located along Mustang Drive near the Runway End 27 ILS installation, just to the south of the Minnesota Air National Guard 148<sup>th</sup> Fighter Wing base entrance. The site is approximately 0.6 miles from Runway End 27. The site was in an open area, however there was considerable traffic along Mustang Drive as base personnel were going to a from the base along this road. The measured ambient sound level was 47.5 dB. **Table 17** presents a summary of the noise measurements captured at Site 15.



**Table 17 Site 15 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/4/2019 | A       | Prop          | 2                  | 81.0                  |
| 11/4/2019 | A       | Jet           | 4                  | 93.5                  |
| 11/4/2019 | A       | F-16          | 13                 | 113.4                 |

Source: Landrum & Brown analysis, 2020.

**Site 16:** Located at 4464 Ralston Drive. The site is in an open space recreational area located on the Federal Prison Camp. The site is approximately 0.5 miles to the southwest of Runway End 03. There was minimal background traffic noise from Ralston Drive and Miller Trunk Highway. The measured ambient sound level was 45 dB. **Table 18** presents a summary of the noise measurements captured at Site 16.



**Table 18 Site 16 Noise Measurement Summary**

| Date      | Op Type | Aircraft Type | Number of Aircraft | L <sub>max</sub> (dB) |
|-----------|---------|---------------|--------------------|-----------------------|
| 11/5/2019 | D       | Jet           | 7                  | 80.1                  |
| 11/5/2019 | D       | E6-B          | 5                  | 79.5                  |
| 11/5/2019 | O       | E6-B          | 4                  | 77.2                  |
| 11/5/2019 | D       | Prop          | 15                 | 77.8                  |
| 11/5/2019 | A       | F-16          | 8                  | 105.3                 |
| 11/5/2019 | O       | Prop          | 2                  | 78.9                  |

Source: Landrum & Brown analysis, 2020.



## Methods for Noise Event Correlation

Measured noise events were matched with specific aircraft operations using the following two-step method:

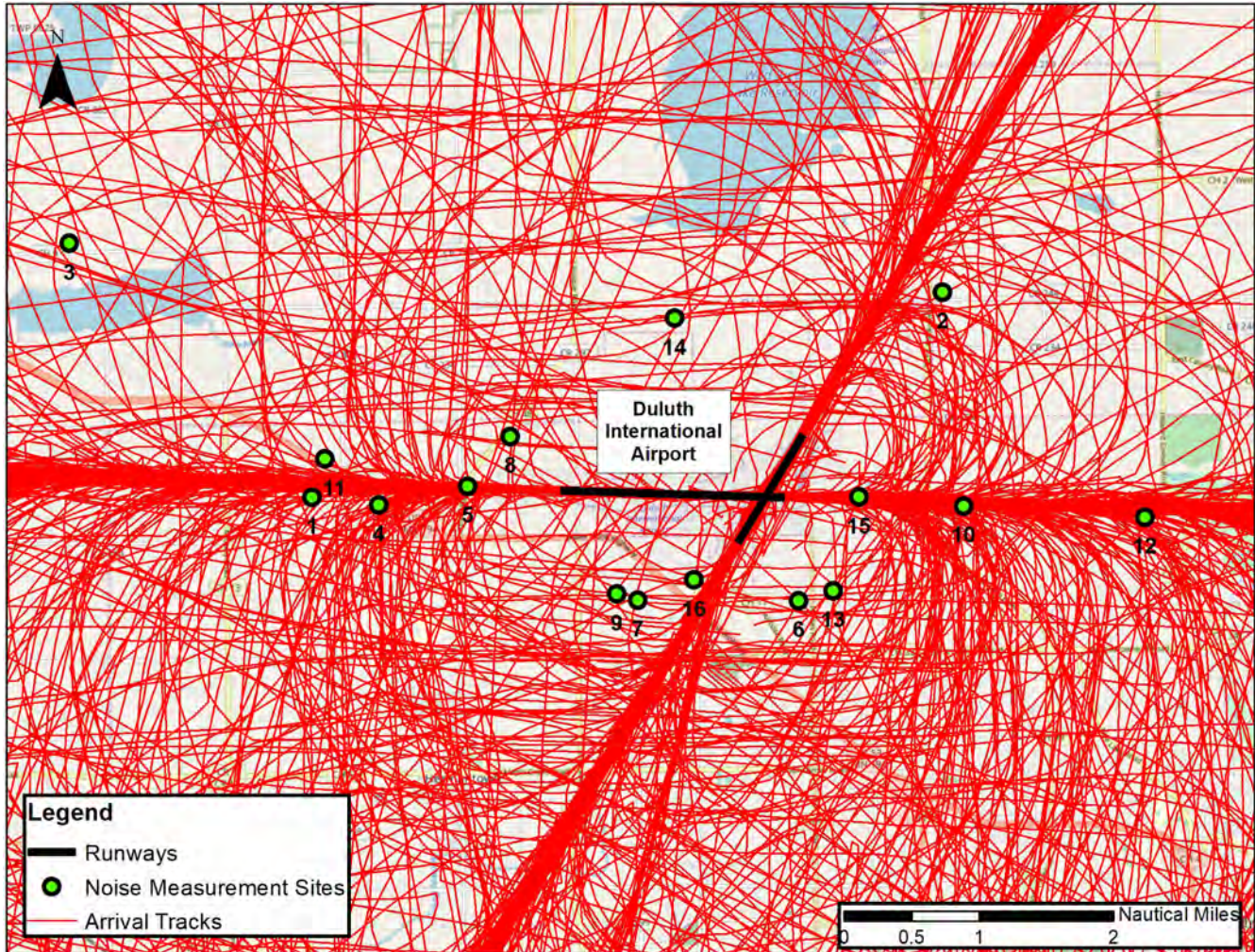
- Each measurement site and equipment was supervised by a technician who observed and logged aircraft operations
- Noise events from noise meter were correlated to logged aircraft operations by using the time of the event and operation

Although this method provided positive identification of aircraft operations and highly accurate correlation with measured noise events, some community noise (e.g. cars, heavy machinery, animals) and aircraft noise occurred simultaneously and correlated as aircraft noise events. Unfortunately, there is currently no technology to separate aircraft noise levels from simultaneous non-aircraft noise levels.

