SUBURBAN O'HARE COMMISSION

ORD RUNWAY ROTATION TEST

ANALYSIS AND RECOMMENDATIONS

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Contents

Table of Figures

List of Tables

Acknowledgment

The authors of the report would like to thank all that made the voluntary runway rotation test possible or participated in the the runway rotation test.

Starting with the Chicago Department of Aviation (CDA) for partnering with the communities surrounding O'Hare International Airport to mitigate the impacts of noise. Despite the challenges the runway rotation program presents to CDA's nightly operation of one of the busiest most complex airfields in the nation, the department made every effort to overcome conflicts with safety inspections, flight test and construction schedules and demonstrated consistent good faith throughout the rotation test. This level of comittment to provide periods of noise relief to neighbors likely set a new threshold of good faith noise management performance for the nation.

While CDA's role has been highly visible, kudos go to the professional air traffic controllers in the tower. The O'Hare tower controllers were the invisible heroes. Despite working in a high pressure, fast paced environment at one of the world's busiest airports, the tower controllers consistently choreographed solutions to deliver outstanding performance in the first attempt at rotating runways. Although safety and capacity remained priorities, they ensured that the rotation program also remained a priority as conditions allowed. Our thanks. You all are the best of the best! The voluntary rotation program could not have been done without you.

We also would like to thank CDA for providing the flight track, noise monitor and complaint data to JDA for this study on behalf of the Suburban O'Hare Commission.

1. SUMMARY OF JDA ORD RUNWAY ROTATION TEST FINDINGS

There is evidence that the Chicago ORD Runway Rotation Program is working to offer some relief to communities around the airport. The following are some of the salient findings of an analysis of the 25 weeks of data from the runway rotation program:

JDA F1 The runway rotation program balance of FQ II period runway use improved in 2016 as compared to 2015. Configurations should be adjusted for the next phase of the rotation test to address over and under-utilization of runways. Balance should also be improved by removing operational constraints (mixed runway operations, overflights and runway crossings) that may be causing under use of some configurations.

JDA F2 ONCC criteria reference balanced runway use but also encourage under use or over use of certain pavements. ONCC criteria should be revised to encourage use of all pavements available during FQ to fairly balance noise impacts.

JDA F3 The number of overflights over SOC communities shows relief in overflights during weekly periods where runways are operated away from those communities (an element of predictability).

JDA F4 Noise monitor data shows that the RRP program provides relief to SOC towns with fewer noise events during weekly periods where runways are operated away from those communities (another element of predictability).

JDA F5 Noise complaint data shows 14.4% fewer nighttime 3rd Quarter nighttime complaints during the first 12 weeks of the RRP test period compared to the 3rd Quarter in 2015 despite a 22 % increase in total complaints.

JDA F6 Total SOC community nighttime noise complaints declined 25% in 3rd Quarter of 2016 compared to 3rd Quarter 2015.

JDA F7 ORD nighttime noise complaints declined 50% in October and 41% in November of 2016 as compared to 2015.

JDA F8 Total SOC community nighttime noise complaints declined 29% in October and 31% in November of 2016 as compared to 2015.

JDA F9 Elk Grove Village, Schiller Park and Wood Dale had increases in night time complaints in the 3rd Quarter of 2016 as compared to 2015. Over use of runways 10L/28R, 10C/28C and 15/33 are likely related to the increased complaints.

JDA F10 The runway heading 290° currently in use off runway 28R impacts Bensenville, Wood Dale, Itasca and Elk Grove Village. The highest population impact from departures on 28 R is 4,984 people in Elk Grove Village.

Demand related findings that affect noise:

JDA F11 The RRP Program accounted for 26.2% of the nighttime flight operations (10 PM - 7 AM) at the airport

JDA F12 The Fly Quiet period accounted for 39.9% of the nighttime flight operations (10 PM - 7 AM) at the airport

JDA F13 Nighttime operations increased 10.3 % from 2012 to 2015. 2015 nighttime operations exceed OMP estimates by 85 operations. Nighttime demand is constraining the runway rotation program and limiting the periods of noise relief to communities. If the airlines continue scheduling more nighttime operations, the long-term prospect of effective noise mitigation is diminished.

- OMP full build estimated **172** nighttime operations.
- 2014 averaged **237** nighttime operations
- 2015 averaged **257** nighttime operations
- Weeks 1-25 of Runway Rotation Program averaged **249** nighttime operations

JDA F14 49% of third Quarter 2016 nighttime operations were commercial aircraft operated by United and American Airlines.

JDA F15 The number of total daytime operations at the airport appears to be contained by lack of gate and runway capacity during the daytime hours (7 AM to10 PM). Possible limiting factors:

- Loss in departure capacity in 2014 due to converging runway operations
- Runway maintenance
- Gate capacity during daytime hours
- Growth in cargo operations

JDA F16 Aircraft size is increasing at ORD including during the FQ and RRP periods smaller regional jets are being replaced by larger regional jets (Embraer 170/190 and Bombardier CRJ 700/900) and in some cases, narrow-body aircraft (i.e., Boeing 737-800 and Airbus A320 types). Larger aircraft generate, in general, more noise than the aircraft they replace (assuming the same generation of aircraft technology)

2. SUMMARY OF JDA ORD RUNWAY ROTATION TEST RECOMMENDATIONS

JDA R1 The runway rotation test provided periods of nighttime noise relief to neighboring communities as demonstrated by both overflight and noise monitor event data. The rotation tests should continue in multiple phases used to continue to improve the effectiveness of rotation program until final adoption of a permanent rotation plan at full build out of OMP.

JDA R2 The runway rotation program included on average 65 operations per night. FQ II averages 99 operations per night. There were on average 249 nighttime operations during the rotation test. Future phases of the rotation should eliminate the operational constraints of mixed runway operations, runway crossings and overflights of busy ground operations areas (i.e., cargo facilities in the Southeast of the airport) may increase the numbers of operations in the rotation program. This requires revision ONCC FQ Rotation Criteria 1 to avoid mixed use runways.

JDA R3 The next phase of rotation test configurations should be changed to fairly balance use of all runways available during nighttime hours. Requires revision to ONCC FQ Rotation Criteria 4 and 5 (which encourage limiting or increasing use of specific runways) with "Runway configurations and frequency of configuration use should fairly balance operations across all runways available during FQ."

JDA R4 Future rotation test configurations should provide for a second departure runway for the FQ I period.

JDA R5 , Runway 10L/28R or 10C/28C (the longest runways) should be available for use by pilots declaring an operational need to use a long runway without giving 2 hours prior notificeto CDA.

JDA R6 The community and CDA need to maintain an open dialogue with airlines that focuses on containing passenger operation demand to daytime operations by addressing possible contributing factors such as limited gate capacity and utilize monthly reporting to encourage cooperation.

