Metropolitan Airports Commission (MAC)

Minneapolis-St. Paul International Airport (MSP)
Noise Oversight Committee (NOC)
MAC General Office Building
Lindbergh Conference Room
6040 28th Avenue South
Minneapolis, MN 55450

NOC Committee Members

Dianne Miller – Co-Chair, City of Eagan Representative (City of Eagan)
Jeffrey Hart – Co-Chair (Delta Air Lines)
Ryan Barette – Minnesota Business Aviation Association Representative
Kyle Bronowski – At-large Airport User Representative (Endeavor Air, Inc.)
Pam Dmytrenko – City of Richfield Representative (City of Richfield)
Gordon Goss – Chief Pilot Representative (Delta Air Lines)
Tom Link – At-Large Community Representative (City of Inver Grove Heights)
Dwayne Lowman – City of Bloomington Representative (Bloomington City Council)
Jay Miller – City of Mendota Heights Representative (Mendota Heights City Council)
Angie Moos – Cargo Carrier Representative (United Parcel Service)
Loren Olson – City of Minneapolis Representative (City of Minneapolis)
James Rokala – Charter/Scheduled Operator Representative (Sun Country Airlines)

MEETING AGENDA

January 24, 2018 at 1:30 pm
MAC General Office Building
Lindbergh Conference Room
(Dianne Miller, City of Eagan, will be the acting Chairperson for the meeting)
***Note:** 1:00 to 1:30 – Committee Agenda Review Session
(NOC members only in the Coleman Conference Room)

1.	1:30 – 1:35	Review and Approval of the November 15, 2017 Meeting Minutes
2.	1:35 – 1:45	Review of Monthly Operations Reports: November and December, 2017
3.	1:45 – 2:00	Update on Phoenix Sky Harbor International Airport PBN Ruling
4.	2:00 – 2:45	Response to MSP FairSkies Requests
5.	2:45 – 3:00	Annual MSP Fleet Mix and Nighttime Operations Report
6.	3:00 – 3:10	Vortex Generator Noise Monitoring Study
7.	3:10 – 3:20	Super Bowl Communication Plan Update
8.	3:20	Public Comment Period
9.		Announcements
10.		Adjourn

MSP NOISE OVERSIGHT COMMITTEE
DRAFT MEETING MINUTES
Wednesday, 15th of November 2017 at 1:30pm

MAC General Office
Lindbergh Conference Room

Call to Order

A regularly-scheduled meeting of the MSP Noise Oversight Committee, having been duly called, was held Wednesday, 15th of November 2017, in the Lindbergh Conference Room at the MAC General Office. Chair Miller called the meeting to order at 1:38pm. The following were in attendance:

Representatives:	T. Link; L. Moore; G. Goss; J. Hart; D. Miller; P. Dmytrenko; J. Miller; L. Olson; J. Rokala; A. Moos
Staff:	D. Nelson; B. Juffer, C. Leqve; A. Kolesar; J. Lewis; P. Hogan; J. Welbes
Others:	M. Olson – FAA, Northern Plains District; A. Nemcek – City of Rosemount; L. Grotz – City of Edina; B. Hoffman – City of Saint Louis Park; K. Terrell – MSP FairSkies; D. Sloan – Mendota Heights ARC; C. Carrino – MSP FairSkies; S. Devich – City of Richfield; M. Sands - FAA

Chair Miller, Eagan, introduced and welcomed two new NOC members, James Rokala from Sun Country Airlines and Lynn Moore from the City of Bloomington.

1. **Review and Approval of the July 19 and September 20, 2017 Meeting Minutes**
   Chair Miller, Eagan, requested an approval for the July 19th, 2017 meeting minutes, the motion was moved by **Chair Hart, Delta,** seconded by **Representative Dmytrenko, Richfield,** and passed unanimously. **Chair Miller** requested an approval of the September 20, 2017 minutes, the motion was moved by **Representative Goss, Delta,** seconded by **Representative Dmytrenko** and passed unanimously.

2. **Review of Monthly Operations Reports: September and October, 2017**
   Brad Juffer, Assistant Technical Advisor, started by reporting that there were 33,313 operations in September, a 2.2% drop from 2016, and 35,027 operations in October, a 0.3% increase from 2016.

   The noise office recorded 1,551 nighttime operations between 10:30 PM and 6:00 AM in September and 1,807 nighttime operations in October. During the two months, there were 214 fewer operations (6.3% decrease) than the same period in 2016. October represents the 5th

straight month of reductions in nighttime activity compared to 2016 and year to date, nighttime operations are 4% lower than the same time period last year.

Regarding runway use, **Juffer** reported that September's wind conditions were mostly from the south and southeast, as a result, Runway 12L and 12R had 55% of all arrivals. Runway 17 saw 39% of all departures.

In October, there was more balance in the wind directions, however the gusts were stronger. Runway 12L and 12R saw 45% of arrivals, departures on 30L and 30R increased from 38% in September to 48% in October, and use of Runway 17 dropped to 33%. The south winds of September resulted in 53% of all hours spent in a South Flow during that month. Even that high amount of hours was still less than 2016 when CRO and winds had the airport configured in a South Flow 58% of the time. In October the split was 38% North Flow, 42% South Flow, and 10% Mixed Flow.

Juffer then reported a consistent carrier jet fleet mix across September and October, noting the B737-Max made its MSP debut in November as Southwest Airlines began using the aircraft for regularly scheduled service.

Juffer went on to report the aircraft noise complaints. A total of 522 locations logged complaints in September, which fell to 331 in October. There were 15,283 complaints filed in September and 10,844 complaints in October. These totals are over 5,000 more complaints or 25% when compared to last year.

Monthly density graphics were then presented showing the highest density of locations filing noise complaints for September and October. **Juffer** reported that 2.9% of the areas in September included more than 10 locations entering noise complaints, 5.8% had more than 6 locations, 9.6% had more than 4 locations, and the remaining 82% contained less than 3 locations. The total locations were reduced in October and so were the corresponding densities. During October there were no areas that had more than 10 locations entering noise complaints, 4.9% had more than 6 locations, 5.4% had more than 4 locations, and the remaining 90% contained less than 3 locations.

Total complaint density for the two-month period was then presented. **Juffer** reported that there were 238 areas that filed at least 1 complaint. Of those, 5.5% filed more than 5 complaints per day, 17.6% filed more than 1 per day, 31% filed more than 1 complaint per week, with the remaining 46% filing less than 1 complaint per week.

During September and October, **Juffer** reported that the top 10 complaint locations filed 15,512 complaints. This represents nearly 60% of the complaints filed during these months; eight of those 10 locations were also in the top 10 during the previous two months.

Juffer then reported data from the 39 RMT locations. During September, there were 444 hours of aircraft events above 65 decibels and 506 hours in October. The 444 hours is the lowest recorded since February of this year. There were 87,883 aircraft noise events above 65 decibels recorded in September and 95,472 in October. **Juffer** noted that October had more total aircraft

operations that lead to the increase in aircraft noise events. Both time above and event totals for September and October dropped from 2016.

Juffer reported the noise abatement procedure compliance, noting the Runway 17 Departure Procedure continued to see high usage at 99.8% in September and 99.9% in October. Only 17 jets during those months were west of the 2.5 mile turn point.

The Eagan/Mendota Heights Departure Corridor compliance rate was 97.6% in September and 97.1% in October. The Crossing-in-the-Corridor procedure was used 30.7% and 32.5% of the time during the day in the previous 2 months. At night, 46% of the operations in September crossed in the corridor and 44.3% in October.

The Runway Use System report shows that the overall use of the high priority runways were very similar to one another at 53.7% in September and 53.5% in October. Due to the increased south winds and south flow in September, the departure usage on Runways 12L, 12R and 17 increased in September. In October the airport configuration was more balanced with 55% of arrivals on Runways 30L, 30R and 35 and 52% of departures on 12L, 12R and 17.

Representative Olson, Minneapolis, asked for clarification on the time above data. **Juffer** responded that the time above data was 9% lower than the information provided for the same time period in 2016. This is a result of numerous variables such as the airport flow, the times the aircraft operated, as well as surrounding community noise sources.

Representative Dmytrenko, Richfield, asked how the MAC Noise Office staff responds to noise complaints when there is a clear increase in complaints. **Juffer** responded that the office responds in a number of ways, when filing a complaint via the website, there is a specific spot that asks the resident if they would like a staff response to their question. If they do, then staff responds to the individual resident. If they do not wish for a response, the complaint is archived and retained for reporting purposes. Residents who call to file a complaint on the hotline and request a return phone call will receive a phone call from staff. Sometimes staff meets with individual residents. For example, recently MAC staff met with Representative Tom Link, Inver Grove Heights, and two residents from his community to have a face to face conversation regarding their aircraft noise concerns.

3. Response to MSP FairSkies Requests

Chad Leqve, MAC Director of Environment, reminded the NOC of the previous MSP FairSkies requests, noting that on March 7th, 2017 Dana Nelson, NOC Technical Advisor, received a letter from MSP FairSkies requesting publication of a 55 dB DNL annual noise contour. On March 15th, 2017, the NOC discussed the request and did not move forward with the publication of the 55 dB DNL contour. On August 9th, 2017, MAC staff members met with MSP FairSkies representatives to discuss a FairSkies forum that was held on June 8th, 2017, in Saint Louis Park. It was at that meeting that the FairSkies representatives clarified that the goal for their contour request was to advance a more stringent federal noise metric/threshold prior to the FAA returning to MSP to consider the implementation of Area Navigation departure procedures.

Leqve paused to revisit the NOC's mission of providing a balanced forum for the discussion and evaluation of noise impacts around MSP through: identifying, studying, and analyzing airport noise issues and solutions; providing policy recommendations or options to the MAC Planning, Development, and Environment Committee and Full Commission regarding airport noise issues; monitoring compliance with established noise policy at MSP; and ensuring the collection of information and dissemination to the public. **Leqve** then listed a number of NOC accomplishments that demonstrate the NOCs execution of its mission.

Leqve then revisited the September 20th, 2017 NOC meeting, when representatives from MSP FairSkies addressed the Committee and requested that the NOC and MAC produce a 55 dB Noise Exposure Map/Contour, produce an N65 Noise Exposure Map/Contour, establish a goal to reduce noise, and enhance the NOC with greater stakeholder (citizen) representation. After introducing each request, **Leqve** then went into greater detail on each item and the associated considerations for the NOC.

Regarding the request to publish the 55 dB DNL noise contour, **Leqve** reminded the Committee that the residential sound insulation program and Annual Noise Contour Report are prescribed by the noise litigation Consent Decree with specific requirements for the MAC to follow. **Leqve** also expressed the potential confusion that another noise contour may create with regard to noise mitigation eligibility and the existing partnership that currently exists with the FAA to allow residential sound insulation beyond the federally-established threshold. **Leqve** then mentioned the current effort by the FAA to evaluate the appropriateness of the noise metric (DNL) and threshold (65 dB DNL) and that this effort will include an opportunity for the public to participate in the process. Lastly, regarding the MSP FairSkies purpose to advance a more stringent noise standard before FAA returns to MSP to implement RNAV departure procedures, **Leqve** reminded the Committee about the NOC's RNAV Resolution from 2014, which provides a preemptive and unanimous position on a stakeholder engagement strategy at MSP.

While discussing mitigation considerations related to the request by FairSkies, **Representative Olson, Minneapolis,** asked for clarification regarding a MSP 60 dB DNL Contour Acreage chart that was presented to show the 2005 and 2007 forecast as compared to the actual. **Leqve** reiterated that it was a chart based on the 60 dB DNL as agreed on by the stakeholders and the associated mitigation program. **Olson** then asked if the 55 dB DNL would mirror the 60 dB DNL trend line and **Leqve** replied that it would, although the contour would be larger.

Leqve continued by presenting considerations for the request to establish a goal to reduce noise. He explained the goals iterated in the MAC Purpose, the strict regulatory environment for U.S. airports, NOC's long list of achievements in the midst of a mature noise program and a heavily regulated environment, as well as the current focus on providing mitigation to all homes impacted at the actual 60 DNL noise level.

Lastly, **Leqve** presented considerations related to the request to enhance the NOC with greater stakeholder (citizen) representation. **Leqve** discussed the MASAC group that was present prior to the NOC, the importance of having a balanced forum to discuss aircraft noise issues, the existence of quarterly listening sessions to engage with citizens, the MAC Noise Program's communication enhancements and a list of NOC recent activities that that stemmed from resident/citizen input.

Representative Link, Inver Grove Heights, mentioned the FAA's policy on the 55 dB DNL contour and he asked what the status of that was. **Leqve** responded that the FAA is not

specifically evaluating the 55 dB DNL contour, but reviewing their current policy as it relates to the 65 dB DNL contour. The last report from the FAA was to have results from the airport surveys released by the end of 2017 and when that's complete, the Agency will conduct three policy studies related to its noise metric and threshold based on the survey results.

Representative Dmytrenko, Richfield, thanked Leqve for the background information on the NOC and MASAC and thanked MSP FairSkies as an organization and their input. **Representative Olson, Minneapolis,** stated that Minneapolis supports the production of a 55 dB DNL contour map so they can be part of the national conversation and then asked if the group could continue the conversation as it relates to the noise reduction goals. She also stated that the group is succeeding by a lot of metrics and that the contour is actually shrinking except for the areas that are really still impacted by noise during the nighttime hours. **Olson** also stated that if residents feel like they don't have adequate representation, that the issue needs to be addressed and is glad to have more time to have the board discuss these concerns.

The Committee unanimously agreed that in order to adequately consider the information presented at the meeting and to allow time for at-large representatives to communicate with their respective at-large groups, it would be appropriate to continue the discussion and respond to the MSP FairSkies requests at its January 2018 meeting.

4. Annual MSP Fleet Mix and Nighttime Operations Report

Dana Nelson, Technical Advisor, introduced the annual report that reviews fleet mix trends and trends in nighttime operations at MSP. A complete report was provided to the Committee in their meeting packet and **Nelson** reviewed some highlighted information. Widebody jets have maintained a consistent 2% total over the years in the operations at MSP. **Nelson** showed the group a chart with the percentages of wide body types over the years, the three jets with the highest numbers are the Airbus 330, Boeing 763, and the MD11.

Narrowbody jets were the second largest group of operations but in mid-2014 the airlines started to up-gauge their aircraft and the narrowbody aircraft surpassed regional jets. Across the board, airlines have made an effort to operate fewer operations but with more passenger seating. The top four narrowbody jets over the years are the Airbus 319, Airbus 320, Boeing 738, and the MD90. It should also be noted that the Boeing 717 saw growth in 2016 to 2017, this is a quiet and efficient aircraft. The Boeing 739 has seen an increase in use as well. Last, the MD80 has had a decrease in operations over the years, these are one of the noisiest aircraft to operate at MSP.

Representative Hart, Delta, asked **Nelson** if there was a way to add a noise footprint for each aircraft so there could be a visual comparison of the noise impact difference. **Nelson** responded that she pulled the FAA certification information for a few aircraft types, these list the aircraft's takeoff noise level and the perceived noise level. The B738 has an effective perceived noise level (EPNL) of 88.6 dB, earlier variances of this aircraft were around the low 90s. The A319/320 are at about an 87.4-87.8 EPNLdB, the MD90 is at an 84.2 EPNLdB and the MD80 is at 91.5 EPNLdB. The last thing to note is that the DC9 was once a very popular aircraft and had registered the primary noise events, the number of DC9 operations has been dropping. From January-September of 2017, there have been a total of six DC9 aircraft operations and those have been non-scheduled and charter operations.

The primary aircraft in the regional jet category are the CRJ2, CRJ9, and E170. This category has had an overall decrease in operation numbers. The CRJ2 was around 20% of the fleet

for 2012 and in 2017 that number dropped to about 16%. However the CRJ9 was hovering around 7% in 2012 and in 2017 rose to over 11%. The E170 follows the same trend as the CRJ2 and went from being over 15% of the fleet mix in 2012 to just over 7% in 2017.

Nelson introduced three new aircraft: the A320 NEO which Spirit and Frontier have operating at MSP and American has 100 on order; the B737 Max, which Southwest has in operation at MSP with additional orders by American and United; and the CS-100 which Delta has on order and aircraft deliveries are scheduled to begin in 2018.