## Air Traffic Maps

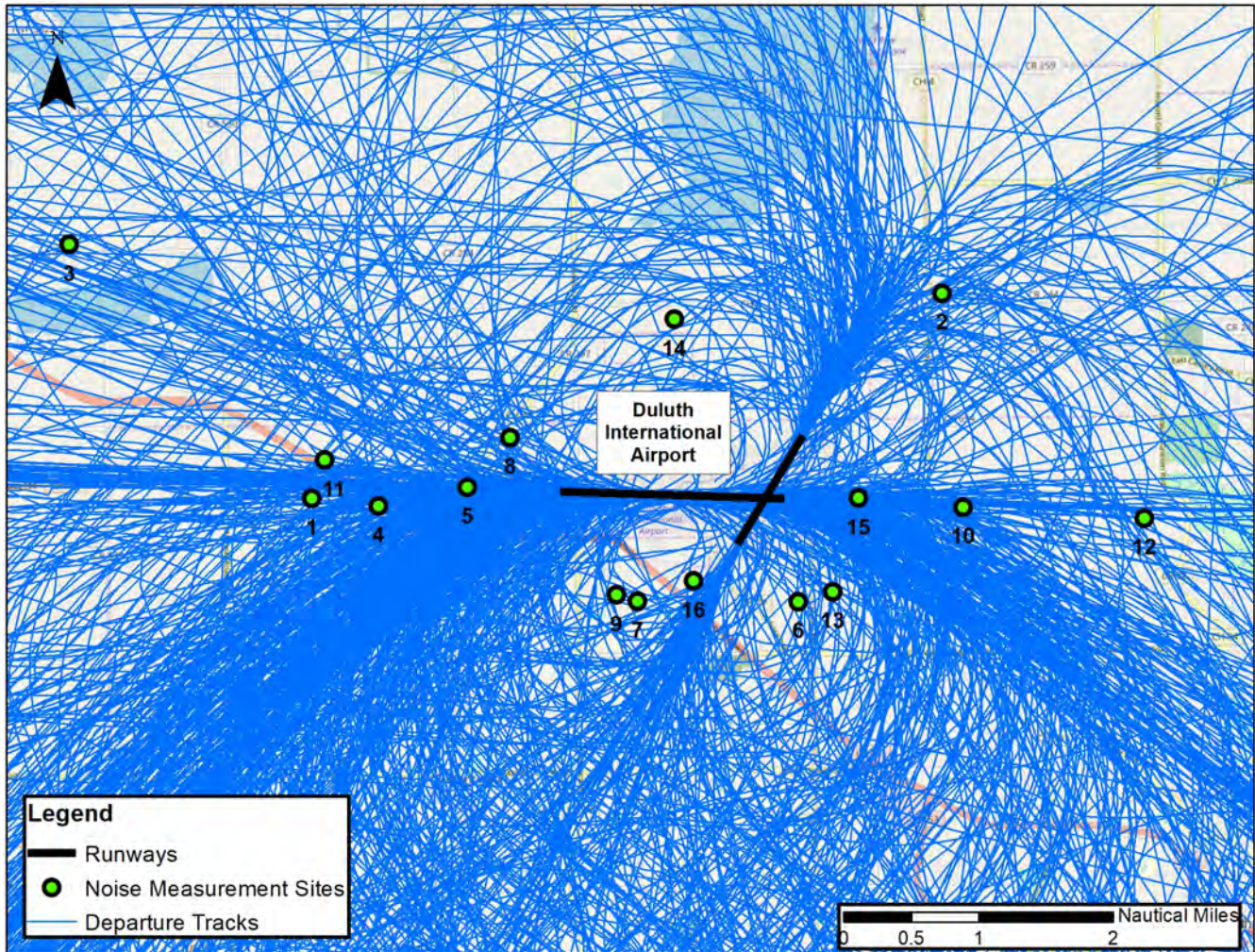
The following exhibits illustrate the typical arrival and departure flight paths relative to the noise measurement sites. Each map shows flight tracks for multiple days. The radar flight track data was supplied by the FAA's National Offload Program (NOP) database. The flight track colors represent different aircraft operation types shown on the map legends.

**EXHIBIT 2**      **Arrival Radar Flight Tracks**



Source: FAA National Offload Program (NOP) data, Landrum & Brown analysis, 2020.

**EXHIBIT 3**      **Departure Radar Flight Tracks**



Source: FAA National Offload Program (NOP) data, Landrum & Brown analysis, 2020.



## Noise Measurement Results

Noise level readings were used to characterize the noise environment to distinguish the various noise levels associated with individual aircraft operations. The noise measurement process was designed to capture the noise levels of a representative mix of aircraft operations near the measurement sites that includes military, general aviation, commuter/air taxi, and air carrier operations at DLH. Some of the noise events collected at the measurement sites had varying levels of background ambient noise due to proximity to major thoroughfares such as Miller Trunk Highway.

### Sound Metrics

The description, analysis, and reporting of community sound levels is made difficult by the complexity of human response to sound and the myriad of sound-rating scales and metrics that have been developed for describing acoustic effects. Various rating scales have been devised to approximate the human subjective assessment of "loudness" or "noisiness" of a sound.

A sound metric that is commonly used in community noise analysis is the  $L_{max}$  metric, which quantifies the peak or maximum noise level reached by a noise event.

For an aircraft noise event, the sound of the aircraft begins to rise above ambient noise levels. The closer the aircraft gets, the louder it is until the aircraft is at its loudest ( $L_{max}$ ) point. As the aircraft passes, the noise level decreases until the sound level settles to ambient levels.