JDA R7 CDA should begin providing ORD daytime and nighttime flight operation counts in Airport Noise Management System (ANMS) monthly and quarterly reports as compared to previous months, quarters, years and OMP estimated operations.

JDA R8 290 ° departure heading on runway 28C should be considered and remain the heading on 28R as FQ departure headings to minimize population impacts of operations under 3,000' AGL with corresponding balance in frequency of use of runways 28C, 28R and 33 to fairly balance combined SOC community population impacts.

JDA R9 CDA should coordinate with the Airlines/FAA tower to implement Noise Abatement Departure Profile (NADP) 1 or 2 (FAA Advisory Circular 91-53A).

JDA R10 Analysis of the current headings used for departures on runways 28C and 28R demonstrate that different populations are impacted by each runway. Use of the runways should be considered separately to fairly balance noise impacts.

3. BACKGROUND

Chicago O'Hare International Airport (ORD) continues to be one of the busiest and most complex Airports in the World. The resulting noise impact to the communities surrounding ORD are significant. Through a series of analyses and reports, JDA Aviation Technology Solutions has provided the Suburban O'Hare Communities with recommendations to mitigate noise for their residents.

JDA identified 20 Fly Quiet recommendations, 18 of which are either being implemented or considered for implementation by the Chicago Department of Aviation. Recommendation FQ 18 Runway Rotation Plan is one of five recommendations likely to have significant benefit.

JDA collaborated with the Chicago Department of Aviation (CDA) and Landrum & Brown to represent SOC interests in developing a Runway Rotation Program (RRP) for consideration by the O'Hare Noise Compatibility Commission (ONCC). The RRP was subsequently approved by ONCC on May 6, 2016. CDA submitted a request to test the RRP for a 25-week period to the FAA. The request was approved by the FAA on July 1, 2016. CDA started the test on July 6th and competed the 25-week test on December 25th, 2016.

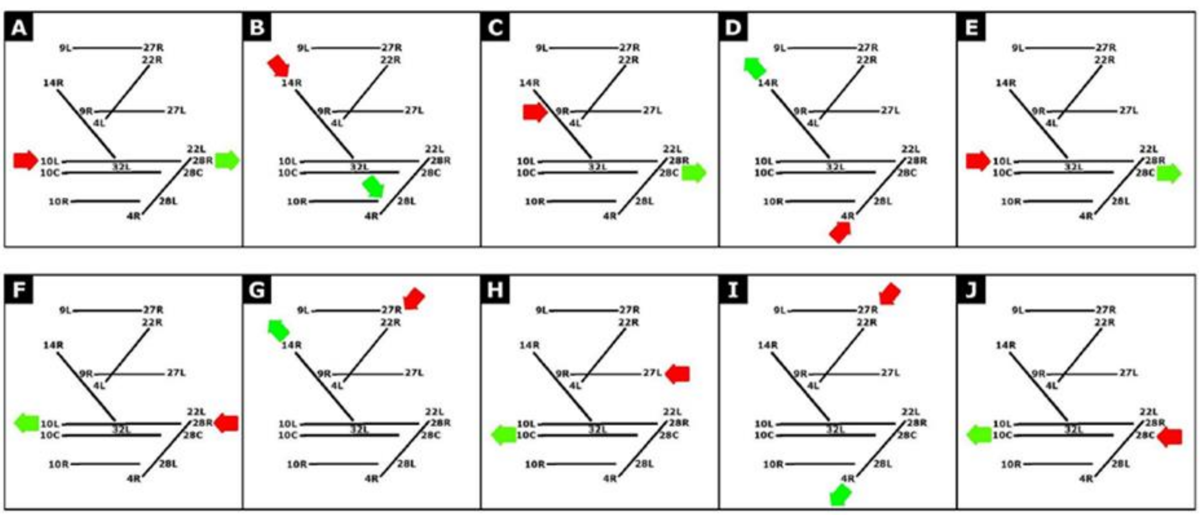


Figure 1: Runway Rotation Configurations A-J

The RRP test period included two 12-week rotations plus one additional week using configurations A- J shown in Figure 1. Runway Configurations A through J were developed to provide for East and West flow configurations of parallel and crosswind runway combinations. Configurations are paired vertically to combine East and West flow options that are rotated in primary and secondary alternatives throughout the 12-week rotation period. The three parallel configuration pairs (A-F, C-H, and E-J) are used twice in the 12-week rotation and the two crosswind runway configuration pairs (B-G and D-I) are used three times in the 12-week rotation.

Assumptions applied to the rotation plan:

- Use of these runways if voluntary, pilots are encouraged to use designated nighttime preferential runways
- Alternative runways may be used to allow for construction, snow removal, runway maintenance, runway inspections and specific aircraft operational needs. Available runways are determined by Chicago Department of Aviation (CDA) Operations and prevailing winds
- Runway 10L/28R, if closed for noise abatement, would be made available for flights that require additional runway length after operator coordination, at a minimum of 2 hours prior to arrival or departure, with Chicago Department of Aviation (CDA) Operations

The final 25-week schedule of configurations is shown in Figure 2 with alternate configurations required for construction highlighted in yellow.