Nelson moved on to the nighttime operations report. When comparing 2015 to 2016, there were close to 10 flights per day increase during the nighttime period; however, in 2017 that number decreased by about four operations per night. During the nighttime hours, runway use percentages were compared between 2016 and 2017. The RUS is in place to direct aircraft over less densely populated areas as much as possible, the Eagan/Mendota Heights area and over the river, so arrivals are directed to Runways 30L and 30R and departures are directed to 12L and 12R. The percentages on those runways, equal over 50% of the nighttime operations, the main increase is on 30L nighttime arrivals. The other runways show a consistent percentage with the two year average. To delve deeper, **Nelson** then listed the top 15 airlines with the highest number of nighttime operations and what percentage of their total operations are at night. While Delta, Sun Country, American, and Southwest had the highest count, the percent of nighttime operations from their total operational level is quite low.

Representative Olson, Minneapolis, asked for clarification on the list of operations by airline and said she would like to see what percentage of nighttime flights belong to which airline. **Chair Miller, Eagan,** asked **Nelson** if those numbers were already available in the monthly operations reports. **Nelson** responded that they were and in the interactive reports under the operations tab. **Representative Hart, Delta,** inquired about scheduled versus unscheduled nighttime operations as well as 10pm-1am flights compared to early morning flights. **Nelson** responded that the information for those details is also in the interactive reports and can be broken down in that detail. **Miller** brought up an inquiry from the Eagan Airports Relations Committee, about Runway 30L having most of the nighttime arrivals and asked for strategies to balance the operations more. **Nelson** responded that at this point her office does not have a recommended strategy but inquiries have been sent to FAA. She continued that she suspects it's related to the geographical location and time difference of flights that come in to MSP at night, mainly from the west coast. **Representative Goss, Delta,** commented that from a pilot's perspective Runways 30L and 12R are more desirable, because of the added length, especially for nighttime arrivals/departures. **Nelson** ended by saying that her team can revise the report according to this feedback and present this annual report again in January 2018 with full 2017 data so that can be accurately compared to the historical data. **Miller** agreed that would be helpful.

5. Vortex Generator Noise Monitoring Study

Chair Miller, Eagan, suggested that this item be postponed to January 2018 meeting due to time restrictions and move on to the 2018 work plan. **Dana Nelson, Technical Advisor,** agreed since the 2018 work plan requires an approval action from the committee.

6. Approval of 2018 NOC Work Plan, Meeting Dates, and 2017 Accomplishments

Dana Nelson, Technical Advisor, introduced the draft 2018 NOC Work Plan. The last listening session was akin to a work session with residents to come up with suggestions on what they would like to see the NOC consider in its 2018 Work Plan. The list was shared with the NOC

members and included every verbal and written comment from the meeting. **Nelson** then asked the committee if they would like to see any other items added. **Chair Miller, Eagan,** requested that in addition to the RUS review, that there be a dialogue with the FAA on runway use calling out priorities. **Representative Hart, Delta,** agreed that he would like to see that as well. There was no opposition and the topic was added to the Work Plan. **Representative Olson, Minneapolis,** asked if altitude information related to arrivals and departures is included. **Nelson** responded that in the past there hasn't been a regular report with that specific information and the scope would have to be more specifically defined when looking at the altitudes in specific geographic areas. However altitude trends based on geographical grids as well as by using the noise monitors is available in the interactive reports. **Olson** responded that the public continues to be interested in arrival altitude information and especially with the fleet changing and how that alters altitude. **Representative Goss, Delta,** responded that arrival altitudes have not changed, nor will they, significantly since the 3 degree slope procedures were put in place; significantly being defined as a few hundred feet. As the fleet changes and as the weather and aircraft loads change, there may be altitude changes in departures. **Representative Dmytrenko, Richfield,** added that she would like to focus on outcomes and that maybe there are opportunities to invite experts to address the Committee on topics related to aircraft fleet, manufacturing technologies, and the future of aviation. The topic was added to the Work Plan. **Nelson** mentioned that discussing and responding to the MSP FairSkies requests should be added to the 2018 Work Plan as well and under that address many items that were also requested by members at the listening session , as they overlap. **Chair Miller, Eagan,** requested a motion to approve the amended 2018 NOC Work Plan, it was moved by **Representative Hart, Delta,** seconded by **Representative Moos, UPS,** and was passed unanimously.

Nelson added that the meeting dates for 2018 are listed and needs committee approval for the meeting dates. **Chair Miller, Eagan,** requested a motion, it was moved by **Representative Dmytrenko, Richfield,** seconded by **Representative Moore, Bloomington,** and passed unanimously. **Chair Miller, Eagan,** requested a motion to approve and send the 2017 NOC accomplishments to PD&E in December. The motion was moved by **Representative Dmytrenko, Richfield,** seconded by **Representative Goss, Delta,** and passed unanimously.

7. **Review of October 25, 2017 Listening Session**
   Dana Nelson, Technical Director, stated that 26 people attended the fall listening session and majority of the residents were from Minneapolis and Edina. MAC staff, FAA staff, NOC representatives, City of Minneapolis staff, and Delta staff were also in attendance.

8. **Public Comment Period – Representative Olson, Minneapolis,** made a motion to allow a Minneapolis resident address the Committee. The motion was seconded by **Representative Link.**

   Kevin Terrell, MSP FairSkies Coalition, commented that he was glad to hear the committee discuss a focus on outcomes because that requires one to have good key performance indicators (KPI). That aside, **Terrell** said that the KPI's before the committee were not an accurate reflection of citizen expectations. If one is going to use KPI's, one needs to collect and use relevant, accurate, and valid data. **Terrell** stated that the problem with N65 data is that the remote monitoring towers are not evenly distributed, this means that when flow changes, the numbers change and there isn't a valid measurement. One action item listed for 2018 is to improve the monitoring system and **Terrell** suggested that the committee look at the proposal in the legislature that MSP FairSkies put forth. The proposal is around creating matrix of 200

noise and air quality monitors across the Twin Cities, evenly distributed, and run by one of the universities in the area. **Terrell** added that about half of a million dollars could get that project up and running and would provide a consistent look at noise and air quality across the entire Twin Cities.

Terrell then directly addressed the request that MSP FairSkies put forth and said historically a 55 dB DNL contour has been built when the annual noise contour report is produced. He then referred to the current Lake Elmo Long Term Comprehensive Plan and stated there is an associated 55 dB DNL noise contour in that document for that airport. **Terrell** added that the 55 dB DNL is published in Part 150 documents in New York City airports, which showed a doubling in impacted acreage with this contour. **Terrell** stated that staff can create a noise exposure map using this contour and thusly discover the number of people affected by noise; this is the KPI. Regarding the N65 contour, **Terrell** said there were some questions as to which metrics can be used and which metrics the FAA says can be used. **Terrell** stated that N65 is an allowable supplemental metric, it is written in the FAA's guidance; it can be used, it's allowed, and it's been built into the model used to create the noise contour. Related to that, the noise exposure map can be done based on the N65 contour data.

In conclusion, **Terrell** suggested that the committee await the FAA's decision at the end of 2017 and wait for them to come forward with a useful solution. If that doesn't happen, he suggested that the committee take a close look at the request made by MSP FairSkies as their request was made based on facts, within the confines of the system, and based on what else is being done in other parts of the country. **Terrell** said that if the committee decides to not do anything that MSP FairSkies requested, including going backwards on producing a 55 dB DNL noise contour, that FairSkies as well as members of legislature will view that action very dimly.

9. Announcements - None

10. Adjourn

A motion to adjourn was requested by **Chair Miller, Eagan,** moved by **Representative Goss, Delta,** and seconded by **Representative Olson, Minneapolis.**

The meeting adjourned at 3:25 p.m.

The next meeting of the NOC is scheduled for Wednesday, 24th of January, 2018.

Respectfully Submitted,
Amie Kolesar, Recording Secretary

ITEM 2

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Bradley Juffer, Assistant Manager—Noise, Environment & Planning

SUBJECT: **REVIEW OF MONTHLY OPERATIONS REPORTS: NOVEMBER AND DECEMBER, 2017**

DATE: January 10, 2018

Each month the MAC reports information on MSP aircraft operations, aircraft noise complaints, sound levels associated with MSP aircraft operations, and compliance with established noise abatement procedures on its interactive reporting website: https://www.macenvironment.org/reports/.

At the January 24, 2018 NOC meeting, MAC staff will provide a summary of this information for the months of November and December, 2017. To view these summary reports prior to the meeting, visit the Archives section at the link above.

ITEM 3

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Dana Nelson, Manager—Noise, Environment & Planning

SUBJECT: **UPDATE ON PHOENIX SKY HARBOR INTERNATIONAL AIRPORT PBN RULING**

DATE: January 10, 2018

On August 29, 2017, the U.S. Court of Appeals for the District of Columbia Circuit ruled that the Federal Aviation Administration's (FAA) implementation of satellite-based procedures at Phoenix Sky Harbor International Airport violated the National Historic Preservation Act, the National Environmental Policy Act, and the Department of Transportation Act. The Court ruled that the FAA failed to adequately notify elected officials and residents allowing them to comment on the procedures and that the FAA would have to vacate the new satellite-based departure procedures at Sky Harbor.

In response to the court ruling, on November 30, 2017, the parties to the litigation jointly asked a federal appeals court to accept a plan they developed. Specifically, the plan includes two steps:

- During step one, the FAA would create new, temporary instructions for aircraft departing to the west that would route aircraft near the airport in a manner to approximate, to the extent practicable, the routes prior to the implementation of satellite-based procedures. The FAA would engage in community outreach before completing this step.

- During step two, the FAA would develop new satellite-based procedures for the westbound departures and consider routes that approximate the routes prior to the implementation of satellite-based procedures near the airport. The FAA also would consider feedback on procedures throughout the phoenix area. The FAA would engage in community outreach while developing these procedures.

The FAA will need to conduct safety and environmental reviews of the two steps above.

In addition to the two-step plan, the agreement seeks to clarify the scope of its August 29, 2017 remand order by limiting it to the nine satellite-based departure procedures at Sky Harbor International Airport, which were the focus of the litigation. The agreement also asks the Court to remand but not vacate the departure procedures. The first step of the joint plan would alter only the beginning of the departure procedures, to reduce noise

impacts, requiring planes to return to the satellite-based routes after the first leg of their departure.

This landmark court case and joint agreement by the parties reinforces the points raised by the NOC and MAC to the FAA in the 2014 NOC RNAV Resolution: a successful implementation of such satellite-based flight procedures requires a sufficient level of noise analysis and community involvement.

At the January 24, 2018 NOC meeting, MAC staff will provide an update on this topic.

ITEM 4

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Dana Nelson, Manager—Noise, Environment & Planning

SUBJECT: **RESPONSE TO MSP FAIRSKIES REQUESTS**

DATE: January 10, 2018

At the September 20, 2017 NOC meeting, the co-founders of the MSP FairSkies Coalition made several requests to the Committee. The presentation slides containing these requests were sent to the Committee following the meeting and added to the meeting presentation deck at: www.macnoise.com/sites/www.macenvironment.org/files/pdf/noc-presentation-20170920.pdf.

In summary, the following requests were made to the NOC:

1. Produce and publish a 55 dB DNL contour
2. Produce and publish an N65 contour
3. Establish a goal to reduce noise
4. Enhance the NOC with greater stakeholder (citizen) representation

The NOC Co-Chairs directed MAC staff to present information for consideration with respect to each request at the November 15, 2017 NOC meeting. Presentation slides containing these considerations are available in the meeting presentation deck under Item 3 at: www.macnoise.com/pdf/noc-presentation-20171115FINAL.pdf

During the November meeting the Committee members discussed the requests and determined it was necessary to allow time to consider staff's presentation, discuss among the at-large groups and respond to the requests at its January meeting.

REQUESTED ACTION

PROVIDE COMMITTEE RESPONSE TO MSP FAIRSKIES REQUESTS.

ITEM 5

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Dana Nelson, Manager—Noise, Environment & Planning

SUBJECT: **ANNUAL MSP FLEET MIX AND NIGHTTIME OPERATIONS REPORT**

DATE: January 10, 2018

The 2018 NOC Work Plan includes an assessment of current fleet mix and nighttime operational trends. MAC staff has prepared the attached Annual MSP Fleet Mix and Nighttime Operations Report. This report was presented at the November NOC meeting where the Committee made suggestions to add information. Staff committed to incorporating the suggestions in the development of a year-end Fleet Mix and Nighttime Operations Report for presentation at the January 2018 NOC meeting.

Attached is the Annual MSP Fleet Mix and Nighttime Operations Report for 2017. The report includes updated 2017 data as well as the following additions:

- 2017 Carrier Jet Usage and Certificated Noise Levels chart on Page 6
- Average Altitude for Aircraft Arrivals and Departures on Pages 7-8
- Percent Contribution to Nighttime Total included in the tables on Page 12
- Noise Level Certification range included in the table on Page 13
- Nighttime Operations by Origin and Destination tables on Page 14
- Nighttime Operations by Hour on Page 15
- 2017 Scheduled versus Actual Operations on Page 16

A copy of the report is attached and will be presented at the January 24, 2018 NOC meeting.

ANNUAL MSP FLEET MIX AND NIGHTTIME OPERATIONS REPORT

JANUARY 2018

ENVIRONMENT DEPARTMENT, NOISE PROGRAM OFFICE

METROPOLITAN AIRPORTS COMMISSION

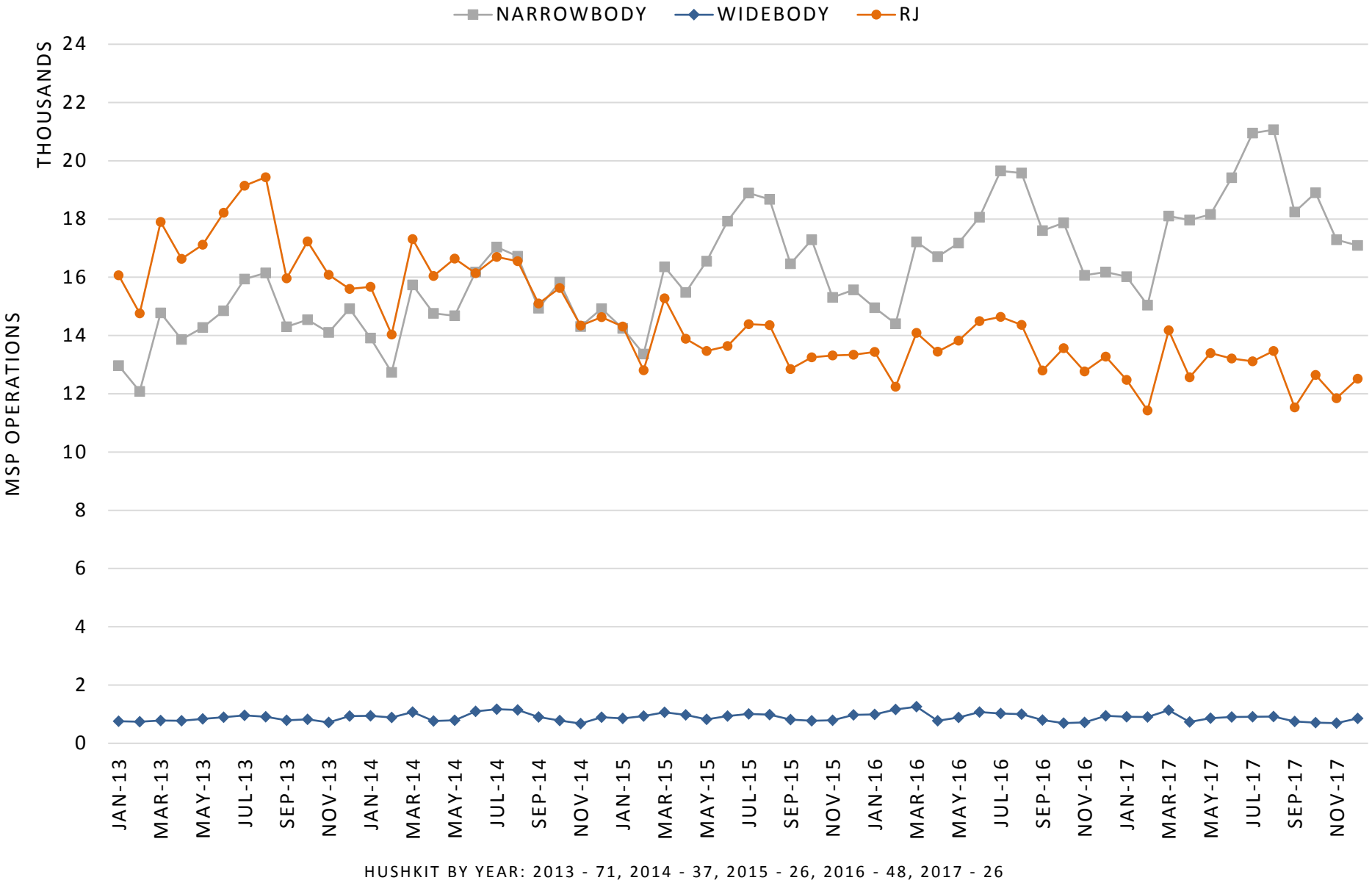
6040 28TH AVENUE SOUTH, MINNEAPOLIS, MN 55450