### Noise Monitoring Results Summary

The noise monitoring program provided insight into the noise exposure from aircraft activity in the areas surrounding the airport. The measured noise levels from departing aircraft tended to produce peak decibel levels several decibels higher than those of arriving aircraft. This difference is caused by two characteristics of the separate operations. First, exposure to noise above the background levels from arriving aircraft is typically shorter than from departing aircraft. Second, the power settings used during approach are lower than those necessary to climb during the takeoff, resulting in measured noise levels of arrivals at several decibels less than measured at similar locations during departure. It should be noted that the  $L_{max}$  noise levels represent the maximum noise level for each individual aircraft event and should not be confused with the average Day-Night Level (DNL) contours that are used for determining eligibility for land use mitigation programs.

### Aircraft Single Event Maximum Noise Level Results

Individual aircraft noise events were measured using the  $L_{max}$  metric. **Table 19** lists noise levels that represent the highest or maximum  $L_{max}$  measured at each monitoring site. **Appendix 1** provides these data in tabular form listing all aircraft noise events and their corresponding  $L_{max}$  in **Table A-1**.



**Table 19**                    **Maximum Aircraft Noise Levels**

| Site | Date      | Time     | Aircraft Type  | L <sub>max</sub> (dB) | Arrival/<br>Departure | Runway |
|------|-----------|----------|----------------|-----------------------|-----------------------|--------|
| 1    | 11/7/2019 | 1:35 PM  | F-16           | 96.1                  | D                     | 27     |
| 2    | 11/5/2019 | 11:21    | F-16           | 108.6                 | A                     | 27     |
| 3    | 11/6/2019 | 1:56 PM  | F-16           | 104.2                 | D                     | 27     |
| 4    | 11/5/2019 | 1:47 PM  | F-16           | 121.17                | D                     | 27     |
| 5    | 11/5/2019 | 9:32 AM  | F-16           | 122.3                 | D                     | 27     |
| 6    | 11/7/2019 | 11:33 AM | F-16           | 109.7                 | A                     | 27     |
| 7    | 11/6/2019 | 3:21 PM  | Helicopter     | 79.3                  | O                     | --     |
| 8    | 11/5/2019 | 1:38 PM  | F-16           | 110                   | D                     | 27     |
| 9    | 11/7/2019 | 9:43 AM  | F-16           | 105.9                 | D                     | 27     |
| 10   | 11/5/2019 | 11:21 PM | F-16           | 104.6                 | A                     | 27     |
| 11   | 11/7/2019 | 3:25 PM  | F-16           | 114.2                 | D                     | 27     |
| 12   | 11/5/2019 | 2:51 PM  | F-16           | 95.2                  | A                     | 27     |
| 13   | 11/6/2019 | 4:16 PM  | Twin Propeller | 67.9                  | A                     | 27     |
| 14   | 11/5/2019 | 10:04 AM | F-16           | 96.2                  | D                     | 27     |
| 15   | 11/4/2019 | 3:06 PM  | F-16           | 113.4                 | A                     | 27     |
| 16   | 11/5/2019 | 3:28 PM  | F-16           | 105.3                 | A                     | 27     |

Source: Landrum & Brown analysis, 2020.