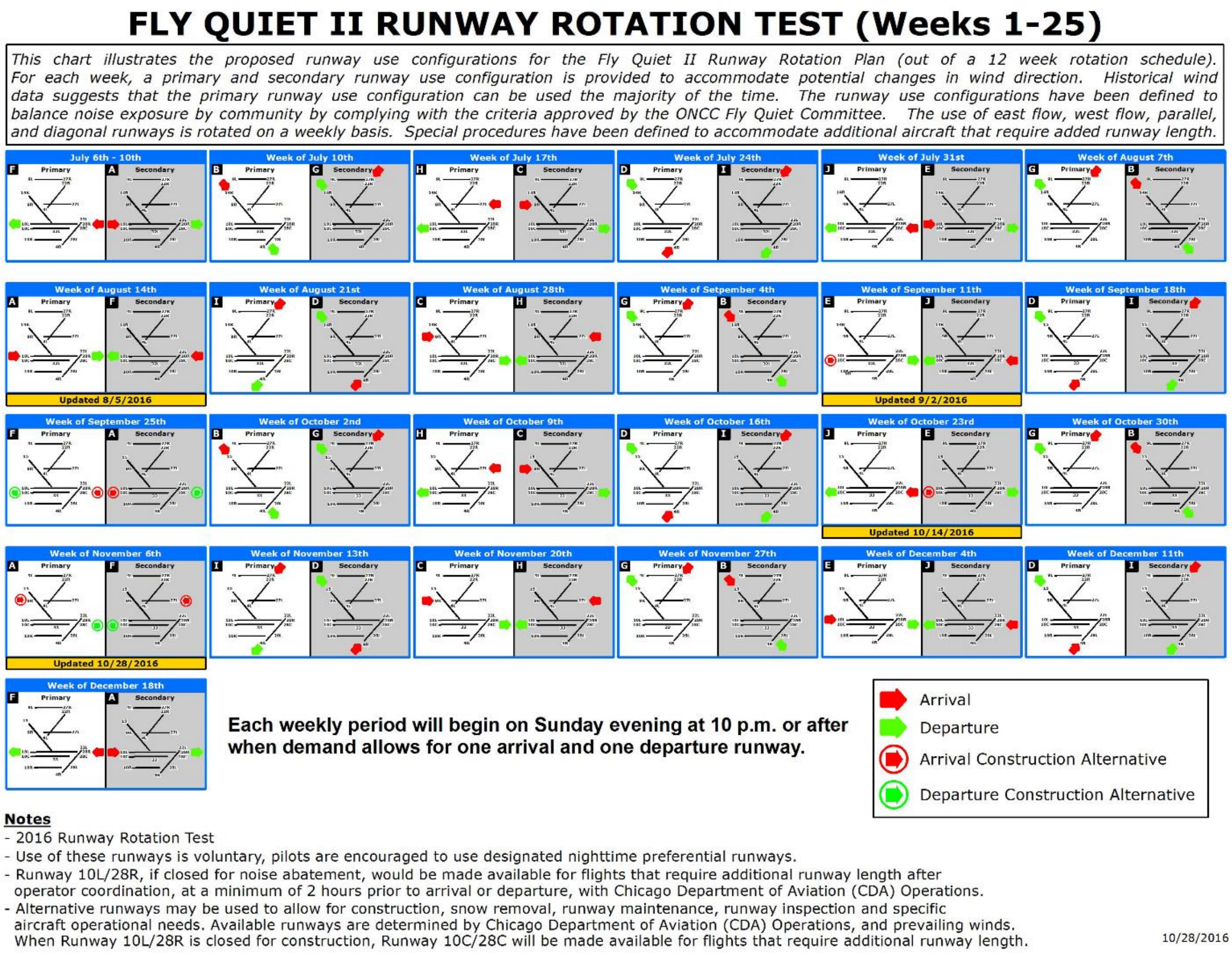


Figure 2: FQ II Runway Rotation Test Schedule

a. ORD Operations

ORD nighttime operations increased 10.3 % from 2012 to 2015 as shown in Figure 3. Average 2015 nighttime operations of 257 are 49.4 % higher than OMP full build out forecast nighttime operations of 172. Nighttime operations are multiplied by ten times for the purposes of determining noise impacts. So, the additional 85 operations in 2015 have the effect of 850 additional daytime operations. This is significant because coupled with existing daytime runway capacity (due to converging runway operations) and landside capacity (i.e., gate) constraints, the number of airport operations may continue to grow during the nighttime period in the foreseeable future (see monthly trends shown in Figure 4.

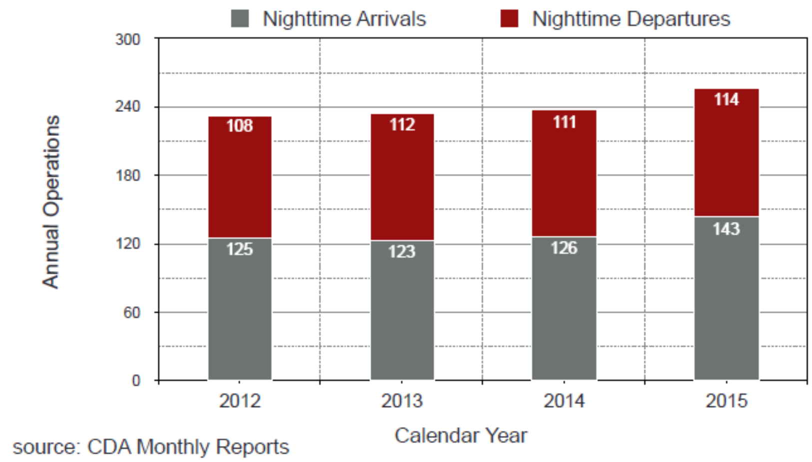


Figure 3: Nighttime Arrival and Departures 2012 - 2015

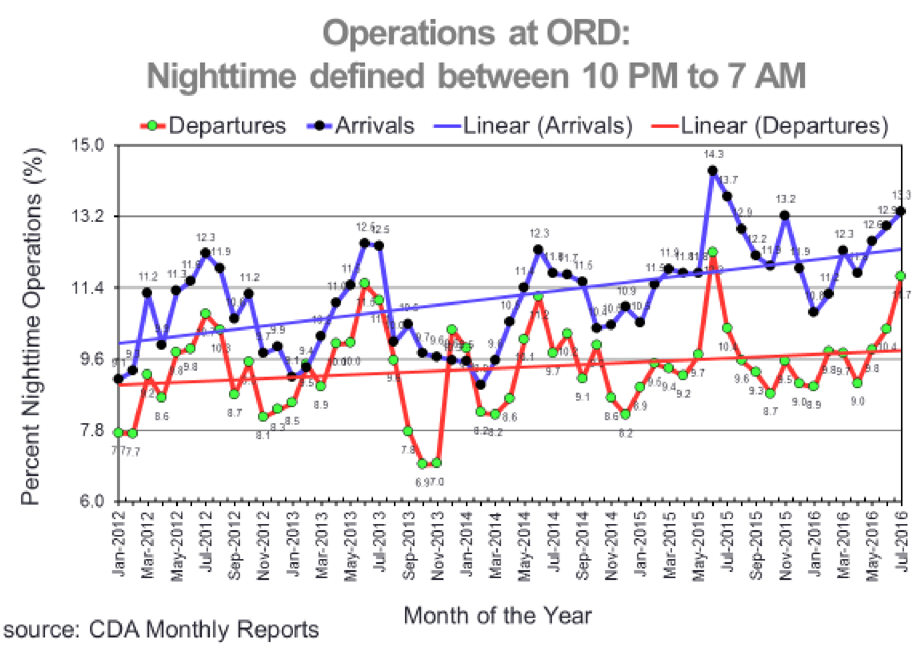


Figure 4: Percent of Nighttime Operations January 2012 - July 2016

Possible factors inducing more nighttime operations include:

- Loss in departure capacity in 2014 due to converging runway operations
- Runway maintenance and construction
- Gate capacity during daytime hours (larger aircraft trends further reduce apron/gate capacity)

- Increased scheduling of nighttime operations by passenger airlines
- Additional cargo operations in newly developed cargo facilities

Passenger airline operation encroachment on nighttime hours diminish the long-term prospect of reducing or providing relief to noise impacts. 49% of the average nightly operations in the 3rd quarter of 2016 were operations by United and American Airlines. Causes for later air carrier operations should be identified and mitigated. Possible options to reduce or mitigate nighttime schedule encroachment include:

- Expand daytime gate capacity
- Additional use of runways during the Fly Quiet period to enable faster and earlier transition into the runway rotation program possible
- Discuss nighttime schedule reductions with the airlines
- Community engagement with airlines to encourage good faith corporate neighbor scheduling policies

b. ORD Fleet Changes

Aircraft size is increasing at ORD as a natural occurrence as smaller regional jets are being replaced by larger regional jets and in some cases, narrow body aircraft (i.e., Boeing 737-800 and Airbus 320 types). Larger aircraft generate, in general more noise than the aircraft they replace (assuming the same generation of aircraft technology).