WWW.MACNOISE.COM

ANNUAL MSP FLEET MIX AND NIGHTTIME OPERATIONS REPORT

TABLE OF CONTENTS

MONTHLY CARRIER JET COUNTS BY TYPE



HUSHKIT BY YEAR: 2013 - 71, 2014 - 37, 2015 - 26, 2016 - 48, 2017 - 26

WIDEBODY JET ACTIVITY

PERCENT OF ANNUAL CARRIER JET OPERATIONS

	TYPE	2013	2014	2015	2016	2017
WIDEBODY	A124	0.00%	0.00%	0.00%	0.00%	0.00%
	A225	0.00%	0.00%	0.00%	0.00%	0.00%
	A300	0.03%	0.07%	0.07%	0.03%	0.03%
	A310	0.01%	0.01%	0.02%	0.00%	0.00%
	A330	0.75%	0.69%	0.73%	0.68%	0.80%
	A340	0.00%	0.05%	0.07%	0.06%	0.07%
	A350	0.00%	0.00%	0.00%	0.00%	0.01%
	A380	0.00%	0.00%	0.00%	0.00%	0.00%
	B742	0.00%	0.00%	0.00%	0.00%	0.00%
	B744	0.01%	0.08%	0.03%	0.01%	0.01%
	B748	0.00%	0.00%	0.00%	0.00%	0.00%
	B762	0.12%	0.14%	0.14%	0.14%	0.15%
	B763	0.55%	0.83%	0.74%	0.90%	0.49%
	B764	0.19%	0.21%	0.22%	0.24%	0.01%
	B767	0.00%	0.00%	0.00%	0.00%	0.00%
	B777	0.18%	0.10%	0.17%	0.18%	0.38%
	B7878	0.00%	0.00%	0.00%	0.00%	0.01%
	DC10	0.20%	0.19%	0.24%	0.13%	0.27%
	MD11	0.51%	0.54%	0.51%	0.61%	0.46%
	TOTAL	**2.56%**	**2.92%**	**2.94%**	**2.98%**	**2.70%**

NARROWBODY JET ACTIVITY

PERCENT OF ANNUAL CARRIER JET OPERATIONS

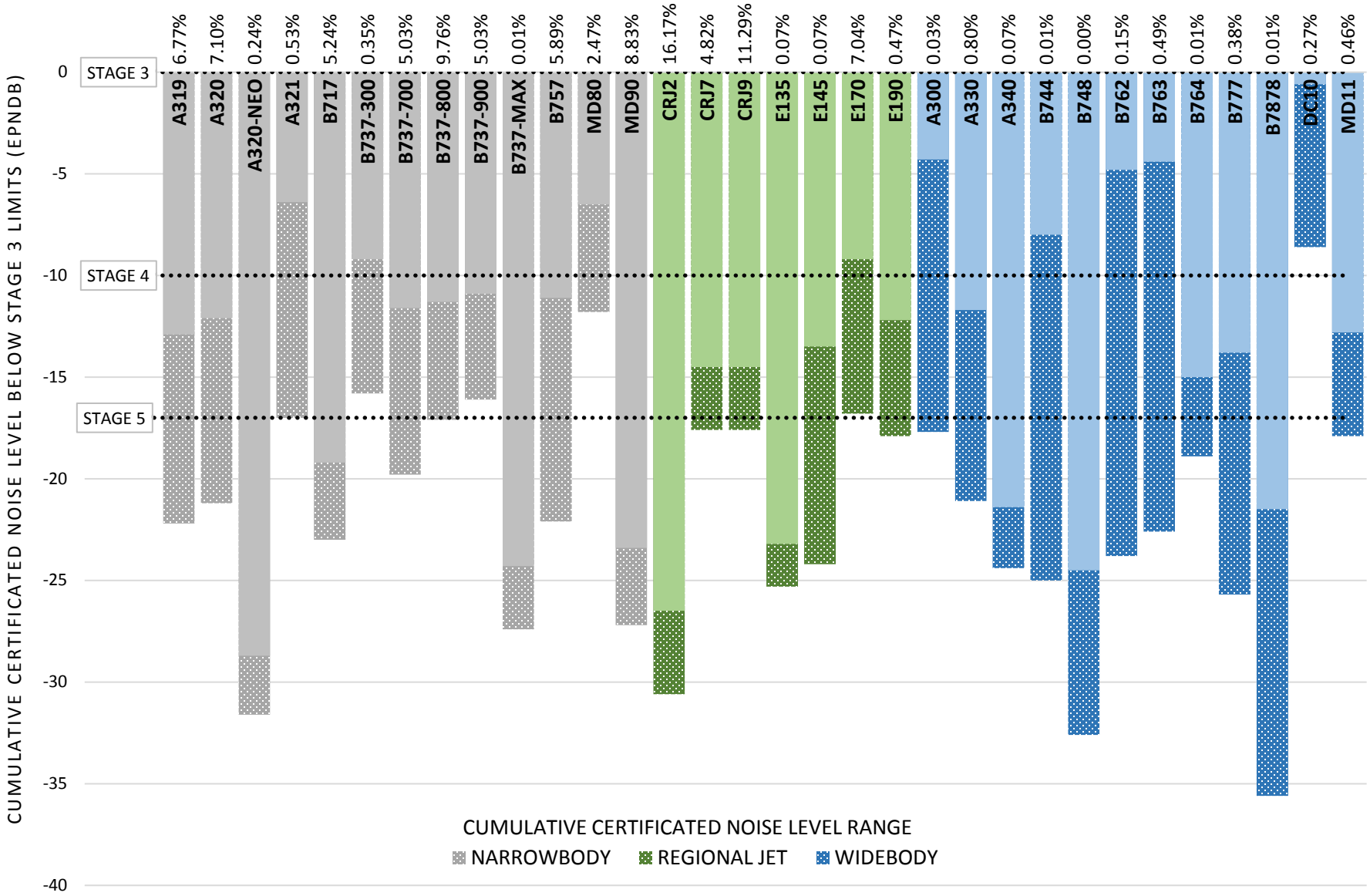
	TYPE	2013	2014	2015	2016	2017
NARROWBODY	A318	0.01%	0.00%	0.00%	0.00%	0.00%
	A319	5.98%	7.54%	7.91%	7.23%	6.77%
	A320	8.35%	9.61%	9.02%	9.89%	7.10%
	A320-NEO	0.00%	0.00%	0.00%	0.03%	0.24%
	A321	0.47%	0.72%	0.84%	0.46%	0.53%
	B717	0.83%	0.59%	1.48%	2.36%	5.24%
	B72Q	0.01%	0.00%	0.00%	0.00%	0.00%
	B733	1.12%	0.75%	0.85%	0.67%	0.35%
	B734	0.04%	0.04%	0.03%	0.03%	0.03%
	B735	0.01%	0.00%	0.00%	0.00%	0.00%
	B7377	4.43%	5.01%	4.83%	4.83%	5.03%
	B738	4.53%	5.62%	6.78%	7.82%	9.76%
	B739	0.13%	0.77%	2.81%	3.78%	5.03%
	B73Q	0.00%	0.00%	0.00%	0.01%	0.00%
	B737-MAX	0.00%	0.00%	0.00%	0.00%	0.01%
	B757	6.89%	6.47%	6.39%	5.80%	5.89%
	DC8Q	0.00%	0.00%	0.00%	0.00%	0.00%
	DC9Q	0.01%	0.00%	0.00%	0.00%	0.00%
	MD80	4.03%	3.72%	3.52%	3.59%	2.47%
	MD90	7.84%	6.78%	8.25%	7.61%	8.83%
	TOTAL	**44.66%**	**47.62%**	**52.73%**	**54.11%**	**57.29%**

REGIONAL JET ACTIVITY

PERCENT OF ANNUAL CARRIER JET OPERATIONS

	TYPE	2013	2014	2015	2016	2017
REGIONAL JET	BA46	0.00%	0.00%	0.00%	0.00%	0.00%
	CRJ	16.10%	0.00%	0.00%	0.00%	0.00%
	CRJ1	0.01%	0.10%	0.00%	0.13%	0.06%
	CRJ2	9.33%	21.40%	17.26%	17.14%	16.17%
	CRJ7	4.11%	4.23%	3.39%	2.75%	4.82%
	CRJ9	7.60%	10.96%	14.70%	13.71%	11.29%
	E135	1.30%	0.06%	0.09%	0.08%	0.07%
	E145	0.67%	1.85%	1.24%	0.22%	0.07%
	E170	13.22%	10.60%	7.37%	8.67%	7.04%
	E175	0.00%	0.00%	0.00%	0.00%	0.00%
	E190	0.40%	0.23%	0.25%	0.20%	0.47%
	F28	0.00%	0.00%	0.00%	0.00%	0.00%
	J328	0.03%	0.03%	0.02%	0.01%	0.01%
	TOTAL	**52.77%**	**49.46%**	**44.33%**	**42.91%**	**40.01%**

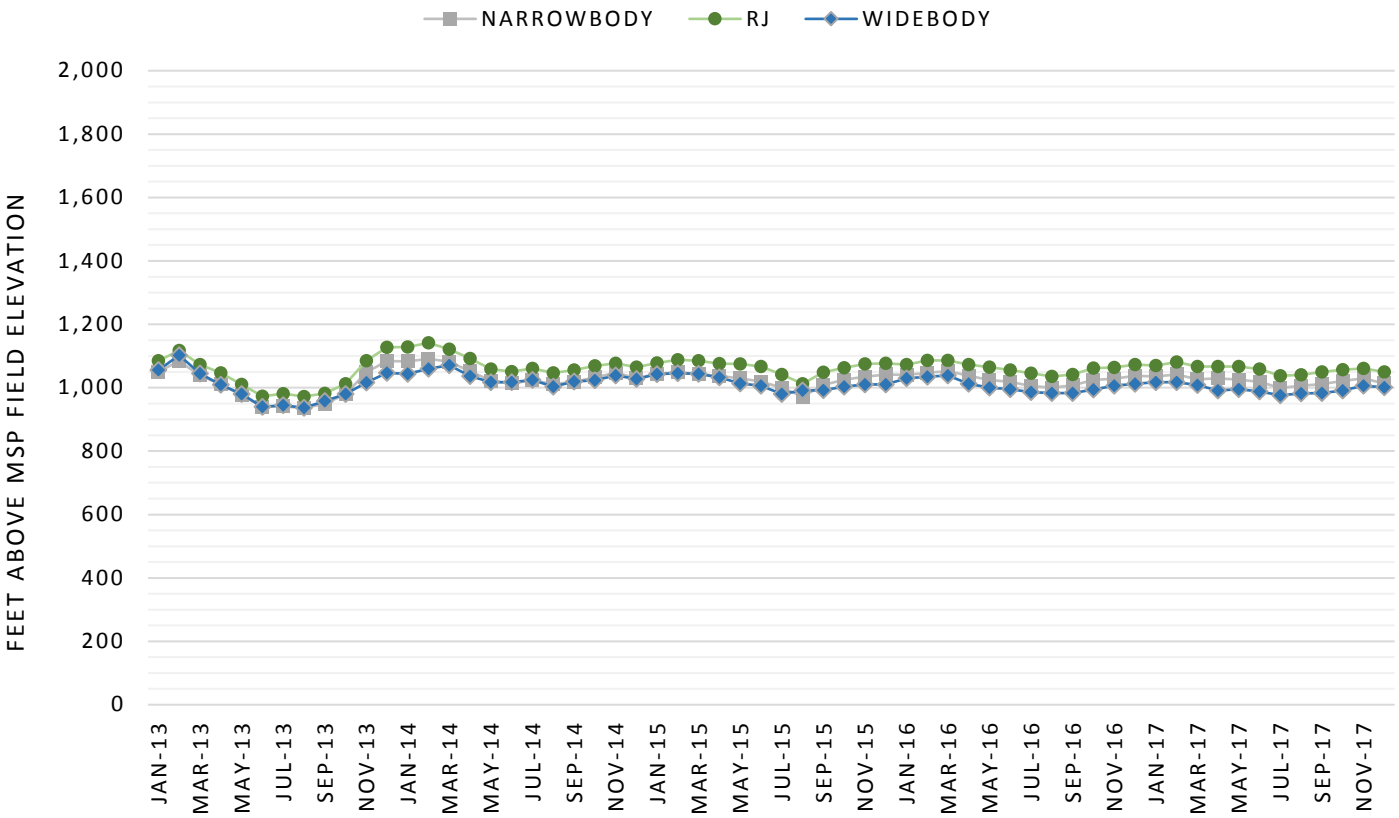
2017 MSP CARRIER JET USAGE WITH CUMULATIVE CERTIFICATED NOISE LEVELS

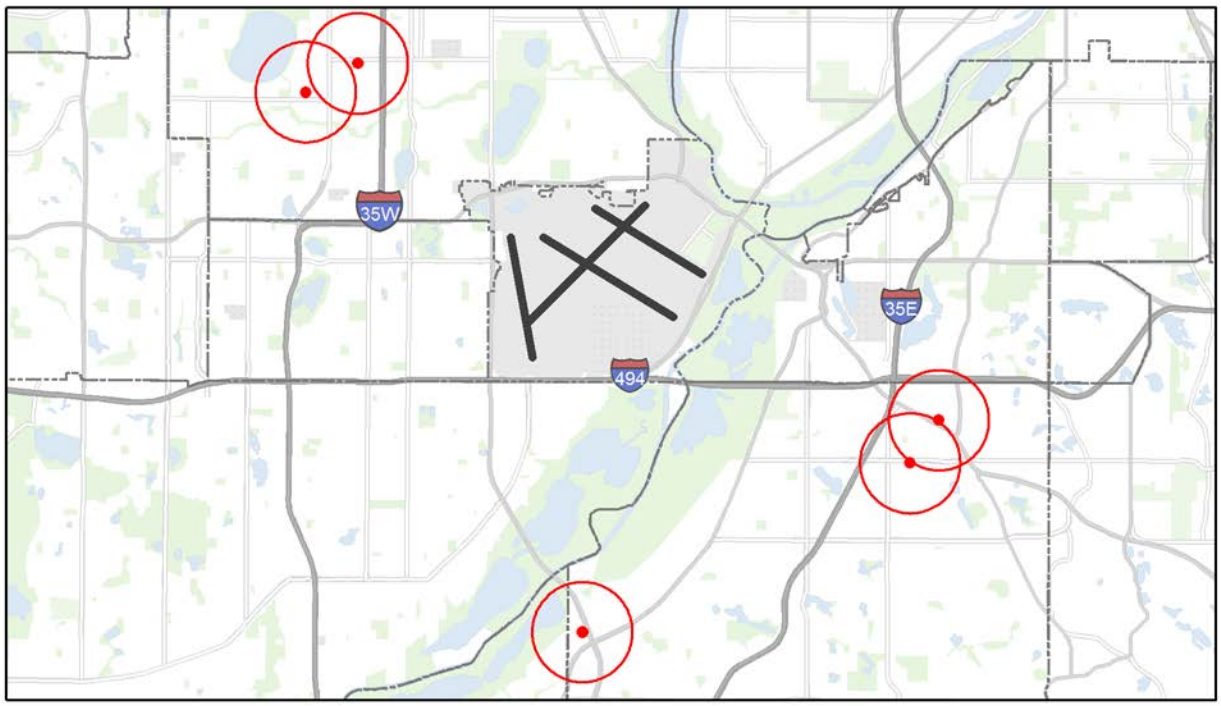


SOURCE: USAGE DATA: MACNOMS; NOISE CERTIFICATION DATA: EUROPEAN AVIATION SAFETY AGENCY

CUMULATIVE CERTIFICATED NOISE LEVELS REPRESENTED AS A RANGE TO ACCOUNT FOR MULTIPLE CERTIFICATION VARIABLES (WEIGHT, MODEL, ENGINE TYPE, AIRFRAME CONFIGURATION, ETC)