Appendix A

Table A-1 Maximum Aircraft Noise Events

| SITE NUMBER | DATE      | START TIME  | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|-------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 1           | 11/6/2019 | 8:45:00 AM  | 10:00:00 AM | 27     | 43-64        | 9:34:00 AM  | 2:00             | 89.6                  | Dep            | MIL      | F16           |
| 1           | 11/6/2019 | 8:45:00 AM  | 10:00:00 AM | 27     | 43-64        | 9:39:00 AM  | 1:34             | 87.6                  | Dep            | MIL      | F16           |
| 1           | 11/6/2019 | 8:45:00 AM  | 10:00:00 AM | 27     | 43-64        | 9:46:00 AM  | 2:00             | 93.5                  | Dep            | MIL      | F16           |
| 1           | 11/7/2019 | 1:00:00 PM  | 2:01:00 PM  | 27     | 43-64        | 1:08:00 PM  | 0:48             | 55.7                  | Dep            | GA       | Prop          |
| 1           | 11/7/2019 | 1:00:00 PM  | 2:01:00 PM  | 27     | 43-64        | 1:16:00 PM  | 0:48             | 52.3                  | Dep            | GA       | Prop          |
| 1           | 11/7/2019 | 1:00:00 PM  | 2:01:00 PM  | 27     | 43-64        | 1:24:00 PM  | 3:40             | 94.4                  | Dep            | MIL      | F16           |
| 1           | 11/7/2019 | 1:00:00 PM  | 2:01:00 PM  | 27     | 43-64        | 1:35:00 PM  | 2:40             | 96.1                  | Dep            | MIL      | F16           |
| 1           | 11/7/2019 | 1:00:00 PM  | 2:01:00 PM  | 27     | 43-64        | 1:54:00 PM  | 0:54             | 61.9                  | Dep            | CM       | Jet           |
| 2           | 11/5/2019 | 10:45:00 AM | 11:45:00 AM | 27     | 43-45        | 11:03:40 AM | 01:04            | 97.6                  | Arr            | MIL      | F16           |
| 2           | 11/5/2019 | 10:45:00 AM | 11:45:00 AM | 27     | 43-45        | 11:09:34 AM | 01:22            | 89.7                  | Arr            | MIL      | F16           |
| 2           | 11/5/2019 | 10:45:00 AM | 11:45:00 AM | 27     | 43-45        | 11:16:30 AM | 00:20            | 79.7                  | Arr            | MIL      | F16           |
| 2           | 11/5/2019 | 10:45:00 AM | 11:45:00 AM | 27     | 43-45        | 11:21:41 AM | 01:11            | 108.6                 | Arr            | MIL      | F16           |
| 2           | 11/5/2019 | 10:45:00 AM | 11:45:00 AM | 27     | 43-45        | 11:24:59 AM | 01:03            | 99.0                  | Arr            | MIL      | F16           |
| 2           | 11/6/2019 | 10:30:00 AM | 11:30:00 AM | 27     | 49-54        | 10:53:17 AM | 01:00            | 103.7                 | Arr            | MIL      | F16           |
| 2           | 11/6/2019 | 10:30:00 AM | 11:30:00 AM | 27     | 49-54        | 11:29:21 AM | 00:38            | 77.6                  | Dep            | GA       | Prop          |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 12:28:32 PM | 00:53            | 72.3                  | Ovf            | CM       | Jet           |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 12:39:55 PM | 00:42            | 67.9                  | Ovf            | CM       | Jet           |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 12:45:09 PM | 00:42            | 59.2                  | Ovf            | CM       | Jet           |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 1:15:40 PM  | 00:33            | 57.0                  | Ovf            | CM       | Jet           |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 1:34:38 PM  | 00:48            | 81.3                  | Ovf            | CM       | Jet           |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 1:44:12 PM  | 01:39            | 95.7                  | Dep            | MIL      | F16           |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 1:52:21 PM  | 00:43            | 68.2                  | Ovf            | CM       | Jet           |
| 3           | 11/6/2019 | 12:00:00 PM | 2:10:00 PM  | 27     | 34           | 1:56:38 PM  | 01:57            | 104.2                 | Dep            | MIL      | F16           |
| 4           | 11/5/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 46-47        | 1:34:54 PM  | 00:14            | 67.1                  | Dep            | CM       | Jet           |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME  | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|-------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 4           | 11/5/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 46-47        | 1:36:10 PM  | 00:40            | 79.6                  | Dep            | CM       | Jet           |
| 4           | 11/5/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 46-47        | 1:37:19 PM  | 01:04            | 106.3                 | Dep            | MIL      | F16           |
| 4           | 11/5/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 46-47        | 1:39:11 PM  | 01:09            | 102.3                 | Dep            | MIL      | F16           |
| 4           | 11/5/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 46-47        | 1:46:50 PM  | 00:17            | 86.5                  | Dep            | CM       | Jet           |
| 4           | 11/5/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 46-47        | 1:47:25 PM  | 01:28            | 121.7                 | Dep            | MIL      | F16           |
| 4           | 11/5/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 46-47        | 1:50:10 PM  | 00:44            | 86.9                  | Dep            | CM       | Jet           |
| 4           | 11/6/2019 | 1:00:00 PM  | 2:02:00 PM  | 27     | 54.5         | 1:14:00 PM  | 0:54             | 68.0                  | Dep            | GA       | Prop          |
| 4           | 11/6/2019 | 1:00:00 PM  | 2:02:00 PM  | 27     | 54.5         | 1:33:00 PM  | 1:42             | 95.4                  | Dep            | MIL      | F16           |
| 4           | 11/6/2019 | 1:00:00 PM  | 2:02:00 PM  | 27     | 54.5         | 1:40:00 PM  | 0:54             | 54.3                  | Dep            | GA       | Prop          |
| 4           | 11/6/2019 | 1:00:00 PM  | 2:02:00 PM  | 27     | 54.5         | 1:43:00 PM  | 1:26             | 92.5                  | Dep            | MIL      | F16           |
| 4           | 11/6/2019 | 1:00:00 PM  | 2:02:00 PM  | 27     | 54.5         | 1:51:00 PM  | 0:49             | 64.5                  | Dep            | CM       | Jet           |
| 4           | 11/6/2019 | 1:00:00 PM  | 2:02:00 PM  | 27     | 54.5         | 1:55:00 PM  | 2:00             | 89.5                  | Dep            | MIL      | F16           |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 8:47:04 AM  | 00:50            | 78.1                  | Dep            | GA       | Prop          |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 8:48:56 AM  | 01:06            | 67.4                  | Dep            | GA       | Prop          |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 8:57:37 AM  | 00:18            | 78.7                  | Dep            | GA       | Prop          |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 9:02:56 AM  | 00:04            | 61.3                  | Dep            | GA       | Prop          |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 9:03:44 AM  | 00:26            | 74.0                  | Dep            | GA       | Prop          |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 9:32:43 AM  | 00:57            | 122.3                 | Dep            | MIL      | F16           |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 9:43:27 AM  | 01:42            | 120.3                 | Dep            | MIL      | F16           |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 9:56:29 AM  | 00:28            | 114.4                 | Dep            | MIL      | F16           |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 9:57:01 AM  | 00:29            | 119.7                 | Dep            | MIL      | F16           |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 10:04:46 AM | 01:07            | 120.8                 | Dep            | MIL      | F16           |
| 5           | 11/5/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 45-47        | 10:06:14 AM | 00:28            | 77.7                  | Dep            | MIL      | F16           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 10:54:28 AM | 00:26            | 66.9                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:03:14 AM | 00:28            | 72.7                  | Dep            | CM       | Jet           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:09:44 AM | 00:59            | 88.4                  | Arr            | MIL      | F16           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:17:37 AM | 00:24            | 60.7                  | Ovf            | GA       | Prop          |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME  | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|-------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:18:13 AM | 00:29            | 70.5                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:22:23 AM | 00:36            | 69.0                  | Dep            | CM       | Jet           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:23:26 AM | 00:23            | 66.4                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:27:24 AM | 00:37            | 86.0                  | Arr            | MIL      | F16           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:28:12 AM | 00:22            | 65.5                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:29:32 AM | 00:43            | 84.6                  | Arr            | MIL      | F16           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:31:55 AM | 00:17            | 64.1                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:33:07 AM | 00:39            | 109.7                 | Arr            | MIL      | F16           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:39:07 AM | 00:15            | 63.8                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:40:36 AM | 00:56            | 93.1                  | Arr            | MIL      | F16           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:44:55 AM | 00:26            | 73.2                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:45:43 AM | 00:23            | 62.3                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:49:19 AM | 00:24            | 70.1                  | Dep            | CM       | Jet           |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 11:56:58 AM | 00:26            | 72.6                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 12:05:21 PM | 00:28            | 68.3                  | Arr            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 12:13:15 PM | 00:22            | 83.6                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 12:17:15 PM | 00:17            | 69.7                  | Ovf            | GA       | Prop          |