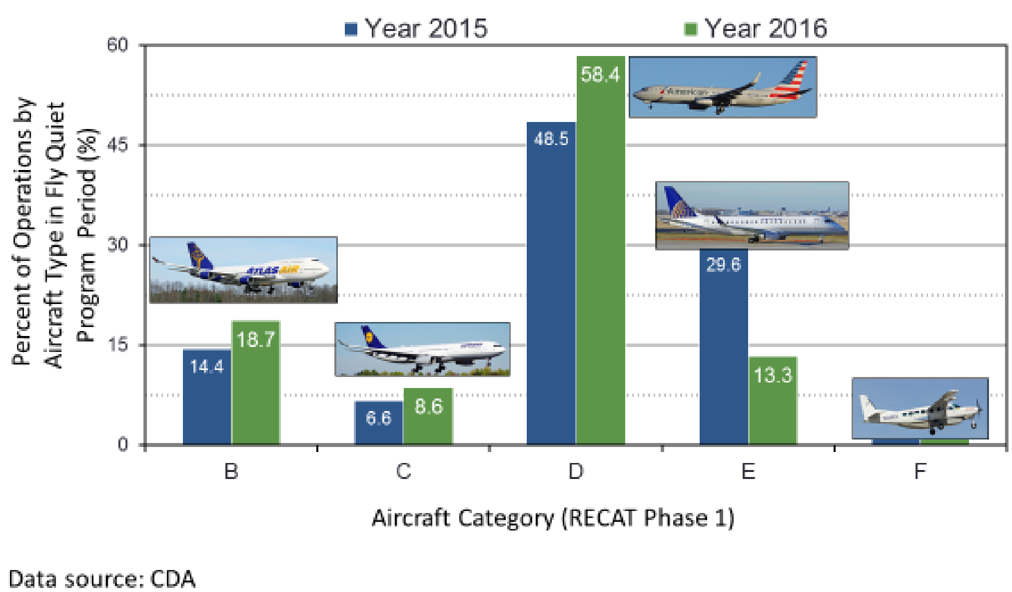


Figure 5: Percent of FQ II Operations by Aircraft Types in 2015 Compared Weeks 1-12 of the RRP

Figure 5 illustrates the fleet mix trends during the Fly Quiet Program period by aircraft category.

4. TIME PERIODS AND STATISTICS

a. Time Periods

Daytime Operations – include all operations between 7:00 AM and 10:00 PM.

Nighttime Operations - include all operations between 10:00 PM and 7:00 AM.

Fly Quiet Operations – the original Fly Quiet Program applied preferential runway use with the goal of including all operations between 10:00 PM and 7:00 AM.

CDA redefined the Fly Quiet Program into three Fly Quiet Programs to align with nighttime demand patterns.

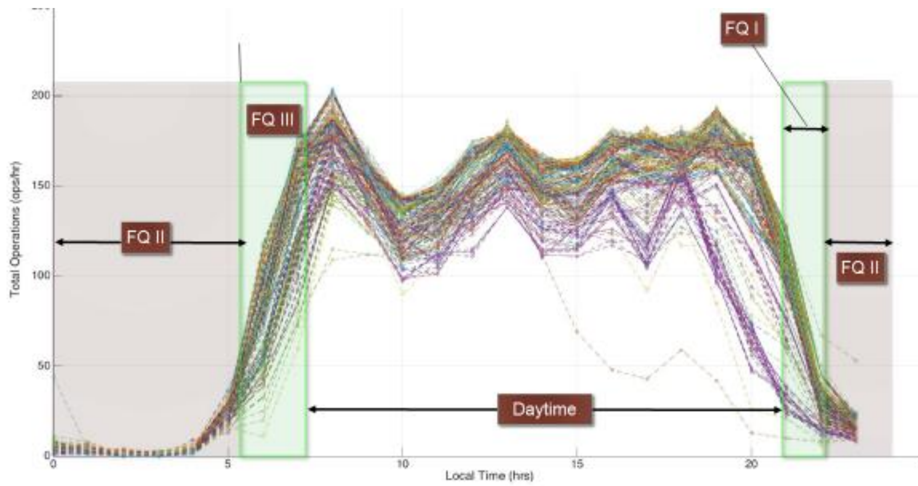


Figure 6: Fly Quiet Program I, II and III

Fly Quiet I – the evening shoulder hours when demand requires two departure runways and 1 arrival runway.

Fly Quiet II – the overnight hours when demand requires one arrival and one departure runway.

Fly Quiet III – the morning shoulder hours when demand requires two arrival runways and one departure runway.

Runway Rotation Program (RRP) – the hours when the tower utilized the designated runway rotation test configurations (limited to FQ II periods of demand requiring one arrival and one departure runway for this phase of the rotation test).

It should be noted that the terms Fly Quiet Program and Fly Quiet II are used interchangeably for purposes of the rotation test reporting.

b. Duration

Figure 7 plots both FQ II and Runway Rotation Program daily duration. FQ II duration averaged 7 hours and the runway rotation program averaged 4.5 hours (at times discontinuous). There were 21 days in which no rotation program occurred over the 25-week period.