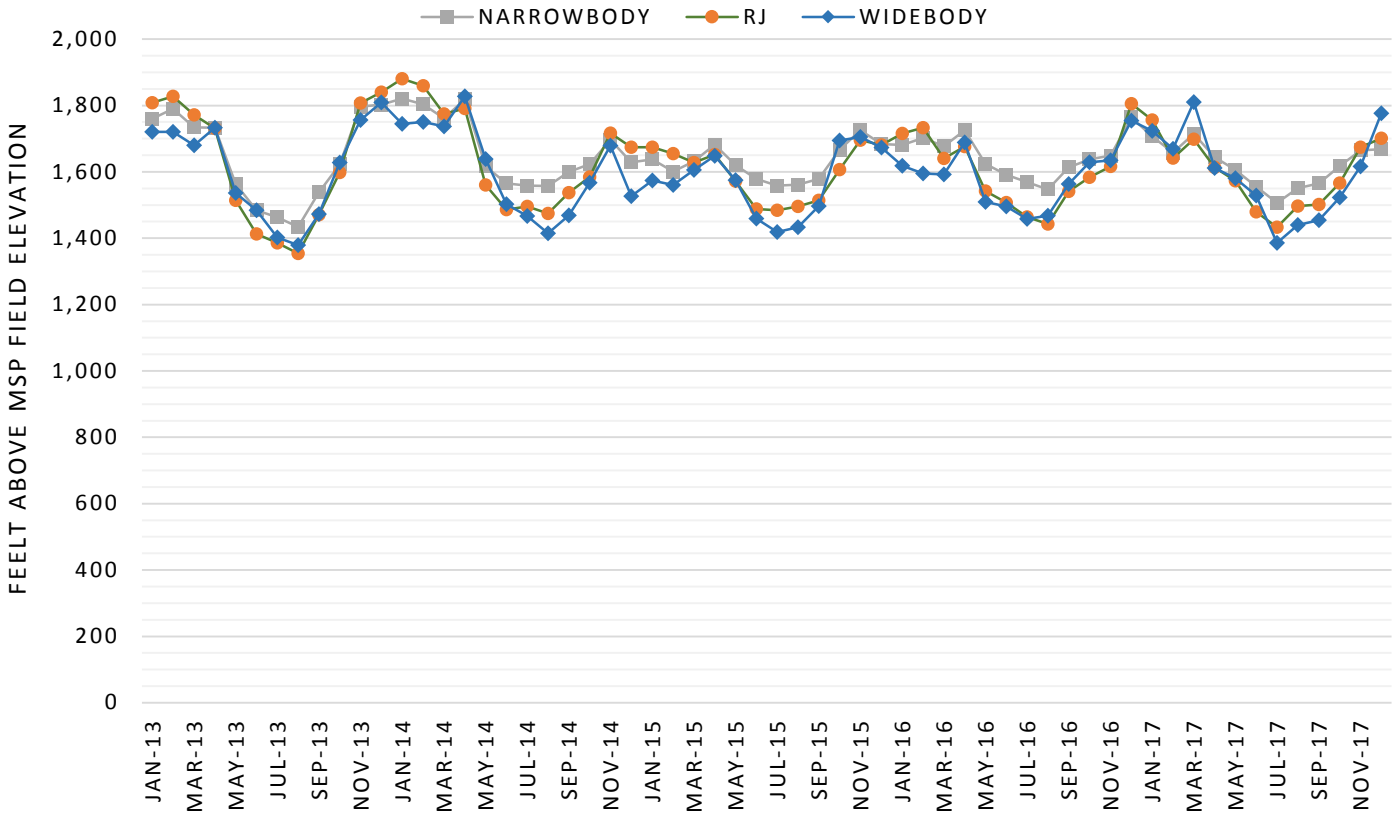
AVERAGE ALTITUDE FOR AIRCRAFT ARRIVING TO MSP

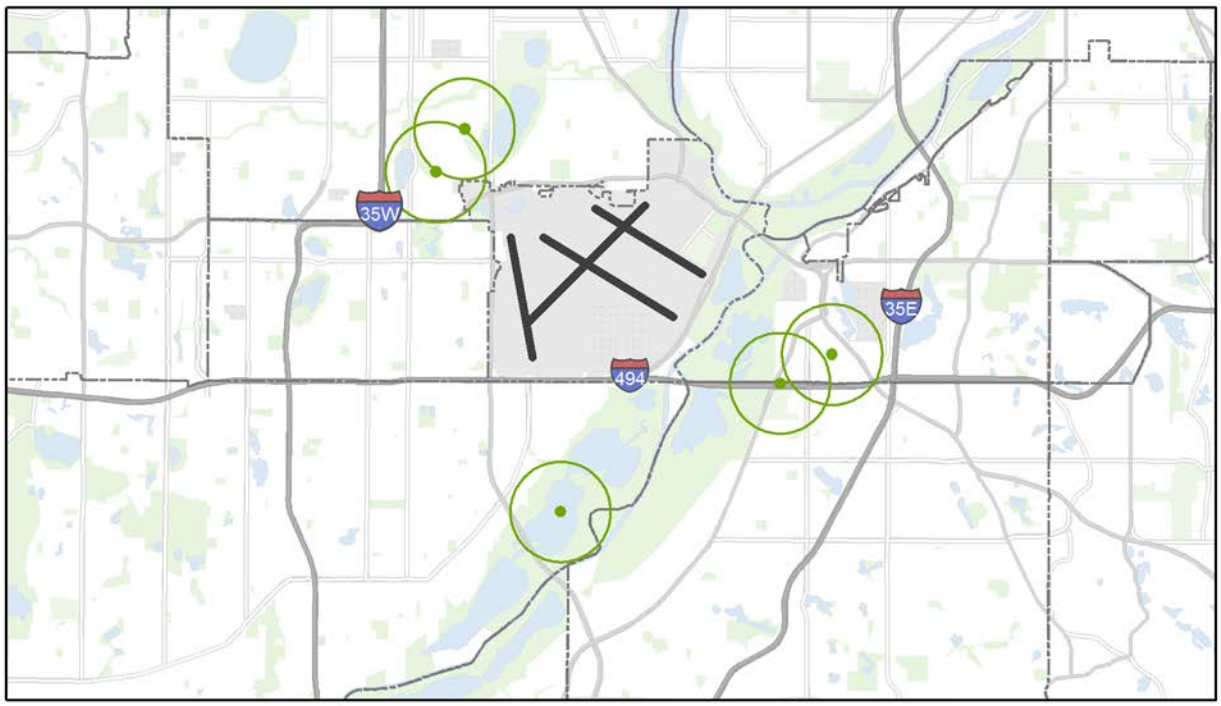




MEASUREMENT POINT IS THREE NAUTICAL MILES FROM THE THRESHOLD OF THE ARRIVAL RUNWAY
FLIGHT TRACK DATA SOURCE CHANGED NOVEMBER 2013

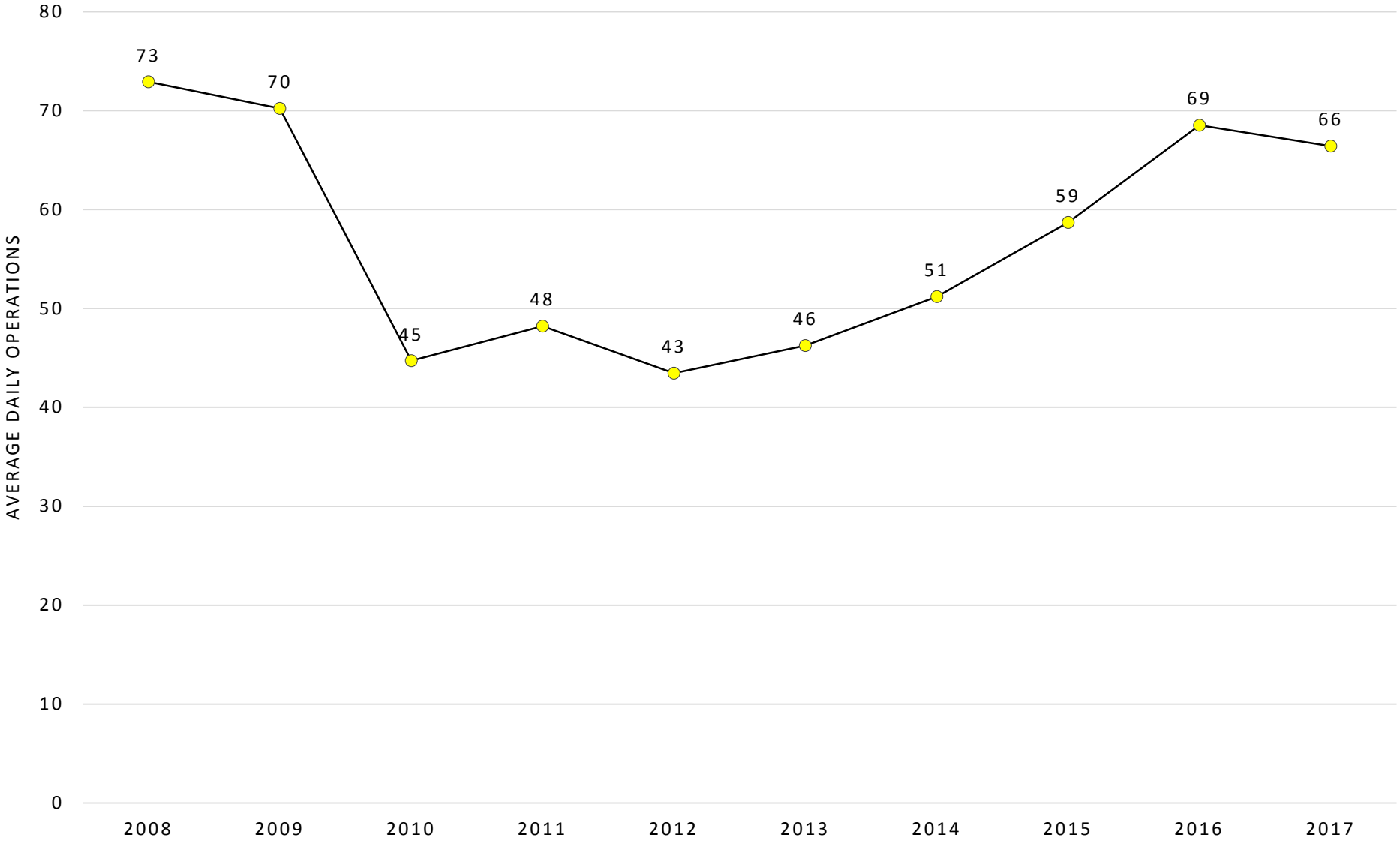
AVERAGE ALTITUDE FOR AIRCRAFT DEPARTING FROM MSP





MEASUREMENT POINT IS THREE NAUTICAL MILES FROM THE START OF TAKEOFF ROLL
FLIGHT TRACK DATA SOURCE CHANGED NOVEMBER 2013

AVERAGE DAILY NIGHTTIME OPERATIONS
10:30 PM - 6:00 AM



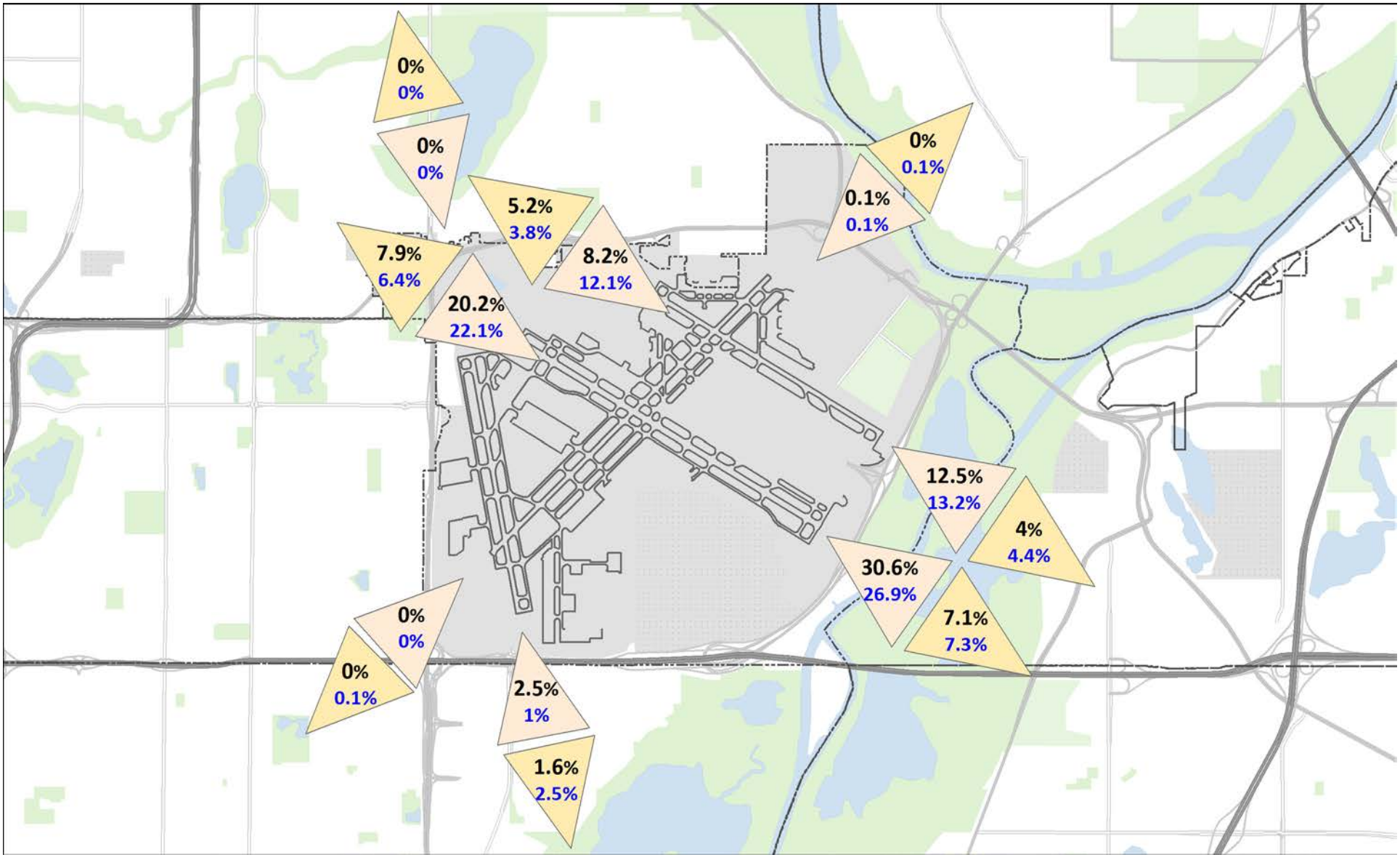
NIGHTTIME OPERATIONS BY RUNWAY

(10:30 PM – 6:00 AM)