| 6           | 11/7/2019 | 10:45:00 AM | 12:45:00 PM | 27     | 45-48        | 12:24:00 PM | 00:24            | 71.8                  | Ovf            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:15:27 PM  | 00:49            | 76.8                  | Dep            | MIL      | Helo          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:21:48 PM  | 00:27            | 79.3                  | Ovf            | GA       | Helo          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:27:07 PM  | 00:15            | 64.6                  | Ovf            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:28:16 PM  | 00:32            | 72.1                  | Ovf            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:35:06 PM  | 00:47            | 69.6                  | Dep            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:36:03 PM  | 00:26            | 71.3                  | Dep            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:38:36 PM  | 00:42            | 70.1                  | Ovf            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:40:03 PM  | 00:32            | 68.6                  | Ovf            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 41-42        | 3:43:01 PM  | 00:36            | 77.6                  | Ovf            | GA       | Prop          |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME | END TIME   | RUNWAY | AMBIENT (dB) | TIME       | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|------------|------------|--------|--------------|------------|------------------|-----------------------|----------------|----------|---------------|
| 7           | 11/6/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 41-42        | 3:44:54 PM | 00:15            | 68.5                  | Ovf            | GA       | Prop          |
| 7           | 11/6/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 41-42        | 4:00:25 PM | 00:32            | 69.5                  | Dep            | CM       | Jet           |
| 7           | 11/6/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 41-42        | 4:06:05 PM | 00:56            | 68.6                  | Ovf            | CM       | Jet           |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:16:20 PM | 01:30            | 76.2                  | Dep            | GA       | Prop          |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:27:24 PM | 01:06            | 77.3                  | Dep            | GA       | Prop          |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:31:59 PM | 01:10            | 75.6                  | Dep            | GA       | Prop          |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:34:16 PM | 00:34            | 77.9                  | Dep            | GA       | Jet           |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:35:37 PM | 00:41            | 81.4                  | Dep            | CM       | Jet           |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:36:55 PM | 01:28            | 105.4                 | Dep            | MIL      | F16           |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:38:52 PM | 01:04            | 110.0                 | Dep            | MIL      | F16           |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:41:23 PM | 00:28            | 67.0                  | Dep            | GA       | Prop          |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:43:54 PM | 01:43            | 80.5                  | Dep            | GA       | Prop          |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:46:17 PM | 00:38            | 67.1                  | Dep            | GA       | Prop          |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:47:01 PM | 02:08            | 108.9                 | Dep            | MIL      | F16           |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:49:22 PM | 00:39            | 80.2                  | Dep            | GA       | Prop          |
| 8           | 11/5/2019 | 1:05:00 PM | 2:05:00 PM | 27     | 38-50        | 1:50:56 PM | 00:37            | 73.6                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 8:51:00 AM | 1:35             | 73.4                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 8:54:00 AM | 0:40             | 68.6                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 8:56:00 AM | 1:32             | 73.4                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:14:00 AM | 1:15             | 66.6                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:19:00 AM | 0:37             | 55.6                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:20:00 AM | 0:43             | 69.1                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:22:00 AM | 1:38             | 71.1                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:34:00 AM | 2:31             | 95.8                  | Dep            | MIL      | F16           |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:43:00 AM | 1:39             | 91.4                  | Dep            | MIL      | F16           |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:46:00 AM | 0:53             | 61.8                  | Dep            | GA       | Prop          |
| 8           | 11/7/2019 | 8:41:00 AM | 9:56:00 AM | 27     | 38-50        | 9:51:00 AM | 3:17             | 96.4                  | Dep            | MIL      | F16           |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME  | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|-------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 8:36:29 AM  | 00:21            | 83.8                  | Dep            | GA       | Prop          |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 8:51:38 AM  | 00:32            | 73.3                  | Dep            | GA       | Prop          |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:15:20 AM  | 00:19            | 67.4                  | Dep            | GA       | Jet           |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:16:24 AM  | 00:24            | 65.7                  | Ovf            | CM       | Jet           |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:19:51 AM  | 00:55            | 82.8                  | Dep            | GA       | Prop          |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:20:51 AM  | 00:22            | 76.1                  | Dep            | GA       | Prop          |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:22:37 AM  | 00:25            | 75.2                  | Dep            | GA       | Prop          |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:34:35 AM  | 02:20            | 100.3                 | Dep            | MIL      | F16           |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:43:46 AM  | 01:15            | 105.9                 | Dep            | MIL      | F16           |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:49:36 AM  | 00:23            | 75.2                  | Ovf            | GA       | Prop          |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:52:07 AM  | 02:23            | 100.6                 | Dep            | MIL      | F16           |
| 9           | 11/7/2019 | 8:30:00 AM  | 10:30:00 AM | 27     | 37-50        | 9:58:33 AM  | 00:19            | 83.9                  | Dep            | GA       | Prop          |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:02:39 AM | 00:56            | 97.8                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:04:04 AM | 00:24            | 86.6                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:04:33 AM | 00:22            | 87.8                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:04:56 AM | 00:49            | 98.8                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:05:48 AM | 00:38            | 75.2                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:08:10 AM | 00:49            | 103.9                 | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:09:12 AM | 00:36            | 81.0                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:10:00 AM | 02:04            | 90.6                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:12:08 AM | 00:57            | 82.4                  | Arr            | GA       | Prop          |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:17:51 AM | 00:40            | 70.9                  | Arr            | GA       | Prop          |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:20:31 AM | 00:53            | 103.4                 | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:21:27 AM | 00:22            | 83.9                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:21:57 AM | 01:41            | 104.6                 | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:24:28 AM | 00:29            | 88.5                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:25:29 AM | 00:22            | 81.4                  | Arr            | MIL      | F16           |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME  | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|-------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:25:52 AM | 00:23            | 87.4                  | Arr            | MIL      | F16           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:47:55 AM | 00:54            | 87.0                  | Arr            | ENY      | Jet           |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:50:44 AM | 00:34            | 71.6                  | Arr            | GA       | Prop          |