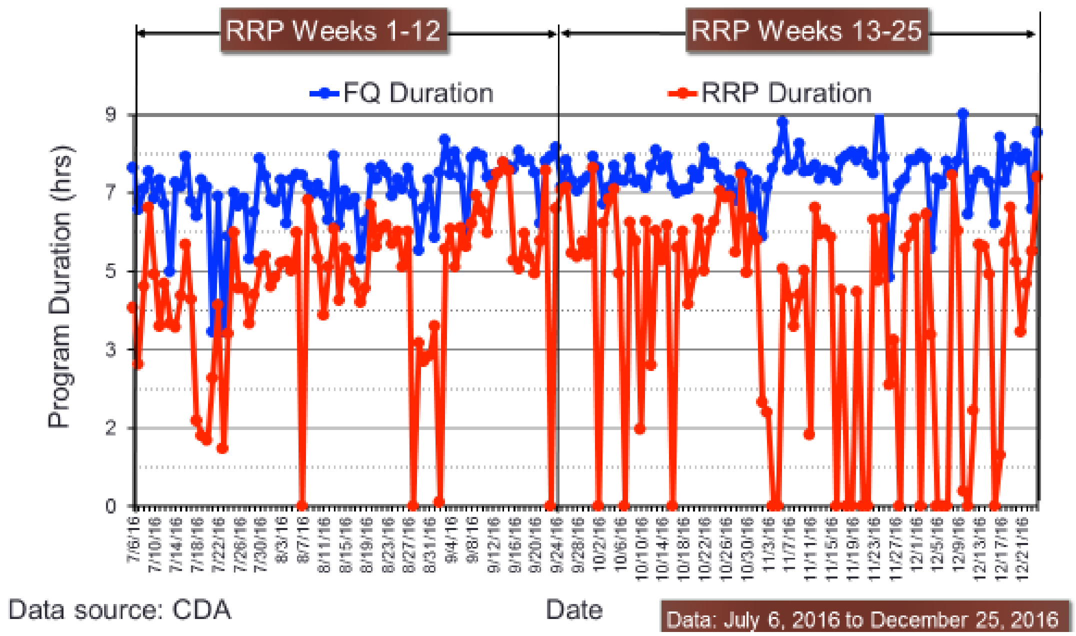


Figure 7: Week 1-25 FQ II Daily Duration

Average Duration Weeks 1-12

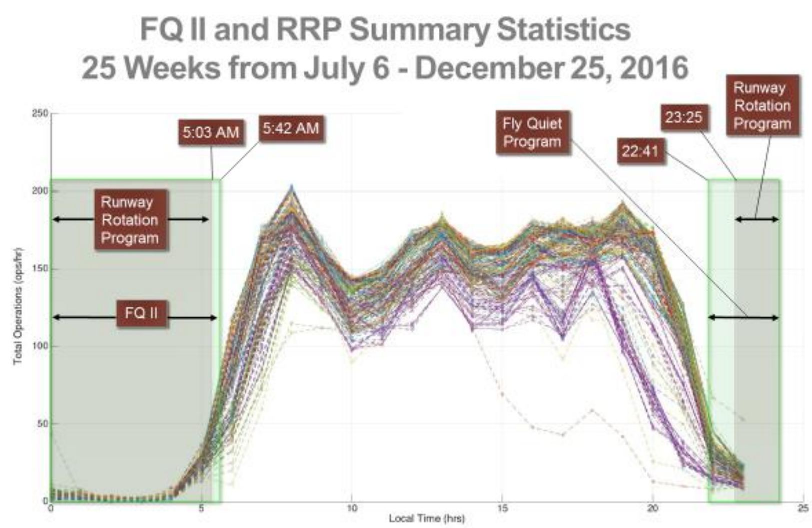
- FQ II = 6.8 hours
- RRP = 4.8 hours

Average Duration Weeks 13-25

- FQ II = 7.2 hours
- RRP = 4.3 hours

Average Duration Weeks 1-25

- FQ II = 7.0 hours
- RRP = 4.5 hours



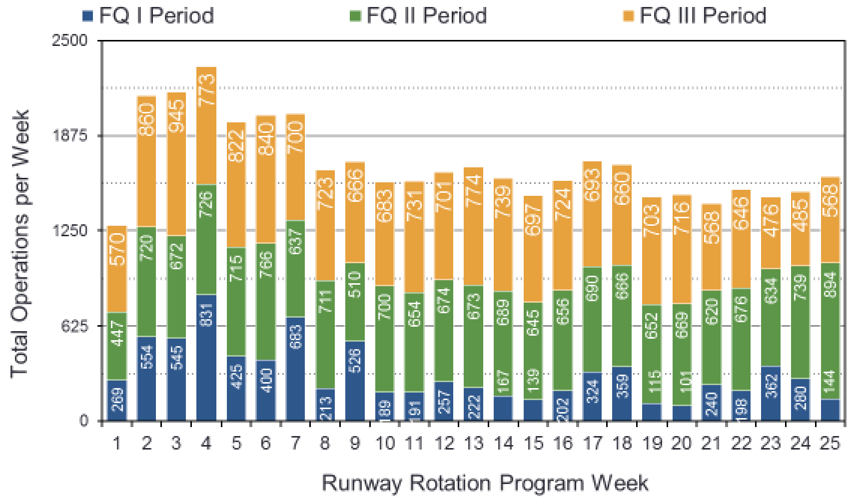
For RRP statistics: End time = 0 when RRP program was not activated

Figure 8: 25 Week Average FQ II and RRP Start and End Times

There was a slight improvement of .4 hours in the duration of Fly Quiet II hours in weeks 13-25 of the runway rotation program.
The runway rotation program time decreased by 0.5 hours in weeks 13-25.

The rotation test is constrained to the FQ II period because the rotation configurations A-J include just one arrival and one departure runway.

c. Operations

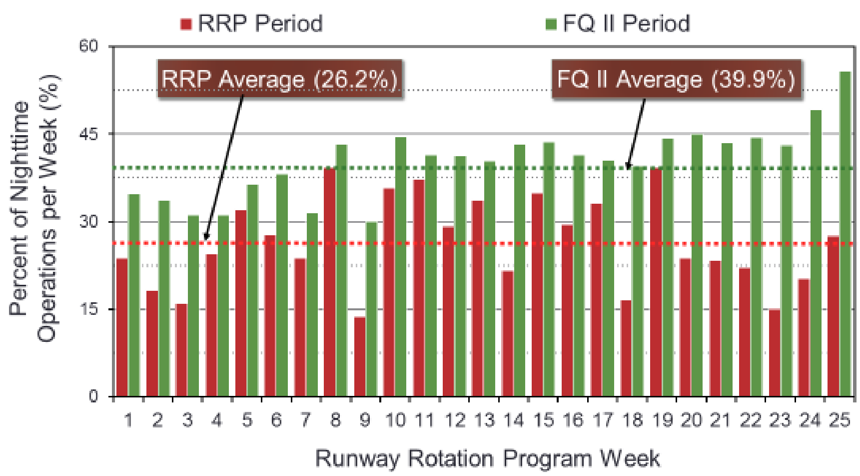


Data source: CDA (JDA Analysis)

Figure 9: Weeks 1-25 Average FQ I, II and III Operations

Nighttime operations averaged 249 per night during the 25 week rotation program. The average number of flight operations per week in FQ I, II and III are summarized in Figure 9.

On average the runway rotation program included 26.2 % of nighttime operations and FQ II included 39.9 % of nighttime operations (see Figure 10). Based on this analysis, the FQ II averages 99 operations and the rotation program averages 65 operations per night.