			2017			2014 - 2016 AVERAGE		
RWY	**ARR / DEP**	**OVERFLIGHT AREA**	**TOTAL NIGHT OPS**	**AVERAGE DAILY NIGHT OPS**	**%**	**TOTAL NIGHT OPS**	**AVERAGE DAILY NIGHT OPS**	**%**
04	ARR	SO. RICHFIELD/BLOOMINGTON	2	0.0	0.0%	11	0.0	0.1%
12L	ARR	SO. MINNEAPOLIS/NO. RICHFIELD	1,998	5.5	8.2%	2,621	7.2	12.1%
12R	ARR	SO. MINNEAPOLIS/NO. RICHFIELD	4,893	13.4	20.2%	4,806	13.2	22.1%
17	ARR	SO. MINNEAPOLIS	0	0.0	0.0%	2	0.0	0.0%
22	ARR	ST. PAUL/HIGHLAND PARK	22	0.1	0.1%	31	0.1	0.1%
30L	ARR	EAGAN/MENDOTA HEIGHTS	7,423	20.3	30.6%	5,843	16.0	26.9%
30R	ARR	EAGAN/MENDOTA HEIGHTS	3,036	8.3	12.5%	2,858	7.8	13.2%
35	ARR	BLOOMINGTON/EAGAN	594	1.6	2.5%	219	0.6	1.0%
TOTAL NIGHTTIME ARRIVALS			**17,968**	**49.2**	**74%**	**16,391**	**44.9**	**75%**
04	DEP	ST. PAUL/HIGHLAND PARK	0	0.0	0.0%	29	0.1	0.1%
12L	DEP	EAGAN/MENDOTA HEIGHTS	973	2.7	4.0%	957	2.6	4.4%
12R	DEP	EAGAN/MENDOTA HEIGHTS	1,716	4.7	7.1%	1,581	4.3	7.3%
17	DEP	BLOOMINGTON/EAGAN	398	1.1	1.6%	533	1.5	2.5%
22	DEP	SO. RICHFIELD/BLOOMINGTON	3	0.0	0.0%	11	0.0	0.1%
30L	DEP	SO. MINNEAPOLIS/NO. RICHFIELD	1,918	5.3	7.9%	1,385	3.8	6.4%
30R	DEP	SO. MINNEAPOLIS/NO. RICHFIELD	1,265	3.5	5.2%	835	2.3	3.8%
35	DEP	SO. MINNEAPOLIS	0	0.0	0.0%	7	0.0	0.0%
TOTAL NIGHTTIME DEPARTURES			**6,273**	**17.3**	**26%**	**5,338**	**14.6**	**25%**
TOTAL NIGHTTIME OPERATIONS			**24,241**	**66.5**	**100%**	**21,729**	**59.5**	**100%**

NIGHTTIME OPERATIONS BY RUNWAY

(10:30 PM – 6:00 AM)



NIGHTTIME OPERATIONS BY AIRLINE
(TOP 15 BY COUNT)

	AIRLINE	ID	COUNT	PERCENT OF AIRLINE OPERATIONS' OCCURRING AT NIGHT	PERCENT OF CONTRIBUTION TO NIGHT TIME TOTAL
2017	DELTA	DAL	5,896	4.10%	26.08%
	SUN COUNTRY	SCX	3,735	17.80%	16.52%
	AMERICAN	AAL	2,417	14.10%	10.69%
	SOUTHWEST	SWA	2,234	12.70%	9.88%
	SKYWEST AIRLINES	SKW	1,887	2.40%	8.35%
	UNITED	UAL	1,248	14.40%	5.52%
	SPIRIT	NKS	1,239	13.50%	5.48%
	UPS	UPS	874	31.90%	3.87%
	REPUBLIC AIRLINES	RPA	721	8.40%	3.19%
	FEDEX	FDX	635	23.90%	2.81%
	ENDEAVOR AIR	EDV	491	1.30%	2.17%
	FRONTIER AIRLINES	FFT	420	18.40%	1.86%
	MESA AIRLINES	ASH	323	9.10%	1.43%
	ALASKA	ASA	298	19.20%	1.32%
	COMPASS	CPZ	188	1.90%	0.83%

	AIRLINE	ID	COUNT	PERCENT OF AIRLINE OPERATIONS OCCURRING AT NIGHT	PERCENT OF CONTRIBUTION TO NIGHT TIME TOTAL
2016	DELTA	DAL	6,300	4.60%	27.08%
	SUN COUNTRY	SCX	3,342	17.10%	14.37%
	AMERICAN	AAL	3,080	17.80%	13.24%
	SKYWEST AIRLINES	SKW	2,186	3.10%	9.40%
	SOUTHWEST	SWA	2,048	11.90%	8.80%
	SPIRIT	NKS	1,189	13.50%	5.11%
	UNITED	UAL	961	12.20%	4.13%
	UPS	UPS	867	32.80%	3.73%
	ENDEAVOR AIR	FLG	834	2.10%	3.59%
	FRONTIER AIRLINES	FFT	596	27.50%	2.56%
	REPUBLIC AIRLINES	RPA	554	8.40%	2.38%
	FEDEX	FDX	465	20.00%	2.00%
	ALASKA	ASA	326	20.80%	1.40%
	COMPASS	CPZ	301	1.70%	1.29%
	MESA AIRLINES	ASH	214	6.00%	0.92%

*AIRLINE OPERATIONS OCCURRING AT NIGHT REPRSENTS THE PERCENTAGE OF RESPECTIVE AIRLINE SCHEDULE THAT OCCURS AT NIGHT

*CONTRIBUTION TO TOTAL IS RESPECTIVE AIRLINE CONTRIBUTIONS TO OVERALL MSP NIGHT OPERATIONS

NIGHTTIME OPERATIONS BY AIRCRAFT
(TOP 15)

AIRCRAFT CODE	DESCRIPTION	COUNT	NOISE LEVEL CERTIFICATION (EPNdB BELOW STAGE 3)
B738	BOEING 737-800	6,071	11.3 - 17.1
B757	BOEING 757-200	2,552	11.1 - 22.1
B7377	BOEING 737-700	2,549	11.6 - 19.8
A320	AIRBUS INDUSTRIES A320	1,836	12.1 - 21.2
E170	EMBRAER 170	1,825	9.2 - 16.8
B739	BOEING 737-900	1,813	10.9 - 16.1
A319	AIRBUS INDUSTRIES A319	1,166	12.9 - 22.2
CRJ9	CANADAIR REGIONAL JET CRJ-900	958	14.5 - 17.6
MD90	MCDONNELL DOUGLAS MD90	774	23.4 - 27.2
CRJ2	CANADAIR REGIONAL JET CRJ-200	601	26.5 - 30.6
B717	BOEING 717	535	19.2 - 23.0
A321	AIRBUS INDUSTRIES A321	518	6.4 - 17.0
CRJ7	CANADAIR REGIONAL JET CRJ-700	418	14.5 - 17.6
MD11	MCDONNELL DOUGLAS MD11	384	12.8 - 17.9
A330	AIRBUS INDUSTRIES A330	271	11.7 - 21.1

NOISE CERTIFICATION DATA SOURCE: EUROPEAN AVIATION SAFETY AGENCY

CUMULATIVE CERTIFICATED NOISE LEVELS REPRESENTED AS A RANGE BELOW STAGE 3 NOISE LEVELS TO ACCOUNT FOR MULTIPLE CERTIFICATION VARIABLES (WEIGHT, MODEL, ENGINE TYPE, AIRFRAME CONFIGURATION, ETC)

NIGHTTIME OPERATIONS BY ORIGIN AND DESTINATION
(TOP 15)

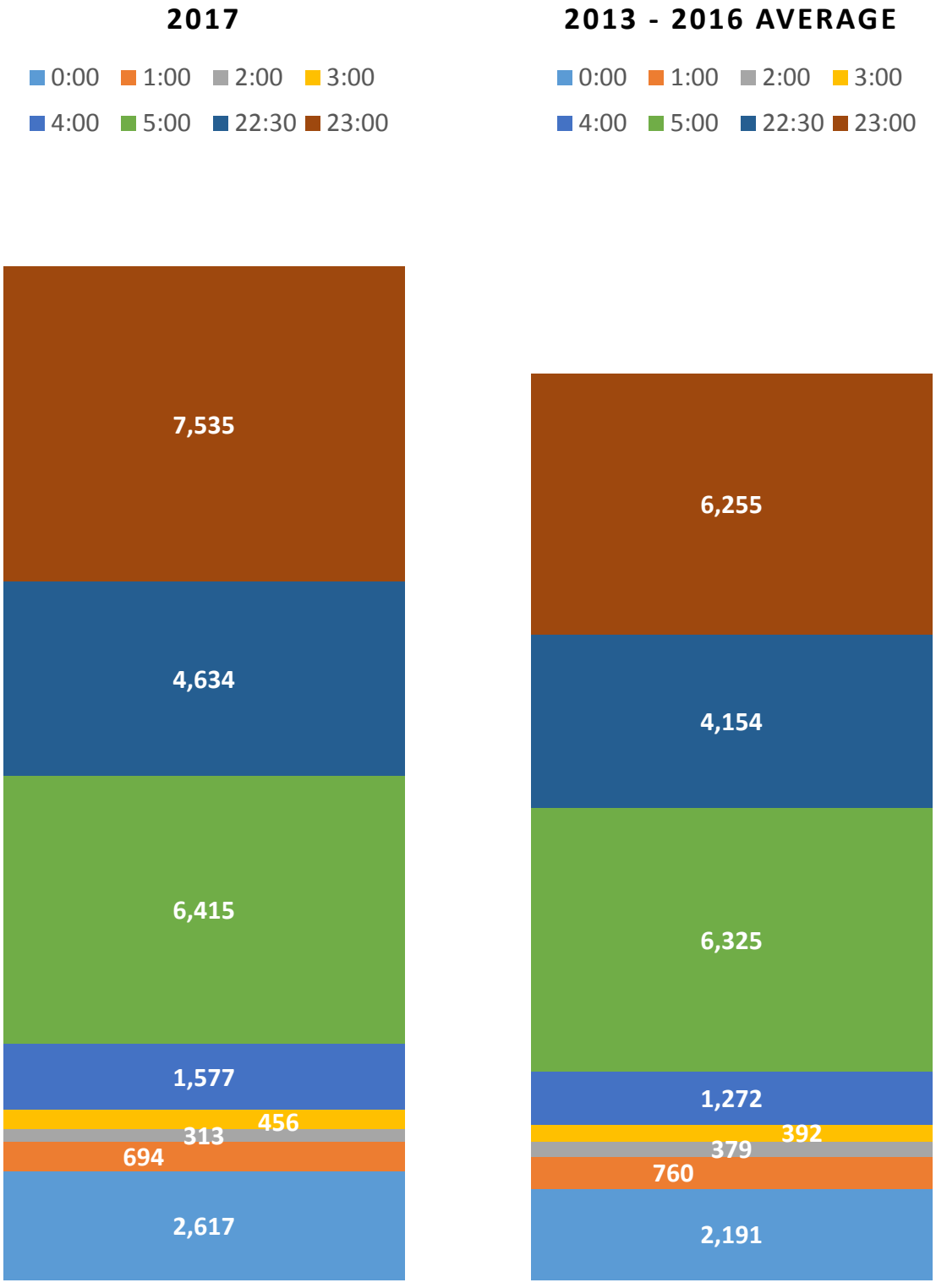
MSP ARRIVALS

AIRPORT CODE	ORIGIN AIRPORT	COUNT
LAX	LOS ANGELES	1,343
LAS	LAS VEGAS	1,338
SFO	SAN FRANCISCO	1,101
PHX	PHOENIX	1,029
DEN	DENVER	928
ATL	ATLANTA	881
ORD	CHICAGO (O'HARE)	783
SEA	SEATTLE	779
DCA	WASHINGTON D.C. (REAGAN NATIONAL)	594
SDF	LOUISVILLE	486
MEM	MEMPHIS	460
DFW	DALLAS/ FORT WORTH	381
PANC	TED STAVENS ANCHORAGE INTERNATIONAL	354
MDW	CHICAGO (MIDWAY)	348
CLT	CHARLOTTE	347

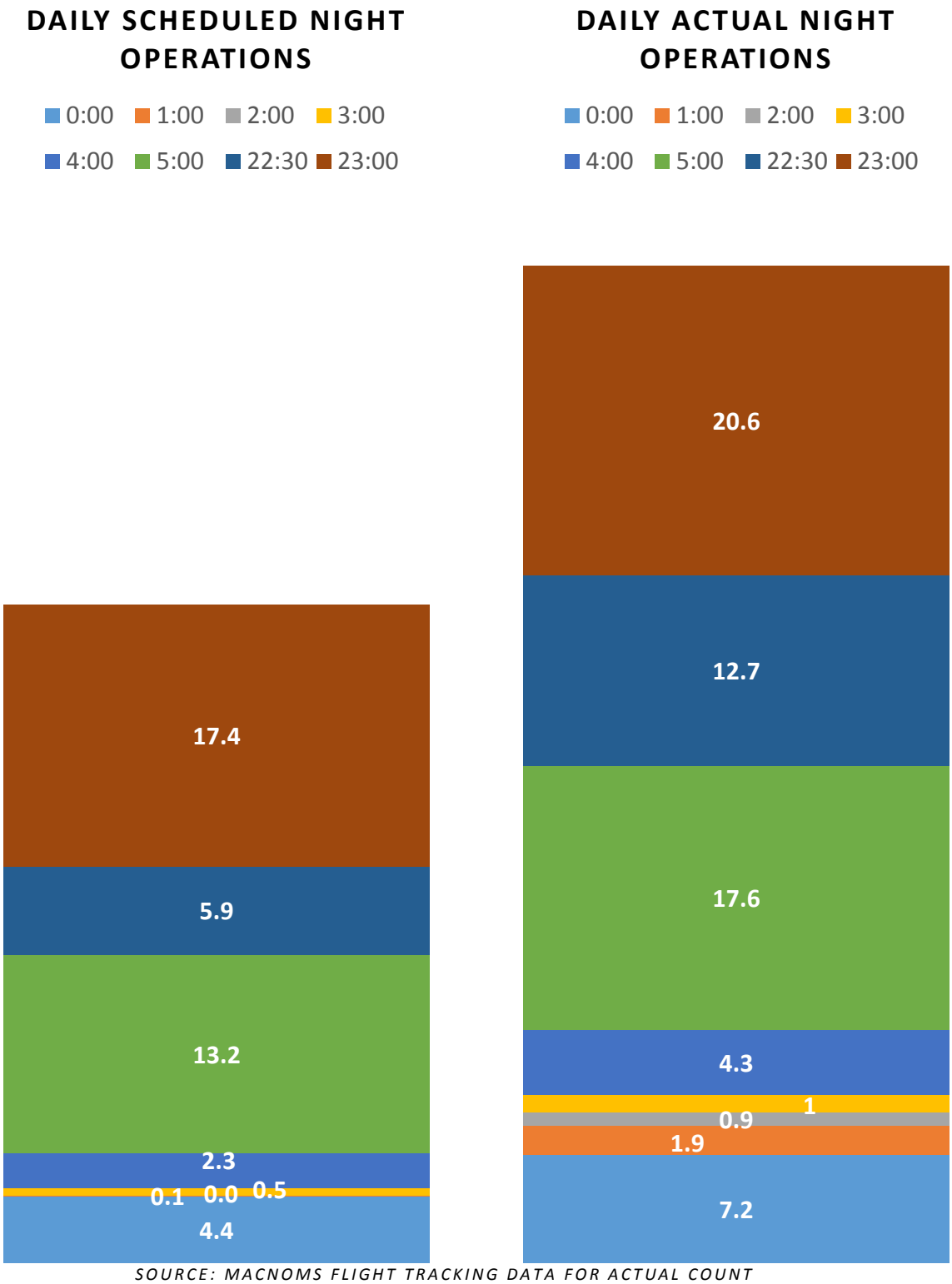
MSP DEPARTURES

AIRPORT CODE	DESTINATION AIRPORT	COUNT
ORD	CHICAGO (O'HARE)	534
ATL	ATLANTA	473
CLT	CHARLOTTE	361
IAH	HOUSTON	322
DEN	DENVER	305
PHX	PHOENIX	232
TVF	THEIF RIVER FALLS REGIONAL	189
FLL	FT. LAUDERDALE	167
LAS	LAS VEGAS	152
STL	ST LOUIS	126
GFK	GRAND FORKS	121
MSN	MADISON	116
DLH	DULUTH	104
MOT	MINOT	104
GEG	SPOKANE	102

NIGHTTIME OPERATIONS BY HOUR



2017 SCHEDULED VERSUS ACTUAL OPERATIONS



SOURCE: MACNOMS FLIGHT TRACKING DATA FOR ACTUAL COUNT
OFFICIAL AIRLINE GUIDE (OAG), UPS AND FEDEX REPORTING FOR SCHEDULED COUNT
OAG DOES NOT REPORT ALL MSP AIRLINE AND CARGO SCHEDULES.