| 10          | 11/5/2019 | 10:51:00 AM | 11:52:00 AM | 27     | 42           | 11:53:18 AM | 00:51            | 71.0                  | Arr            | GA       | Prop          |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 2:48:32 PM  | 00:32            | 77.5                  | Arr            | GA       | Prop          |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 2:54:16 PM  | 00:44            | 93.8                  | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 2:55:50 PM  | 01:04            | 95.4                  | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 2:57:26 PM  | 00:26            | 93.7                  | Arr            | CM       | Jet           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:04:53 PM  | 00:52            | 95.4                  | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:05:59 PM  | 00:39            | 91.9                  | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:06:44 PM  | 00:29            | 96.4                  | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:10:34 PM  | 00:38            | 102.3                 | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:11:23 PM  | 00:25            | 102.0                 | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:12:11 PM  | 00:37            | 97.5                  | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:13:25 PM  | 00:28            | 93.6                  | Arr            | MIL      | F16           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:17:32 PM  | 00:22            | 65.1                  | Arr            | GA       | Prop          |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:22:31 PM  | 00:18            | 67.2                  | Arr            | GA       | Prop          |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:26:07 PM  | 00:31            | 70.2                  | Arr            | GA       | Prop          |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:27:41 PM  | 00:28            | 70.4                  | Arr            | GA       | Prop          |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:28:34 PM  | 00:47            | 80.0                  | Arr            | GA       | Jet           |
| 10          | 11/7/2019 | 2:45:00 PM  | 3:45:00 PM  | 27     | 45-55        | 3:30:54 PM  | 00:36            | 76.5                  | Arr            | GA       | Prop          |
| 11          | 11/6/2019 | 8:45:00 AM  | 9:50:00 AM  | 27     | 41-48        | 8:41:22 AM  | 00:23            | 66.0                  | Dep            | GA       | Prop          |
| 11          | 11/6/2019 | 8:45:00 AM  | 9:50:00 AM  | 27     | 41-48        | 9:34:03 AM  | 01:58            | 104.5                 | Dep            | MIL      | F16           |
| 11          | 11/6/2019 | 8:45:00 AM  | 9:50:00 AM  | 27     | 41-48        | 9:39:26 AM  | 01:31            | 105.2                 | Dep            | MIL      | F16           |
| 11          | 11/6/2019 | 8:45:00 AM  | 9:50:00 AM  | 27     | 41-48        | 9:46:33 AM  | 01:45            | 107.7                 | Dep            | MIL      | F16           |
| 11          | 11/7/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 42-53        | 1:09:24 PM  | 00:40            | 69.1                  | Ovf            | GA       | Prop          |
| 11          | 11/7/2019 | 1:00:00 PM  | 2:00:00 PM  | 27     | 42-53        | 1:25:02 PM  | 01:27            | 114.2                 | Dep            | MIL      | F16           |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME | END TIME   | RUNWAY | AMBIENT (dB) | TIME       | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|------------|------------|--------|--------------|------------|------------------|-----------------------|----------------|----------|---------------|
| 11          | 11/7/2019 | 1:00:00 PM | 2:00:00 PM | 27     | 42-53        | 1:26:48 PM | 01:27            | 109.2                 | Dep            | MIL      | F16           |
| 11          | 11/7/2019 | 1:00:00 PM | 2:00:00 PM | 27     | 42-53        | 1:35:42 PM | 01:59            | 112.6                 | Dep            | MIL      | F16           |
| 11          | 11/7/2019 | 1:00:00 PM | 2:00:00 PM | 27     | 42-53        | 1:54:31 PM | 00:41            | 73.0                  | Dep            | CM       | Jet           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 2:47:57 PM | 00:50            | 78.1                  | Arr            | GA       | Prop          |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 2:51:02 PM | 00:49            | 95.2                  | Arr            | MIL      | E-6B          |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 2:56:05 PM | 01:05            | 84.1                  | Arr            | CM       | Jet           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 2:57:41 PM | 00:31            | 62.5                  | Arr            | GA       | Prop          |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:01:36 PM | 01:08            | 94.8                  | Arr            | MIL      | E-6B          |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:08:36 PM | 00:46            | 94.8                  | Arr            | MIL      | F16           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:10:08 PM | 01:01            | 81.8                  | Arr            | MIL      | F16           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:12:37 PM | 00:50            | 84.8                  | Arr            | GA       | Jet           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:14:23 PM | 01:05            | 94.4                  | Arr            | MIL      | F16           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:16:55 PM | 01:02            | 78.4                  | Arr            | MIL      | F16           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:18:31 PM | 00:53            | 84.1                  | Arr            | GA       | Prop          |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:22:27 PM | 00:40            | 86.7                  | Arr            | MIL      | E-6B          |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:25:00 PM | 00:55            | 77.5                  | Arr            | GA       | Jet           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:27:15 PM | 00:42            | 90.5                  | Arr            | MIL      | F16           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:28:32 PM | 01:05            | 86.3                  | Arr            | MIL      | F16           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:38:12 PM | 00:57            | 73.9                  | Arr            | GA       | Jet           |
| 12          | 11/5/2019 | 2:45:00 PM | 4:18:00 PM | 27     | 41           | 3:55:59 PM | 00:48            | 72.6                  | Arr            | GA       | Jet           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM | 27     | 45           | 2:54:00 PM | 0:55             | 55.8                  | Dep            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM | 27     | 45           | 3:00:00 PM | 0:40             | 52.0                  | Arr            | GA       | Jet           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM | 27     | 45           | 3:04:00 PM | 0:27             | 63.4                  | Arr            | MIL      | F16           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM | 27     | 45           | 3:05:00 PM | 0:56             | 61.1                  | Arr            | MIL      | F16           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM | 27     | 45           | 3:07:00 PM | 0:50             | 58.5                  | Arr            | MIL      | F16           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM | 27     | 45           | 3:08:00 PM | 1:50             | 63.5                  | Dep/Arr        | GA/MIL   | Helo/F16      |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM | 27     | 45           | 3:11:00 PM | 0:55             | 56.5                  | Dep            | GA       | Prop          |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:14:00 PM  | 1:05             | 60.7                  | Dep            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:16:00 PM  | 1:17             | 59.4                  | Arr            | MIL      | Prop/F16      |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:18:00 PM  | 0:37             | 53.4                  | Arr            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:20:00 PM  | 2:03             | 60.7                  | Arr            | MIL      | F16           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:20:00 PM  | 0:31             | 49.5                  | Arr            | MIL      | F16           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:23:00 PM  | 0:46             | 54.5                  | Arr            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:27:00 PM  | 0:45             | 53.7                  | Dep            | GA       | Jet           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:31:00 PM  | 1:09             | 57.3                  | Dep            | CM       | Jet           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:38:00 PM  | 0:35             | 50.9                  | UNK            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:40:00 PM  | 1:30             | 54.8                  | Arr            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:42:00 PM  | 0:32             | 50.2                  | Arr            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:45:00 PM  | 1:41             | 52.1                  | Arr            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:50:00 PM  | 0:53             | 56.4                  | Arr            | GA       | Jet           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 3:59:00 PM  | 1:03             | 52.8                  | Dep            | CM       | Jet           |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 4:16:00 PM  | 0:57             | 67.9                  | Arr            | GA       | Prop          |