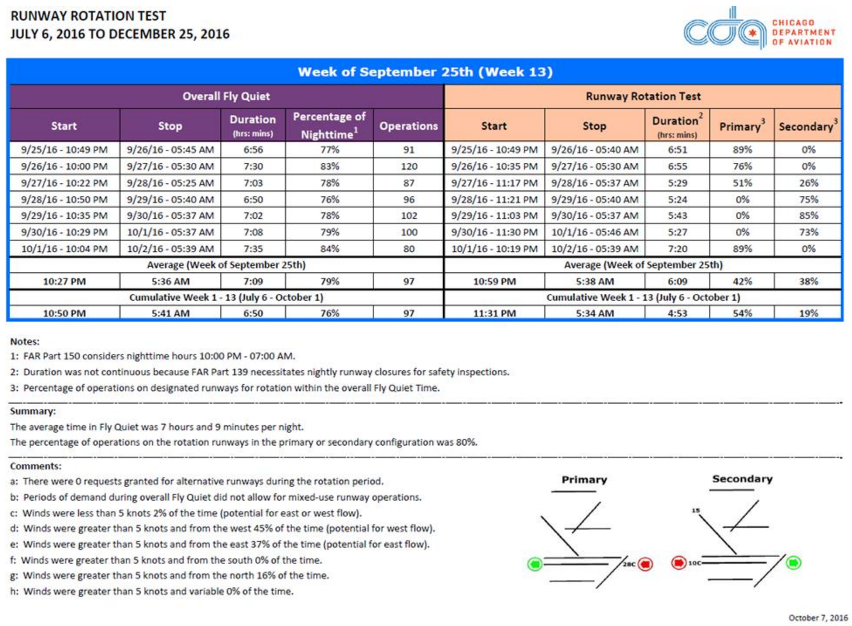
Data source: CDA (JDA Analysis)

Figure 10: Weeks 1-25 Average FQ II and RRP Operations

5. RUNWAY ROTATION CONFIGURATION COMPLIANCE

CDA provided weekly reports on runway rotation program shown in Figure 11. The CDA reports are linked here http://www.airportprojects.net/flyquiettest/schedule/ .

JDA compiled the CDA weekly reports into a consolidated 25-week report. The information is presented in Appendix 1 to provide another tool to evaluate compliance over the runway rotation period.



RUNWAY ROTATION TEST
JULY 6, 2016 TO DECEMBER 25, 2016

CHICAGO DEPARTMENT OF AVIATION

Week of September 25th (Week 13)

Overall Fly Quiet					Runway Rotation Test				
Start	Stop	Duration (hrs: mins)	Percentage of Nighttime[1]	Operations	Start	Stop	Duration[2] (hrs: mins)	Primary[3]	Secondary[3]
9/25/16 - 10:49 PM	9/26/16 - 05:45 AM	6:56	77%	91	9/25/16 - 10:49 PM	9/26/16 - 05:40 AM	6:51	89%	0%
9/26/16 - 10:00 PM	9/27/16 - 05:30 AM	7:30	83%	120	9/26/16 - 10:35 PM	9/27/16 - 05:30 AM	6:55	76%	0%
9/27/16 - 10:22 PM	9/28/16 - 05:25 AM	7:03	78%	87	9/27/16 - 11:17 PM	9/28/16 - 05:37 AM	5:29	51%	26%
9/28/16 - 10:50 PM	9/29/16 - 05:40 AM	6:50	76%	96	9/28/16 - 11:21 PM	9/29/16 - 05:40 AM	5:24	0%	75%
9/29/16 - 10:35 PM	9/30/16 - 05:37 AM	7:02	78%	102	9/29/16 - 11:03 PM	9/30/16 - 05:37 AM	5:43	0%	85%
9/30/16 - 10:29 PM	10/1/16 - 05:37 AM	7:08	79%	100	9/30/16 - 11:30 PM	10/1/16 - 05:46 AM	5:27	0%	73%
10/1/16 - 10:04 PM	10/2/16 - 05:39 AM	7:35	84%	80	10/1/16 - 10:19 PM	10/2/16 - 05:39 AM	7:20	89%	0%
Average (Week of September 25th)					Average (Week of September 25th)				
10:27 PM	5:36 AM	7:09	79%	97	10:59 PM	5:38 AM	6:09	42%	38%
Cumulative Week 1 - 13 (July 6 - October 1)					Cumulative Week 1 - 13 (July 6 - October 1)				
10:50 PM	5:41 AM	6:50	76%	97	11:31 PM	5:34 AM	4:53	54%	19%

Notes:
1: FAR Part 150 considers nighttime hours 10:00 PM - 07:00 AM.
2: Duration was not continuous because FAR Part 139 necessitates nightly runway closures for safety inspections.
3: Percentage of operations on designated runways for rotation within the overall Fly Quiet Time.

Summary:
The average time in Fly Quiet was 7 hours and 9 minutes per night.
The percentage of operations on the rotation runways in the primary or secondary configuration was 80%.

Comments:
a: There were 0 requests granted for alternative runways during the rotation period.
b: Periods of demand during overall Fly Quiet did not allow for mixed-use runway operations.
c: Winds were less than 5 knots 2% of the time (potential for east or west flow).
d: Winds were greater than 5 knots and from the west 45% of the time (potential for west flow).
e: Winds were greater than 5 knots and from the east 37% of the time (potential for east flow).
f: Winds were greater than 5 knots and from the south 0% of the time.
g: Winds were greater than 5 knots and from the north 16% of the time.
h: Winds were greater than 5 knots and variable 0% of the time.

October 7, 2016

Figure 11: CDA Weekly Runway Rotation Program Report

CDA noted factors causing rotation test delays of other runway use in Table 1 below lists cumulative average durations and operations during FQ II and the runway rotation periods for the 25-week period. It also lists cumulative factors driving use of other runways (rather than primary and secondary runways) over the 25-week period.

Table 1: Cumulative Reported Average Runway Rotation Statistics for Weeks 1-25

RRP Test Week	Week of	FQ RRP Test Configuration	% Nightime (10PM - 7AM) hours in FQ	FQ II Operations	% Operations w/in FQ			Alt RW Requests Granted	CDA Comments RRP Test Delays or Other RWY Use	Duration		Gap
					Primary	Secondary	Total P/S			FQ	RRP	
Cumulative weeks 1-25			**81**	**97**	**45**	**22**	**67**	**8.5**	**22 ORD Weather 9 Safety Insp 8 Flight Check 6 Weather US 5 Mixed Ops 4 Snow Removal 2 Const ORD 2 Arfld Grnd Ops 1 Aircraft Inc 1 Const MDW 1 RWY Crossing 1 Rubber Rem 1 Demand 1 NavAid Maint**	**7:01**	**4:31**	**2:30**

Uncontrollable factors noted by air traffic as limiting rotation compliance include:

- Demand
- Weather (US and ORD)
- Aircraft incidents
- Construction at Midway Airport

- Snow removal
- Navigational aid maintenance

Controllable factors noted by air traffic as limiting rotation compliance include:

- FAA flight checks
- CDA runway safety inspections
- ORD construction
- Airfield ground operations
- Mixed use operations
- Runway crossings
- Rubber removal

The JDA team considers use of the longest runway also a controllable factor that is limiting rotation compliance (explained in more detail in Section 6).