ITEM 6

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Dana Nelson, Manager—Noise, Environment & Planning

SUBJECT: **VORTEX GENERATOR NOISE MONITORING STUDY**

DATE: January 10, 2018

In 2016, the NOC discussed the noise reduction benefits of vortex generators, a device made to divert airflow from vents on the underside of wings on the Airbus A320-family aircraft to reduce aircraft noise on arrival prior to landing gear and flap extension. The 2017 NOC Work Plan directed staff to commission a mobile noise monitoring study to quantify the noise reduction benefits of vortex generators at MSP. The monitoring was completed in 2017 and the report was added to the November 15, 2017 NOC meeting agenda. During the meeting, the Committee decided to postpone the presentation until January on account of the full meeting agenda in November.

The noise benefit provided by vortex generators is provided between 5,000 and 9,000 feet when arriving to an airport, when the aircraft is in a clean configuration (prior to landing gear and flap extension). While the MAC has long maintained a system of permanent sound monitoring equipment, none are suitably located or configured to collect aircraft sound levels during this particular phase of flight. To collect these levels, a temporary, mobile noise monitoring study was necessary.

The attached report presents noise measurement data that were collected between August 30, 2017 and October 12, 2017 for a monitoring site near East Bush Lake in Bloomington. The purpose of the data collection was to quantify the noise benefits of vortex generators during Airbus A320 family aircraft arrivals. The aircraft noise monitoring and analysis provided in this report offer a comparison of A320 family aircraft equipped with vortex generators to those without in accordance with the 2017 NOC Work Plan.

The vortex generator noise data had Lmax noise level differences from -0.4 to +1.6 dBA, SEL noise level differences from -1.0 to +1.2 dBA and average duration from -1 to +5 seconds. These minor noise level differences are unlikely to be perceptible on the ground.

The MAC Noise Office staff conducted several examinations of the noise data to ensure the methodology was accurately collecting the data. Vortex generators are designed to provide noise reduction benefits during the arrival phase of flight when the aircraft is in a clean configuration (prior to landing gear and flap extension). When taking aircraft noise measurements from the ground during this phase of flight, staff found the measured aircraft noise events struggled to exceed the ambient noise level in the community. Therefore, quantifying the noise reduction benefits provided by these devices from the

ground becomes extremely difficult. The particular limitations in this study included the low threshold settings required to collect the aircraft arrival events when aircraft are at altitudes between 5,000 and 9,000 feet resulted in noise level data that was impacted by louder community noise events; and the small sample of vortex generator-equipped aircraft operations that were available to analyze.

The Vortex Generator Noise Monitoring Study will be presented at the January 24, 2018 NOC meeting.

VORTEX GENERATOR NOISE MONITORING STUDY

November 2017

Environment Department, Noise Program Office

Metropolitan Airports Commission
6040 28th Avenue South, Minneapolis, MN 55450
MetroAirports.org

VORTEX GENERATOR NOISE MONITORING STUDY

TABLE OF CONTENTS

Executive Summary

The 2017 Minneapolis-St. Paul International Airport (MSP) Noise Oversight Committee (NOC) Work Plan directed staff to commission a mobile sound monitoring study as a follow-on to the Committee's 2016 discussion on the topic. The NOC directed Metropolitan Airport Commission (MAC) Noise Office staff to collect sound data to quantify the noise reduction benefits of vortex generators. These devices are designed to disrupt the flow of air over open vent holes on the underside of the wings on Airbus A319, A320 and A321 aircraft. This air flow disruption is intended to reduce high-pitch sound produced when air passes over the vent holes. The potential benefit exists between 5,000 feet and 9,000 feet when arriving to an airport, in a clean configuration (prior to landing gear and flap extension). While the MAC has long maintained a system of permanent sound monitoring equipment, none are suitably located or configured to collect aircraft sound levels during this particular phase of flight. To collect these levels, a temporary, mobile noise monitoring study was necessary.

Site selection was an important consideration during this study. Staff found it difficult to identify locations in the metro area where arriving aircraft would generate sound levels above the ambient noise level, but still be in a clean configuration. Ultimately, the study team chose one site in Bloomington and one site in St. Paul situated under multiple published RNAV (Area Navigation) STARs (Standard Terminal Arrival Routes).

After one week of study, the data was imported and analyzed. The St. Paul site was found to be collecting a considerable number of sound events generated from community activity. To mitigate this, the study team relocated the equipment.

After a second week of data collection, the data was again imported and analyzed. The St. Paul site data was found to continue to contain a considerable amount of community events and monitoring at the site was discontinued. The Bloomington site was performing successfully and was further improved with slight modifications to the event thresholds. The noise monitoring period was extended in order to collect a sufficient sample of data.

The Bloomington sound monitor was deployed for 44 days from August 30, 2017 to October 12, 2017. In total, 9,181 noise events were recorded during the monitoring period. Of those, 4,033 were correlated to MSP aircraft operations, 3,527 of which were aircraft arriving to MSP. Staff identified and verified 491 noise events correlated to Airbus A319, A320 or A321 aircraft.

When comparing to operations in non-vortex generator operations, the vortex generator noise data had maximum noise level (Lmax) differences ranging from -0.4 to +1.6 A-weighted decibels (dBA). The sound exposure level (SEL) differences ranged from -1.0 to +1.2 dBA and the average noise event duration ranged from -1 to +5 seconds. These minor noise level differences are unlikely to be perceptible on the ground[1].

Limitations existing in this study included settings required to collect the aircraft arrival events when aircraft are at altitudes between 5,000 and 9,000 feet, resulting in noise level data clouded by community noise events, as well as a small sample of vortex generator-equipped aircraft included in the study.

[1] A reduction on the order of 3 dBA is widely considered to be required in order to be perceptible.

1. Introduction

The Minneapolis-St. Paul International Airport (MSP) Noise Oversight Committee (NOC) 2017 Work Plan includes an item to quantify the noise reduction benefits of vortex generators on Airbus aircraft arrivals at MSP. The NOC members identified the need for a mobile noise monitoring study after discussing the vortex generator topic at its January 2016 meeting. During this discussion, it was noted that some of the published noise benefits from vortex generators in the public domain are not consistent; therefore, the NOC decided to add a noise monitoring study to its 2017 Work Plan to quantify the benefits using actual data around MSP.

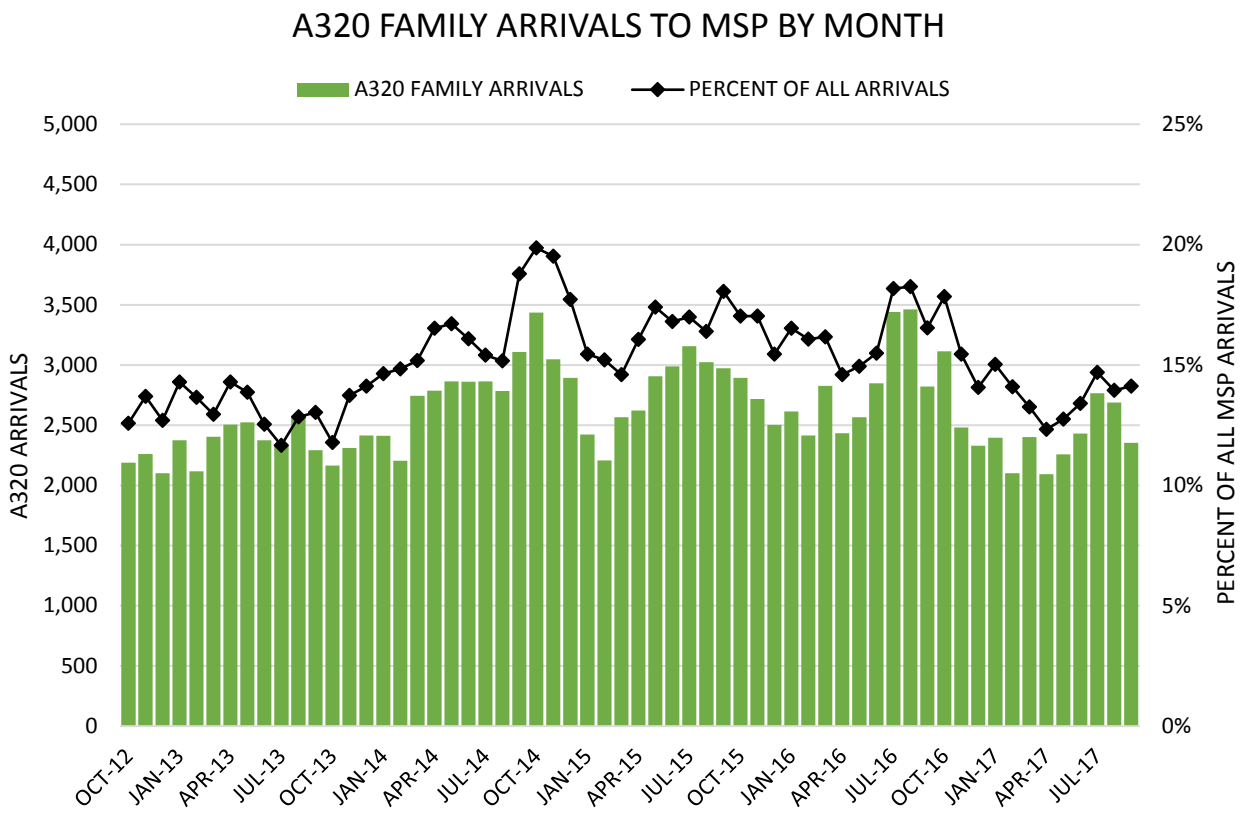
German Aerospace Center developed vortex generators, which are small triangular pieces of aluminum sheet metal mounted upstream of vents on the underside of each wing on the Airbus A320 family aircraft to divert airflow. This is intended to reduce high-pitch sound produced when air passes over this vent. The potential noise reduction benefits of vortex generators only exist between 5,000 feet and 9,000 feet when arriving to an airport in a clean configuration (prior to landing gear and flap extension). At MSP this typically occurs beyond 28 flight track miles from the runway end. While the MAC has long maintained a permanent array of 39 remote monitoring towers (RMTs), by the time arriving aircraft fly over them, they typically have already deployed airflow spoilers (i.e. landing gear, flaps, slats) to slow to a safe airspeed for a stabilized approach. Therefore, deploying a temporary mobile noise monitor was necessary to record sound level data at ground level for aircraft arrivals in a clean configuration at MSP in order to quantify the noise benefits of vortex generators.

The goal of this noise monitoring study is to compare recorded noise levels from like aircraft types in the family of A320 aircraft to quantify the noise benefits of vortex generators.

2. Airbus A320 Family Operations at MSP

The Airbus A320 family of aircraft are narrow body aircraft commonly used for domestic passenger flights. They have been in production since the late 1980's. Approximately 91.9% of 2017 MSP operations were conducted in carrier jets. Further, 57.2% of those were classified as narrow body aircraft. This class of aircraft represents the majority of the operations at MSP and are dominated by the Airbus A320 and Boeing 737 aircraft and associated variants. The A320 family is one of the most flown aircraft at MSP. Figure 2-1 below shows the number and percent of arrivals conducted by the A320 family of aircraft at MSP since October 2012.

Figure 2-1



United Airlines, Lufthansa, and AirFrance started to retrofit their fleet of A320 family aircraft with vortex generators in 2014. Additionally, all new A320 family aircraft delivered after 2014 will have these devices installed. Currently, vortex generators are installed on certain A320 family aircraft operating at MSP with some regularity, providing the opportunity to record sound level data associated with the devices.

To establish a dataset of the Airbus aircraft equipped with vortex generators, the FAA Aircraft Registration database was used along with an online civil aircraft fleet status database from Airfleets.net. United Airlines aircraft operations were excluded from the study results, as they began retrofitting their aircraft in 2017 and the pace of that retrofit is unknown.

3. Noise Monitoring Location Selection Process

Since the potential noise benefit of vortex generators would occur during the arrival phase when an aircraft is in a clean configuration, selecting proper monitoring locations was critical to achieving the study's purpose. The MAC Noise Office used the following criteria to select potential monitoring locations:

1. Near an area navigation (RNAV) standard terminal arrival route (STAR) arrival track in order to capture as many MSP arrival events as possible
2. Published altitude of arrival traffic between 6,000 and 9,000 feet to ensure the aircraft would still be in a clean configuration
3. Site must have low ambient noise so as to not pollute the quality of the measurements
4. Location on public land preferred for accessibility

Using these criteria, the following two sites were selected as candidate locations for this study:

Location #1: Como Golf Course, St. Paul

The Como Golf Course in St. Paul provided a large public space away from large arterial road and railways and near an arrival route for aircraft approaching the airport from the east and south inbound to Runway 12L and from the north to Runway 30R.

Location #2: East Bush Lake, Bloomington

East Bush Lake is centrally located near routes for aircraft approaching the airport from the east and south inbound to Runway 12R and from the west inbound to Runways 30L and 35. This location, at the maintenance facility for the park is also located far from large arterial road and railways, allowing for manageable and limited background (ambient) sound levels. Due to potential for sound level interference from insects and wind, the sound level meter was located on the roof of the maintenance facility. The roof of the facility contained fencing that acted as a wind deflector. This fence was able to deflect surrounding ground noises away from the monitoring equipment, while maintaining an unobstructed upward field of view.

After selecting these candidate sites, staff consulted with Federal Aviation Administration (FAA) terminal area and tower control management and the Delta Air Lines Chief Pilot Office to verify the locations would capture aircraft in a clean configuration and not be impacted by regular speed reduction instructions or airline standard operating procedures, which may result in variations in noise levels. It was determined that at these locations, aircraft speed is dictated by the arrival procedure, which is published at either 210 or 230 knots (indicated airspeed – depending upon the arrival runway). Provided the speed is above 210 knots, it was confirmed the aircraft would more than likely be in a clean configuration.

Figures 3-1 through 3-3 show the two mobile noise monitoring locations overlaid on the RNAV arrival routes at MSP. Figure 3-4 shows the mobile noise monitoring locations overlaid on an arrival density gradient map that depicts actual arrival operations at MSP for August 2017.