| 13          | 11/6/2019 | 2:47:00 PM | 4:51:00 PM  | 27     | 45           | 4:43:00 PM  | 0:55             | 57.8                  | Dep            | GA       | Prop          |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:26:00 AM  | 0:56             | 73.0                  | Dep            | GA       | Prop          |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:32:17 AM  | 01:53            | 90.6                  | Dep            | MIL      | F16           |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:39:18 AM  | 00:19            | 60.1                  | UNK            | GA       | Prop          |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:43:02 AM  | 02:25            | 88.8                  | Dep            | MIL      | F16           |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:45:52 AM  | 00:26            | 58.3                  | UNK            | GA       | Prop          |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:49:12 AM  | 00:57            | 67.8                  | Dep            | GA       | Helo          |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:50:52 AM  | 01:13            | 61.8                  | Ovf            | UNK      | Jet           |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:52:54 AM  | 00:56            | 65.5                  | Ovf            | GA       | Helo          |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:54:56 AM  | 00:37            | 57.0                  | Arr            | GA       | Prop          |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 9:56:02 AM  | 02:08            | 94.0                  | Dep            | MIL      | F16           |
| 14          | 11/5/2019 | 9:15:00 AM | 10:19:00 AM | 27     | 42           | 10:00:02 AM | 00:45            | 72.2                  | Arr            | UNK      | UNK           |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME  | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|-------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 14          | 11/5/2019 | 9:15:00 AM  | 10:19:00 AM | 27     | 42           | 10:01:18 AM | 00:34            | 58.3                  | UNK            | GA       | Prop          |
| 14          | 11/5/2019 | 9:15:00 AM  | 10:19:00 AM | 27     | 42           | 10:03:16 AM | 00:42            | 61.8                  | UNK            | UNK      | UNK           |
| 14          | 11/5/2019 | 9:15:00 AM  | 10:19:00 AM | 27     | 42           | 10:04:19 AM | 02:39            | 96.2                  | Dep            | MIL      | F16           |
| 14          | 11/5/2019 | 9:15:00 AM  | 10:19:00 AM | 27     | 42           | 10:10:01 AM | 03:10            | 81.8                  | UNK            | GA       | Helo          |
| 14          | 11/5/2019 | 9:15:00 AM  | 10:19:00 AM | 27     | 42           | 10:13:26 AM | 01:08            | 70.8                  | Ovf            | GA       | Helo          |
| 14          | 11/5/2019 | 9:15:00 AM  | 10:19:00 AM | 27     | 42           | 10:16:38 AM | 00:46            | 64.8                  | Ovf            | GA       | Helo          |
| 14          | 11/6/2019 | 10:55:00 AM | 12:00:00 PM | 27     | 38-42        | 11:00:00 AM | 0:44             | 51.9                  | UNK            | UNK      | Jet           |
| 14          | 11/6/2019 | 10:55:00 AM | 12:00:00 PM | 27     | 38-42        | 11:12:00 AM | 0:26             | 60.1                  | UNK            | UNK      | Jet           |
| 14          | 11/6/2019 | 10:55:00 AM | 12:00:00 PM | 27     | 38-42        | 11:19:00 AM | 1:19             | 58.5                  | Arr            | GA       | Prop          |
| 14          | 11/6/2019 | 10:55:00 AM | 12:00:00 PM | 27     | 38-42        | 11:26:00 AM | 0:25             | 50.8                  | Dep            | CM       | Jet           |
| 14          | 11/6/2019 | 10:55:00 AM | 12:00:00 PM | 27     | 38-42        | 11:28:00 AM | 1:05             | 60.6                  | Dep            | GA       | Prop          |
| 14          | 11/6/2019 | 10:55:00 AM | 12:00:00 PM | 27     | 38-42        | 11:49:00 AM | 2:05             | 61.8                  | Dep            | GA       | Prop          |
| 14          | 11/6/2019 | 10:55:00 AM | 12:00:00 PM | 27     | 38-42        | 11:54:00 AM | 0:58             | 51.5                  | Arr            | UNK      | Jet           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 10:48:00 AM | 0:50             | 48.8                  | Arr            | GA       | Helo          |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 10:54:00 AM | 0:35             | 54.9                  | Dep            | GA       | Prop          |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:03:00 AM | 0:38             | 49.8                  | UNK            | UNK      | Jet           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:09:00 AM | 1:56             | 81.2                  | Arr            | MIL      | F16           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:16:00 AM | 1:52             | 54.7                  | Dep            | GA       | Prop          |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:22:00 AM | 1:10             | 50.2                  | Arr            | MIL      | F16           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:26:00 AM | 0:23             | 49.0                  | Dep            | GA       | Prop          |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:27:00 AM | 1:14             | 79.7                  | Arr            | MIL      | F16           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:29:00 AM | 1:00             | 71.1                  | Arr            | MIL      | F16           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:33:00 AM | 0:37             | 86.4                  | Dep            | MIL      | F16           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:37:00 AM | 2:53             | 55.2                  | Arr            | GA       | Helo          |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:40:00 AM | 1:24             | 78.0                  | Arr            | MIL      | F16           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:40:00 AM | 0:19             | 45.2                  | UNK            | UNK      | UNK           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:45:00 AM | 0:52             | 47.4                  | Arr            | GA       | Helo          |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME  | END TIME    | RUNWAY | AMBIENT (dB) | TIME        | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|-------------|-------------|--------|--------------|-------------|------------------|-----------------------|----------------|----------|---------------|
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:49:00 AM | 0:41             | 48.9                  | Dep            | GA       | Jet           |
| 14          | 11/7/2019 | 10:45:00 AM | 12:00:00 PM | 27     | 38-45        | 11:51:00 AM | 0:55             | 50.2                  | Arr            | GA       | Helo          |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:05:03 PM  | 00:19            | 97.9                  | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:05:36 PM  | 00:32            | 99.8                  | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:06:27 PM  | 00:22            | 105.0                 | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:06:51 PM  | 00:20            | 113.4                 | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:07:15 PM  | 00:15            | 105.0                 | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:08:00 PM  | 00:40            | 107.6                 | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:12:21 PM  | 00:19            | 98.4                  | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:13:18 PM  | 00:27            | 102.5                 | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:13:57 PM  | 00:37            | 104.6                 | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:16:37 PM  | 00:26            | 97.3                  | Arr            | MIL      | F16           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:24:00 PM  | 00:15            | 70.6                  | Arr            | GA       | Prop          |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:25:57 PM  | 00:25            | 86.3                  | Arr            | CM       | Jet           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:42:27 PM  | 00:14            | 81.0                  | Arr            | GA       | Prop          |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 3:57:14 PM  | 00:13            | 87.9                  | Arr            | CM       | Jet           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 4:21:12 PM  | 00:27            | 91.8                  | Arr            | CM       | Jet           |
| 15          | 11/4/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 45-50        | 4:27:52 PM  | 00:39            | 93.5                  | Arr            | CM       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:25:06 PM  | 00:53            | 74.9                  | Dep            | CM       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:26:06 PM  | 00:37            | 79.5                  | Dep            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:28:37 PM  | 01:29            | 75.8                  | Ovf            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:37:14 PM  | 02:35            | 73.7                  | Dep            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:41:27 PM  | 00:37            | 70.0                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:42:30 PM  | 00:32            | 74.2                  | Dep            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:45:28 PM  | 00:32            | 73.3                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:53:15 PM  | 00:36            | 72.4                  | Ovf            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM  | 4:30:00 PM  | 27     | 44-47        | 2:56:34 PM  | 00:40            | 69.4                  | Dep            | GA       | Prop          |