Great effort was made to control factors during the runway rotation program (not listed by the tower because they did not impact the test). CDA, the FAA and the airlines all contributed to significant effort to realign normal operations, flight tests, construction, airline operations and airfield maintenance to accommodate the rotation test demonstrating an element of good faith that should not be underestimated.

While it may not be possible to capture all FQ II operations per night in the runway rotation program, there is opportunity to close the average gap of 34 operations between the runway rotation and FQ II operations.

The potential to increase operations in the rotation program lies in eliminating additional controllable factors. Consistent with our report dated May 4, 2016 evaluating the proposed rotation program, four factors constraining the runway rotation performance should be removed from future rotation test phase configurations including:

- Mixed use operations
- Runway crossings
- Overflights of airfield ground operations
- Elimination of the requirement for advanced notice of two hours to use runway10L/28R

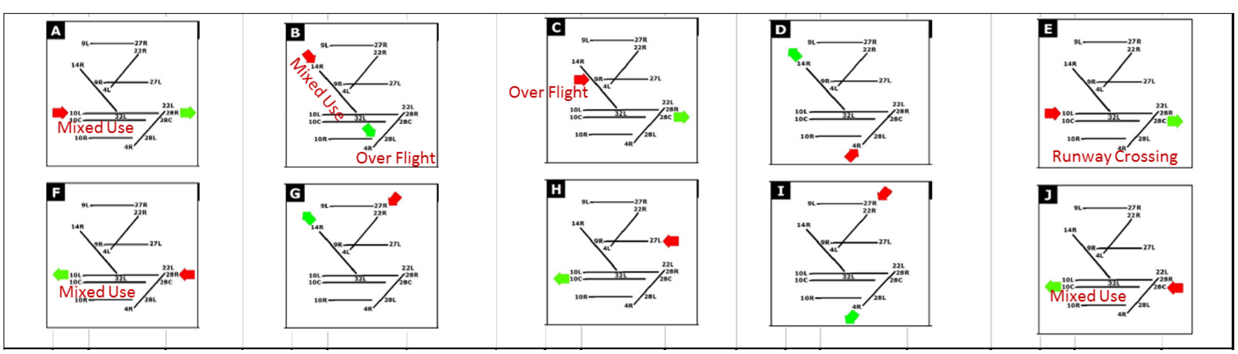


Figure 12: Runway Rotation Program Configurations A-J Operational Constraints

Mixed use operations are present in configurations A, B, F and J. Overflights are present in configurations B and C and configuration E requires an active runway crossing for departures on runway 28C.

Fourteen of twenty-one days with no rotation program occurred during cross wind (i.e., diagonal) runway configuration weeks. Weather was listed as a factor in the days with no rotation program for diagonal configurations D and I. Weather, construction and mixed use were factors in the days with no rotation for diagonal configurations B and G.

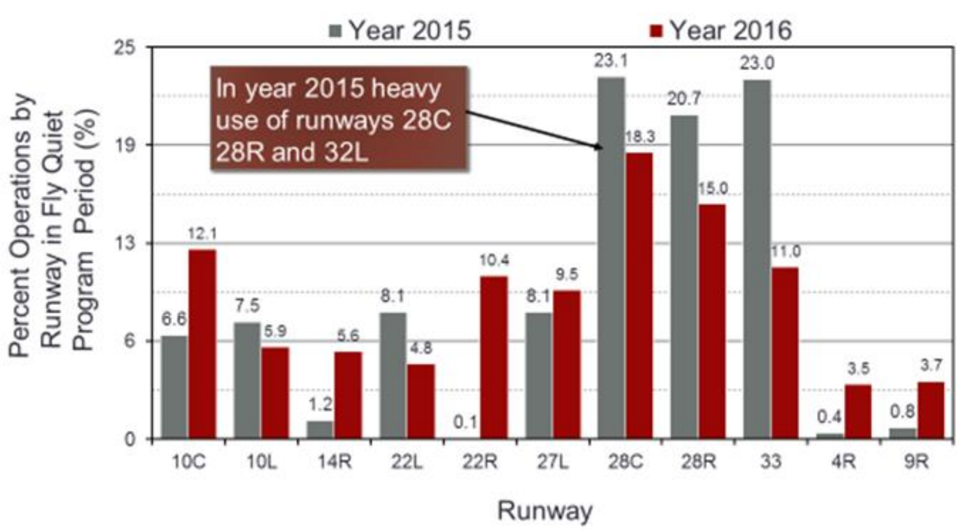
Four of the twenty-one days with no rotation program occurred during configuration C and H weeks. Strong weather, flight checks, holiday demand and airfield ground operations were listed as factors.

The remaining three days with no rotation program occurred during configuration E and J weeks in which runway crossings, rubber removal and weather were listed as factors.

Time in the rotation program deteriorated in the second twelve weeks of the test. Holiday demand, snow removal and weather reduced the air traffic control tower ability to comply with rotation configurations as did the operational constraints imposed by mixed use runways, overflights and active runway crossings.

6. RUNWAY UTILIZATION

The runway rotation program did provide improved balance of runway use of FQ II operations in the 25-week test period in 2016 as compared to 2015 operations during the same time periods as shown in Figure 13. Runways 28C, 28R and 33 were all used greater than 20% of operations in 2015 and all dropped below 18% of operations in 2016.



Data source: CDA. Analysis by JDA.

Figure 13: Week 1-25 FQ II Percent Operations by Runway in 2016 and 2015

Table 2 compiles number of operations occurring within the daily Fly Quiet II (FQ II) start and end times on each runway throughout the 25-week rotation period.

Runway 28 C has the highest use and runway 4L has the lowest use during the 25-week runway rotation period.