Figure 3-1

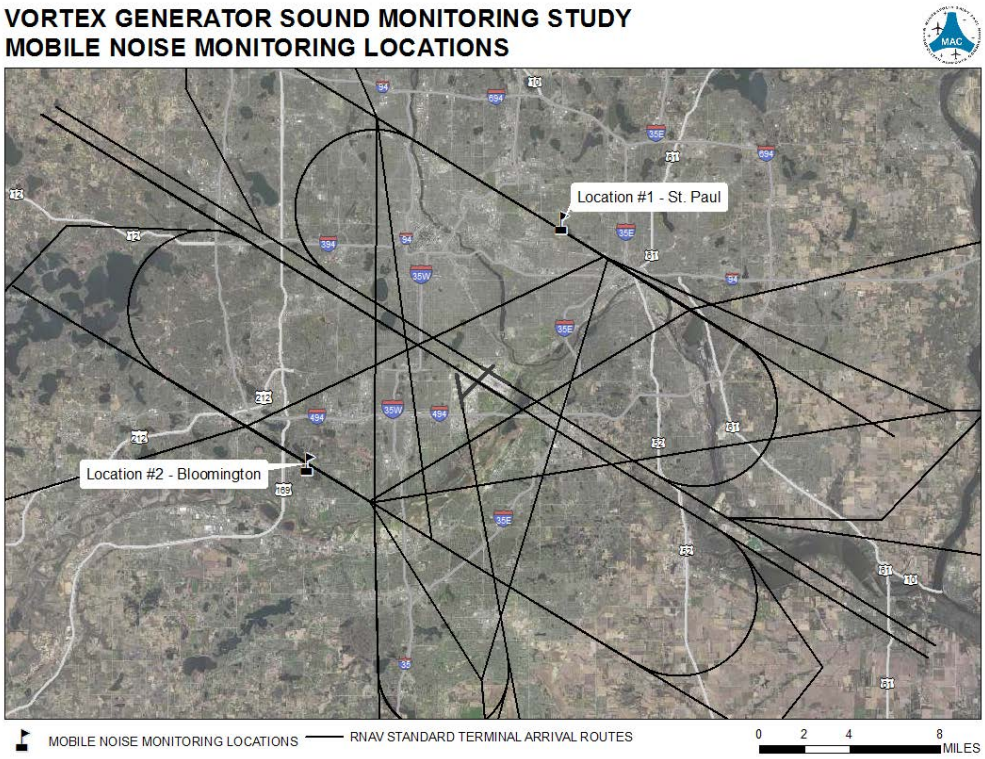


Figure 3-2

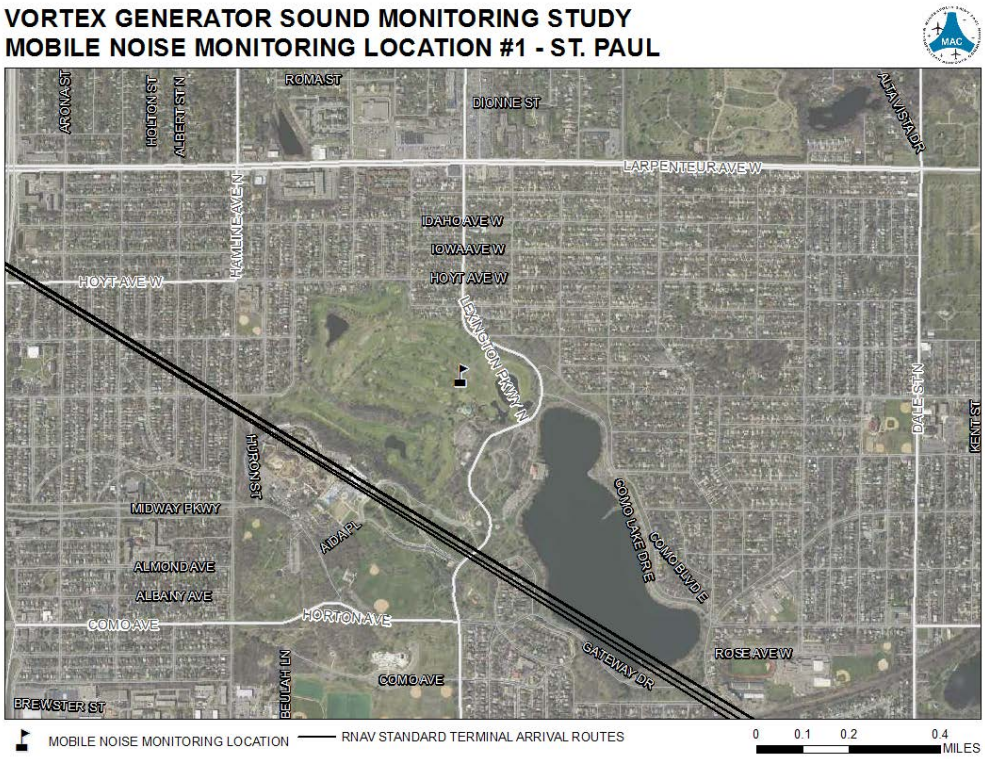


Figure 3-3

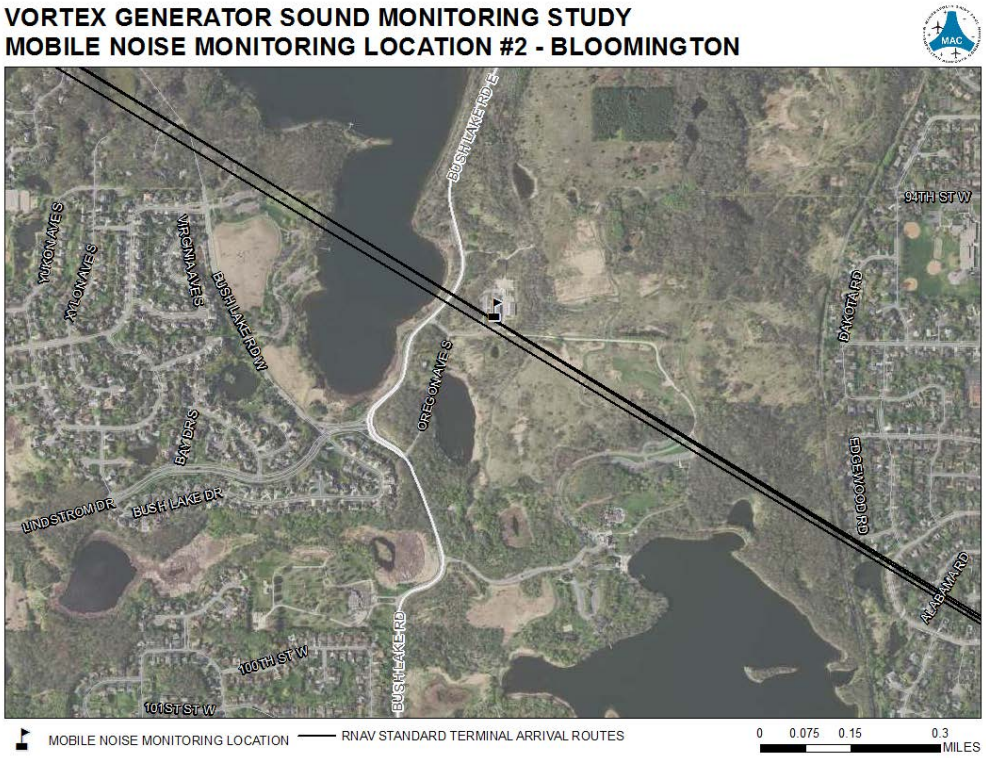
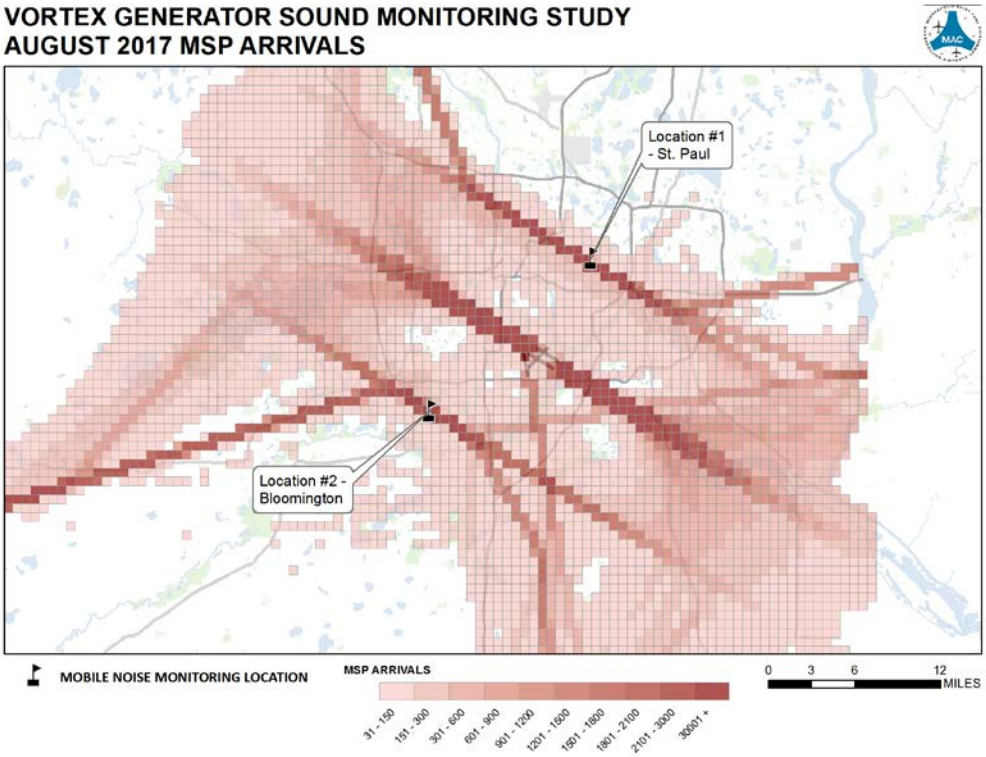


Figure 3-4



4. Noise Monitoring Period

Noise event monitoring and data collection period began at 11:00 A.M. on August 30, 2017 and was initially set to conclude in mid-September. Due to data collection issues at the St. Paul location, discussed in Section 7 below, the monitoring period was extended to mid-October. In total, there were 44 days of data collection from August 30 to 10:00 A.M. on October 12, 2017. The aircraft noise monitoring project was conducted by the staff of the MAC Noise Program Office.

The MSP aircraft operations and runway use during the monitoring period reflect normal airport operational conditions. Since the monitoring period extended beyond a month, there was a representative sample of arrival operations to each runway at MSP. Table 4-1 below shows the MSP aircraft arrival operations during the measurement period. In total there were 21,070 arrivals, 2,880 of which were from A320 family aircraft. Using the aircraft registration identification, staff determined that 168 (6%) of the Airbus A320 family arrivals were conducted by aircraft manufactured during 2014 or later and therefore determined to be equipped with vortex generators.

Table 4-1

Runway	Total Arrivals	Runway Use	A320 Family Arrivals	A320 Family Runway Use
04	1	0.0%	0	0.0%
12L	5,748	27.3%	794	27.6%
12R	6,751	32.0%	941	32.7%
22	1	0.0%	0	0.0%
30L	3,916	18.6%	587	20.4%
30R	3,438	16.3%	442	15.3%
35	1,216	5.8%	116	4.0%
Total	**21,070**	**100.0%**	**2,880**	**100.0%**

5. Noise Monitoring Equipment

Laboratory-quality noise monitoring equipment manufactured by Larson Davis Incorporated (LD) was utilized for this study. The main sound measurement components included a Type 1-LD 831 sound level meter connected to a PRM831 preamplifier and 377B02 microphone. This equipment is calibrated and certified annually.

6. Analysis Parameters

The sound level meters collected noise levels continuously utilizing slow response with A-weighting, as directed by FAR Part 150 standards (*Federal Aviation Regulation, Part 150 – Airport Noise Compatibility Planning*). The sound level meters were initially configured to detect an event when the sound pressure level (SPL) reached a threshold of 52 A-weighted decibels (dBA) and recorded events when the SPL remained at or above 52 dBA for four seconds or longer. This threshold is considerably different from the MAC's system of 39 permanent remote monitoring tower (RMT) locations, which have higher thresholds due to the louder noise levels collected at a closer proximity to the airport. At the permanent RMT sites,

an event is detected when the SPL reaches 65 dBA and recorded if the SPL remains above 63 dBA for a minimum of eight seconds. The lower threshold set for this mobile noise monitoring study introduces a greater probability that the ambient level and/or community noise events would be recorded in the data.

The noise events recorded at the mobile noise monitors are matched to flight track data obtained from the MAC's Noise and Operations Monitoring System (MACNOMS) to determine whether the noise source was associated with an aircraft operation or a non-aircraft noise source (i.e. community). Geographic space and time are used to match recorded noise events to aircraft flight tracks. Matching parameters include a two-dimensional distance, altitude ceiling and time buffer. For an event to be matched to a flight operation, the flight track must be within a 500 meter radius (1,640 feet) around the Bloomington location and within a 1,000 meter radius (3,281 feet) around the St. Paul location. At both locations, a ceiling was set at 3,000 meters (9,842 feet), below which aircraft flights must be flying in order to be matched to a noise event. Additionally, the flight time must occur 30 seconds before or 30 seconds after the maximum sound level (Lmax) event time in order for the operation to be matched to the noise event. Aircraft noise events that were not generated by operations associated with MSP were excluded from the data.

7. Refining the Analysis Parameters

Since the noise monitoring sites were located a distance away from MSP with low threshold settings, staff took extra precautions to verify the sound level meter settings were effective in capturing the desired aircraft noise data in order to achieve the purpose of the study. Therefore, after one week of monitoring, initial data were processed and analyzed.

The Bloomington site experienced a power interruption on Friday, September 1st and data was not collected between September 1st and September 6th. However, when the monitor was operational, 314 events were recorded using the thresholds identified above. Of these, 148 events (47%) were correlated to an aircraft operation and 166 events (53%) were caused by community noise sources. During the same timeframe, the St. Paul site recorded 4,024 events. Of these, only 441 (11%) were correlated to a flight and the remaining 3,583 events (89%) were caused by community noise sources.

Table 7-1 below provides a breakout of the initial noise events matched to aircraft operations at each location.

Table 7-1

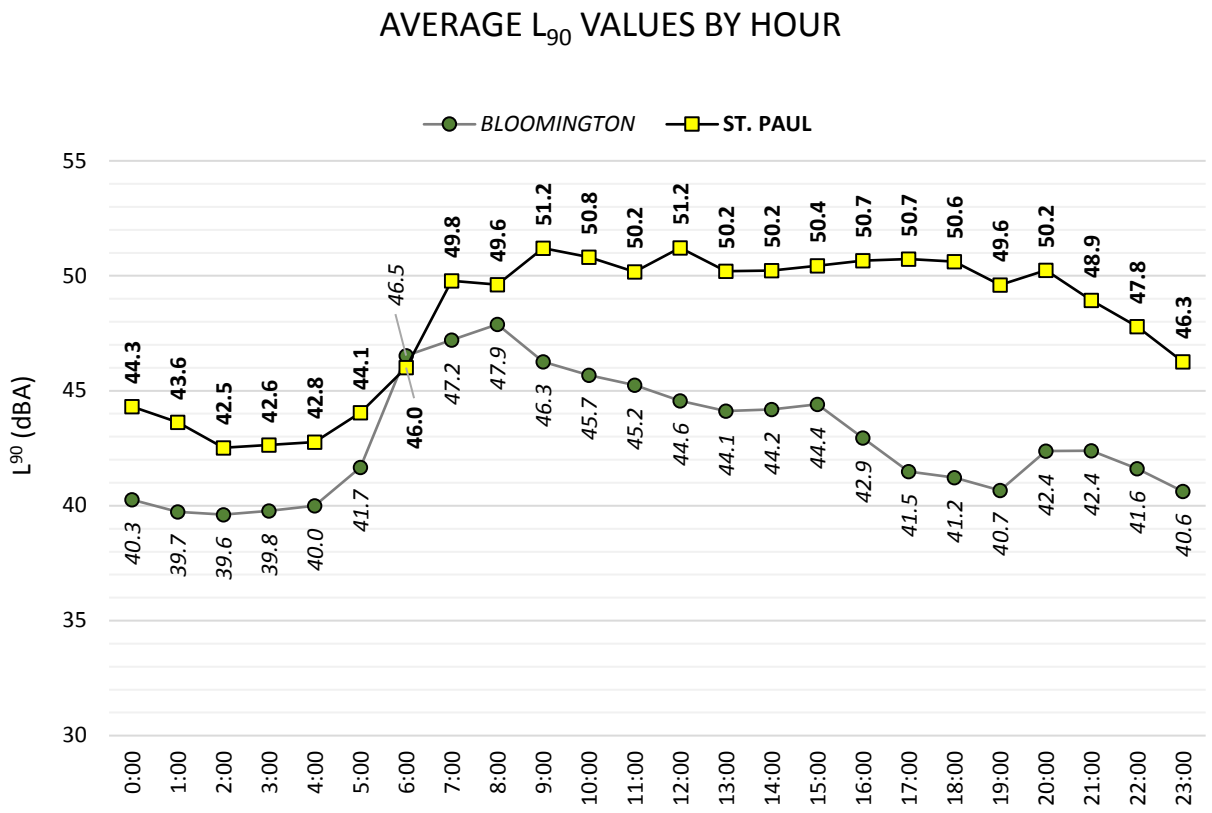
Site	Events	Events Matched to Aircraft Operations	Rate
St. Paul – Como Golf Course	4,024	441	11.0%
Bloomington – East Bush Lake	314	148	47.1%

The high number of events at the Como Golf Course necessitated a small location change in an effort to place it in an area with fewer community noise sources. Staff relocated the monitoring equipment from the original location to an alternate location on the golf course property. The selection process for this refined location followed the same criteria described in Section 3 of this report.

A secondary evaluation of the monitoring parameters was conducted on September 12th using noise monitoring data from September 6th to September 12th. One of the metrics recorded and evaluated was L_{90}. The L_{90} metric is the sound pressure level exceeded for 90% of the time. It generally represents the background or ambient level of a noise environment. The average L_{90} value for the Bloomington location was 44.0 dBA. The average L_{90} value for the St. Paul location was 48.9 dBA. With the sound level meters set to record an event when the SPL exceeded 50 dBA, the high ambient level at the St. Paul location continued to be problematic. Figure 7-1 displays the average hourly L_{90} levels for both monitoring locations.

After the secondary evaluation, staff determined that moving the noise monitoring equipment to the new location on the Como Golf Course did not rectify the issues with the high number of community noise events recorded. It was determined that this site could not properly measure arrival aircraft noise during this phase of flight due to the higher ambient levels overpowering the aircraft overflight noise levels. Therefore, the equipment was removed from the Como Golf Course on September 12th.