# memorandum

Landrum & Brown, Incorporated  
 4445 Lake Forest Dr., Suite 700  
 Cincinnati, Ohio 45242  
 513.530.5333



| SITE NUMBER | DATE      | START TIME | END TIME   | RUNWAY | AMBIENT (dB) | TIME       | DURATION (mm:ss) | L <sub>max</sub> (dB) | OPERATION TYPE | OPERATOR | AIRCRAFT TYPE |
|-------------|-----------|------------|------------|--------|--------------|------------|------------------|-----------------------|----------------|----------|---------------|
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 2:57:24 PM | 00:36            | 69.4                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:01:38 PM | 00:25            | 78.8                  | Dep            | CM       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:04:02 PM | 00:27            | 71.6                  | Dep            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:06:47 PM | 00:31            | 69.8                  | Dep            | CM       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:09:12 PM | 00:40            | 91.7                  | Arr            | MIL      | F16           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:14:56 PM | 00:20            | 74.2                  | Dep            | GA       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:15:23 PM | 01:30            | 87.3                  | Arr            | MIL      | F16           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:21:18 PM | 02:15            | 77.2                  | Ovf            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:24:23 PM | 00:49            | 70.9                  | Ovf            | MIL      | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:27:29 PM | 00:42            | 80.1                  | Dep            | GA       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:28:14 PM | 00:26            | 105.3                 | Arr            | MIL      | F16           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:29:22 PM | 00:38            | 77.8                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:54:01 PM | 00:27            | 69.4                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:56:50 PM | 00:39            | 68.2                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 3:58:03 PM | 00:21            | 71.4                  | Dep            | CM       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:00:27 PM | 00:47            | 71.7                  | Dep            | CM       | Jet           |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:04:01 PM | 00:48            | 70.3                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:04:57 PM | 00:20            | 68.8                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:14:24 PM | 00:20            | 68.4                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:19:26 PM | 00:20            | 70.8                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:25:16 PM | 00:54            | 75.6                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:26:18 PM | 00:28            | 78.9                  | Ovf            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:27:22 PM | 00:46            | 74.9                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:28:56 PM | 00:20            | 66.7                  | Dep            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:30:17 PM | 00:28            | 76.0                  | Ovf            | GA       | Prop          |
| 16          | 11/5/2019 | 2:30:00 PM | 4:30:00 PM | 27     | 44-47        | 4:30:51 PM | 00:16            | 69.8                  | Dep            | GA       | Prop          |