Figure 7-1



The September 12th evaluation confirmed that the mobile noise monitoring location #2 in Bloomington was, indeed, successful at collecting aircraft arrival events with a reasonable number of community events recorded in the data. In fact, the evaluation revealed that there was an opportunity to collect more aircraft event data at the Bloomington site by refining the parameters in the sound level meter. Due to its park location, site characteristics, and elevation off the ground, the ambient level at this site was lower than

that at the St. Paul location. On September 12th the threshold parameters were lowered from the initial 52 dBA to 50 dBA. For the duration of the study, a noise event was recorded at the Bloomington location when the sound pressure level reached 50 dBA or greater for a minimum of four seconds. The adjustment to the threshold parameter did not affect the data that had already been collected. Since the noise monitoring effort was reduced to one location for data collection, staff extended the study period to mid-October in order to capture a sufficient sample size for the study.

8. Study Results

Bloomington location recorded a total of 9,181 noise events. Of those, 4,033 were correlated to MSP aircraft operations; 3,527 arrivals and 506 departures. Staff went through an audial and visual verification process for noise events matched to Airbus A320 family aircraft operations. Audio for each noise event was reviewed individually. Additionally, one-second, ⅓ octave data measurements were plotted and reviewed to ensure the source was an arriving aircraft. This process verified 491 noise events correlated to Airbus A320 family aircraft arriving to MSP. Of these, 38 noise events associated with United Airlines operations were removed from the dataset due to the unknown pace of the airline's vortex generator retrofit. This resulted in 453 A320 family arrival flights registering a noise event at the Bloomington noise monitor. The predominant arrival runways captured in the noise data were Runways 12R, 30L and 35. Figures 8-1 and 8-2 show the aircraft operations that generated a noise event colored by runway.

Figure 8-1

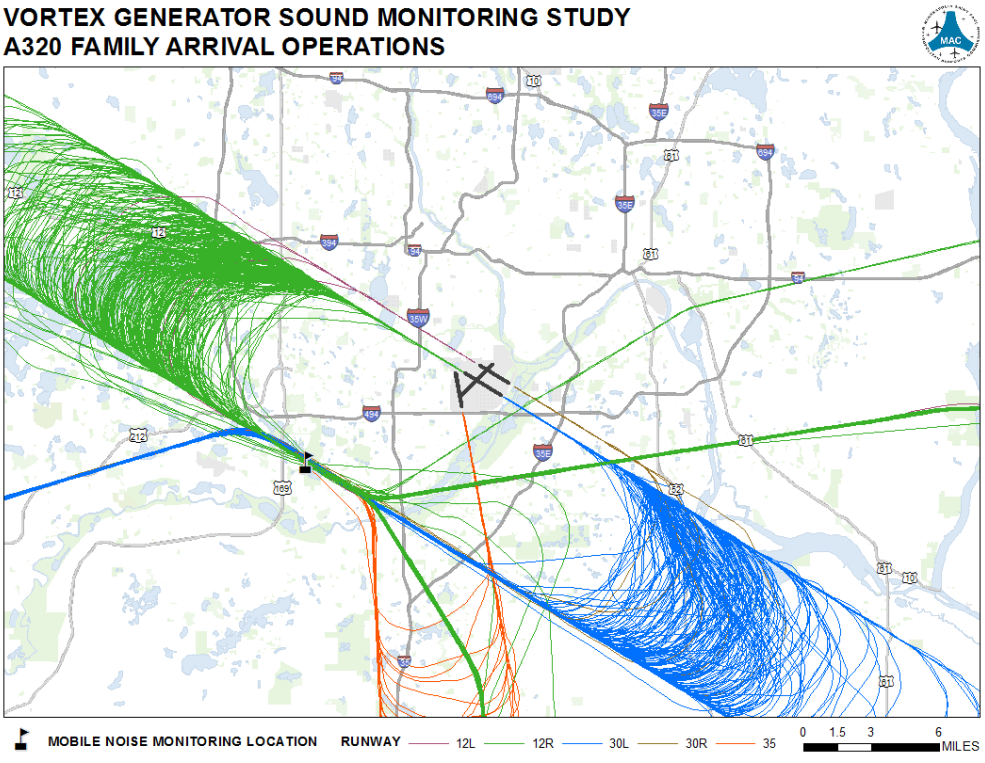
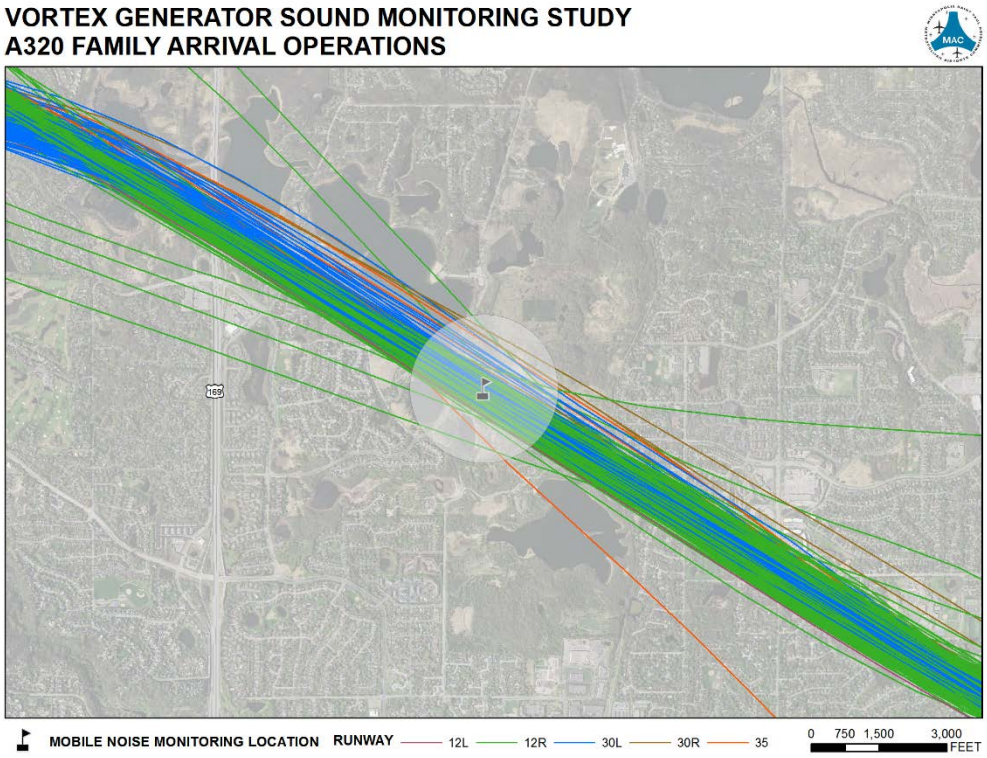


Figure 8-2



The noise data results include the Maximum Sound Level (Lmax), which is the peak noise level generated during the event; Sound Exposure Level (SEL), which is the total noise level someone would experience if all of the noise energy occurred in one second to account for both amplitude and duration; and the event duration, which is the length of the noise event, in seconds.

Table 8-1 below shows a comparison, by aircraft type and arrival runway(s), of the logarithmic average Lmax and SEL, as well as the average event duration for aircraft noise events in vortex generator-equipped aircraft and non-equipped aircraft. The data was examined by aircraft type and arrival runway(s) to allow for a direct comparison.

Table 8-1

A319 Aircraft

Vortex Generator Equipped	Arrival Runway(s)	Count	Average Lmax (dBA)	Average SEL (dBA)	Average Event Duration (seconds)
No	12L or 12R	118	59.2	69.9	29
No	30L or 30R	65	60.3	70.4	24
No	35	5	57.6	69.3	33

A320 Aircraft

Vortex Generator Equipped	Arrival Runway(s)	Count	Average Lmax (dBA)	Average SEL (dBA)	Average Event Duration (seconds)
No	12L or 12R	147	59.4	70.5	31
Yes	12L or 12R	20	59.0	69.5	30
No	30L or 30R	72	57.7	68.3	26
Yes	30L or 30R	5	58.6	69.4	22
No	35	5	59.8	71.3	40

A321 Aircraft

Vortex Generator Equipped	Arrival Runway(s)	Count	Average Lmax (dBA)	Average SEL (dBA)	Average Event Duration (seconds)
No	12L or 12R	12	60.7	70.9	28
Yes	12L or 12R	4	62.3	72.1	33

The mobile noise monitoring study collected aircraft arrival events from Airbus A320 family aircraft providing a sample of aircraft events equipped with and without vortex generators; however, the small sample of vortex generator-equipped aircraft operations was a limitation in the study.

Of the 453 A320 family arrival flights registering a noise event, 29 were determined to be equipped with vortex generators and 424 were non-equipped. There were no vortex generator-equipped A319 aircraft recorded at the noise monitor during the study period.

The vortex generator-equipped A320 aircraft noise levels for Runway 12L or 12R arrivals had a lower Lmax (-0.4 dBA), SEL (-1.0 dBA) and average duration (-1 second). The vortex generator-equipped A320 aircraft noise levels for Runway 30L or 30R arrivals had a higher Lmax (+0.9 dBA) and SEL (+1.1 dBA) and a shorter average duration (-4 seconds).

The vortex generator-equipped A321 aircraft noise levels for Runway 12L or 12R arrivals had a higher Lmax (+1.6 dBA), SEL (+1.2 DBA) and average duration (+5 seconds).

9. Summary

This report presents noise measurement data that were collected between August 30, 2017 and October 12, 2017 for a monitoring site near East Bush Lake in Bloomington. The purpose of the data collection was to quantify the noise benefits of vortex generators in Airbus A320 family aircraft arrivals. The aircraft noise monitoring and analysis provided in this report offer a comparison of A320 family aircraft equipped with vortex generators to those without in accordance with the 2017 NOC Work Plan.

The vortex generator noise data had Lmax noise level differences from -0.4 to +1.6 dBA, SEL noise level differences from -1.0 to +1.2 dBA and average duration that varied from -1 to +5 seconds. These minor noise level differences are unlikely to be perceptible on the ground[2].

The MAC Noise Office staff conducted several examinations of the noise data to ensure the methodology was accurately collecting the data. Vortex generators are designed to provide noise reduction benefits during the arrival phase of flight when the aircraft is in a clean configuration (prior to landing gear and flap extension). When taking aircraft noise measurements from the ground during this phase of flight, staff found the measured aircraft noise events struggled to exceed the ambient noise level in the community. Therefore, quantifying the noise reduction benefits provided by these devices from the ground becomes extremely difficult. The particular limitations in this study included the low threshold settings required to collect the aircraft arrival events when aircraft are at altitudes between 5,000 and 9,000 feet resulted in noise level data that was impacted by louder community noise events; and the small sample of vortex generator-equipped aircraft operations that were available to analyze.

[2] A reduction on the order of 3 dBA is widely considered to be required in order to be perceptible.

Appendix

Table A-1

Acoustic Term	Description
A-weighted decibel, dBA	"Another important characteristic of sound is its frequency, or "pitch". This is the rate of repetition of the sound pressure oscillations as they reach our ear. Formerly expressed in cycles per second, frequency is now expressed in units known as Hertz (Hz). Most people hear from about 20 Hz to about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, around 1,000 to 2,000 Hz. Acousticians have developed "filters" to match our ears' sensitivity and help us to judge the relative loudness of sounds made up of different frequencies. The so-called "A" filter does the best job of matching the sensitivity of our ears to most environmental noises. Sound pressure levels measured through this filter are referred to as A-weighted levels (dBA). A-weighting significantly de-emphasizes noise at low and high frequencies (below about 500 Hz and above about 10,000 Hz) where we do not hear as well. Because this filter generally matches our ears' sensitivity, sounds having higher A-weighted sound levels are usually judged to be louder than those with lower A-weighted sound levels, a relationship which does not always hold true for unweighted levels. It is for these reasons that A-weighted sound levels are normally used to evaluate environmental noise."[i]
Decibel (dB)	"The loudest sounds that we hear without pain have about one million times more energy than the quietest sounds we hear. But our ears are incapable of detecting small differences in these pressures. Thus, to better match how we hear this sound energy, we compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level (SPL). Sound pressure level is a measure of the sound pressure of a given noise source relative to a standard reference value (typically the quietest sound that a young person with good hearing can detect). Sound pressure levels are measured in decibels (abbreviated dB). Decibels are the logarithmic quantities – logarithms of the ratio of the two pressures, the numerator being the pressure of the sound source of interest, and the denominator being the reference pressure (the quietest sound we can hear). The logarithmic conversion of sound pressure to sound pressure level means that the quietest sound we can hear (the reference pressure) has a sound pressure level of about zero decibels, while the loudest sounds we hear without pain have sound pressure levels of about 120 dB. Most sounds in our day-to-day environment have sound pressure levels from 30 to 100 dB."[ii]
L_{90}	"L_{90} is the level exceeded for 90% of the time. For 90% of the time, the noise level is above this level. It is generally considered to be representing the background or ambient level of a noise environment."[iii]

Maximum noise level, L_{max}	"The variation in noise level over time often makes it convenient to describe a particular noise "event" by its maximum sound level, abbreviated as L_{max}."[iv]
SEL	"SEL is a measure of the total noise energy produced during an event, from the time when the A-weighted sound level first exceeds a threshold level (normally just above the background or ambient noise) to the time that the sound level drops back down below the threshold. To allow comparison of noise events with very different durations, SEL "normalizes" the duration in every case to one second; that is, it is expressed as the steady noise level with just a one-second duration that includes the same amount of noise energy as the actual longer duration, time-varying noise. In lay terms, SEL "squeezes" the entire noise event into one second."[v]

Table A-2

Acronym	
KIAS	Knots Indicated Airspeed
LD	Larson Davis
RMT	Remote Monitoring Tower
MAC	Metropolitan Airports Commission
MACNOMS	MAC Noise and Operations Monitoring System
MSP	Minneapolis-St. Paul International Airport
NOC	Noise Oversight Committee
NEO	New Engine Option
RNAV	Area Navigation
SEL	Sound Exposure Level
SPL	Sound Pressure Level
STAR	Standard Terminal Arrival Route

Figure A-1

[i] Harrris Miller Miller & Hanson (March 2014). *Portland International Jetport Noise Exposure Map, HMMH Report No. 298410.* Harrris Miller Miller & Hanson, Inc.

[ii] Harrris Miller Miller & Hanson (March 2014). *Portland International Jetport Noise Exposure Map, HMMH Report No. 298410.* Harrris Miller Miller & Hanson, Inc.

[iii] Environmental Protection Department, The Government of Hong Kong. (2017, 10 30). *Noise Descriptors for Environmental Noise*. Retrieved from Noise Descriptors for Environmental Noise: http://www.epd.gov.hk/epd/noise_education/web/ENG_EPD_HTML/m2/types_3.html

[iv] Harrris Miller Miller & Hanson (March 2014). *Portland International Jetport Noise Exposure Map, HMMH Report No. 298410.* Harrris Miller Miller & Hanson, Inc.

[v] Harrris Miller Miller & Hanson (March 2014). *Portland International Jetport Noise Exposure Map, HMMH Report No. 298410.* Harrris Miller Miller & Hanson, Inc.

ITEM 7

MEMORANDUM

TO: MSP Noise Oversight Committee (NOC)

FROM: Dana Nelson, Manager—Noise, Environment & Planning

SUBJECT: **SUPER BOWL COMMUNICATION PLAN UPDATE**

DATE: January 10, 2018

Super Bowl LII is coming to Minnesota on Sunday, February 4, 2018 at US Bank Stadium. Increased passenger and aircraft activity levels are expected at MSP and the MAC's general aviation reliever airports between January 27 and February 6, 2018.

A communication plan has been developed to inform residents of the expected flight activity at MSP and three primary reliever airports owned by the MAC. The strategy includes the development of two fact sheets – one for MSP and one for the reliever airports – for airport neighbors informing them of the expected flight activity from the Super Bowl.

These fact sheets will be posted on the macnoise.com website and shared with the NOC, reliever airport advisory commissions and councils, as well as the cities that surround these airports. Additionally, the fact sheets will be distributed at the Winter Listening Session on January 30, 2018.

At the January 24, 2018 NOC meeting, MAC staff will distribute the fact sheets and discuss the Super Bowl LII communication plan.