Table 2: Runway Rotation Program Operations by Runway Weeks 1-25

		Runway												
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
6-Jul	1		10		2		44	4	360	26			1	447
10-Jul	2	37	26	265		74	74	1	95	100			48	720
17-Jul	3	34	58				234	122	87	34			103	672
24-Jul	4	57	56	25	29	27	18	3	39	239		225	8	726
31-Jul	5	72	70	18			3	459	38	52			3	715
7-Aug	6	24	102	12		266	6	4	74	262			16	766
14-Aug	7	30	226	3	1		6	3	295	72			1	637
21-Aug	8	18	35	32	231	263	15	13	41	17	19	27		711
28-Aug	9	180	12		1		68	61	52	4			132	510
4-Sep	10	8	9	114	28	229	27	5	93	186			1	700
11-Sep	11	384	5		16			161	31	21			36	654
18-Sep	12	89	12	7	44	50	16	19	15	181	25	216		674
25-Sep	13	255	44		21		20	287	2	37			7	673
2-Oct	14	13	9	351	21	16	9	58	80	64			68	689
9-Oct	15	57			6		250	309	5				18	645
16-Oct	16	56	49	5	91	112	27	29	46	106		121	14	656
23-Oct	17	281	1		24		54	245	22	35			28	690
30-Oct	18	71	29	47	5	206	5	136	11	137			19	666
6-Nov	19	74			4		240	316		2			16	652
13-Nov	20	55		14	92	175	67	142	75	42			7	669
20-Nov	21	143	16		4		177	205	42	1			32	620
27-Nov	22	4		50	61	192	47	112	81	129				676
4-Dec	23	56	79		10		48	204	197	29			11	634
11-Dec	24	14	79		112	148	15	99	149	77		6	40	739
18-Dec	25	17	61		4		122	88	588	2			12	894
Grand Total		**2029**	**988**	**943**	**807**	**1758**	**1592**	**3085**	**2518**	**1855**	**44**	**595**	**621**	**16835**
Percent		**12.1%**	**5.9%**	**5.6%**	**4.8%**	**10.4%**	**9.5%**	**18.3%**	**15.0%**	**11.0%**	**0.3%**	**3.5%**	**3.7%**	**100%**
Weeks 1-12		933	621	476	352	909	511	855	1220	1194	44	468	349	7932
Percent		11.8%	7.8%	6.0%	4.4%	11.5%	6.4%	10.8%	15.4%	15.1%	0.6%	5.9%	4.4%	100.0%
Weeks 13-25		1096	367	467	455	849	1081	2230	1298	661	0	127	272	8903
Percent		12.3%	4.1%	5.2%	5.1%	9.5%	12.1%	25.0%	14.6%	7.4%	0.0%	1.4%	3.1%	100.0%

Use of the second highest used runway 28R occurs in every week but one of the rotation test even though it appears in the rotation schedule 2 weeks as primary (Week 1 and 25) and one week as secondary (Week 7).

1,275 operations on runway 28R occur in weeks that runway 28R is not in the rotation schedule. Total requests granted for other runways reported by CDA was 205. So, it would appear the intent to limit use of runway 10L/28R by requiring a 2-hour notice was ineffective and may have influenced the tower to delay entry into the rotation program to avoid losing the long runway or break continuity of the rotation program anticipating need of its use.

Runways 10L/28R or 10C/28C should be available to pilots declaring an operational need to use them.

Compliance with rotation configurations averaged 72 % during FQ II in the first twelve weeks of the rotation program. Runways 28R and 33 were over utilized and runways 4L, 9R and 22L were under-utilized.

Compliance with rotation configurations in weeks 13-25 averaged 63% during FQ II in weeks 13-25 of the rotation program. Runways 28C and 28R were over utilized and runways 4L, 4R and 9R were under-utilized.

Future configurations and frequency of use of configurations in the rotation schedule should seek to balance use of all runways available during Fly Quiet.

Departures for weeks 1-25 are shown in Table 3. The highest use runway is Runway 33 with 25% of the departures. This is a direct result of the frequency of use of runway 33 in the 25-week schedule which included runway 33 eight weeks as primary and four weeks as secondary. The purpose of the runway rotation is to balance the impacts and provide periods of relief to communities in achieving balance. 25% use of any runway is too much.

Runways 28R and 28C are utilized 19% and 20% respectively for departures. Both runways are used for departures all but one week of the 25-week schedule.

Arrivals for weeks 1-25 are shown in Table 4. The highest used runway for arrivals is runway 22R at 19% followed by 27L and 28C both at 17%. Runway 22 R was scheduled as primary in 6 weeks and secondary in 6 weeks of the rotation schedule. All operations on runway 22R occurred during scheduled weeks. Runway 27L was used for arrivals in all but one of the 25 weeks. Runway 28C was used in all but two of the 25 weeks for arrivals but was only scheduled three weeks as primary and 2 weeks as secondary.

Table 3: Week 1-25 FQ II Departures

Departures														
Week of	Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
6-Jul	1		2		2		3		149	26			1	183
10-Jul	2	2	18	100				1	54	100			48	323
17-Jul	3	10	47					93	73	34			32	289
24-Jul	4	3	18	10	28			1	32	239		1	8	340
31-Jul	5	41	9	11				155	25	52			3	296
7-Aug	6		19	2				1	28	262			16	328
14-Aug	7	9	86		1		1	3	81	72			1	254
21-Aug	8	13	23	2	211			8	25	17	19	2		320
28-Aug	9	63	12		1		1	35	41	4			53	210
4-Sep	10		7	28	28			3	75	186			1	328
11-Sep	11	130	5		16			38	28	21			36	274
18-Sep	12	22	7	1	41			3	11	181	25			291
25-Sep	13	81	37		21		1	122	2	37			7	308
2-Oct	14	7	1	101	21			24	10	64			63	291
9-Oct	15	19			6		3	238	4				18	288
16-Oct	16	15	13		79			18	31	106			14	276
23-Oct	17	88	1		24		3	100	22	35			28	301
30-Oct	18	24		14	4		1	84	5	137			19	288
6-Nov	19	30			4		3	218		2			12	269
13-Nov	20	21		6	86			70	60	42			7	292
20-Nov	21	29	16		4		2	131	37	1			24	244
27-Nov	22			11	59			33	65	129				297
4-Dec	23	37	30		10			89	85	29			10	290
11-Dec	24		38		111			19	69	77			39	353
18-Dec	25		22		4		1	18	393	2			12	452
Total		**644**	**411**	**286**	**761**		**19**	**1505**	**1405**	**1855**	**44**	**3**	**452**	**7385**
% Use		**9%**	**6%**	**4%**	**10%**	**0%**	**0%**	**20%**	**19%**	**25%**	**1%**	**0%**	**6%**	**100%**

Table 4: Week 1-25 FQ II Arrivals

Arrivals														
Week of	Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
6-Jul	1		8				41	4	211					264
10-Jul	2	35	8	165		74	74		41					397
17-Jul	3	24	11				234	29	14				71	383
24-Jul	4	54	38	15	1	27	18	2	7			224		386
31-Jul	5	31	61	7			3	304	13					419
7-Aug	6	24	83	10		266	6	3	46					438
14-Aug	7	21	140	3			5		214					383
21-Aug	8	5	12	30	20	263	15	5	16			25		391
28-Aug	9	117					67	26	11				79	300
4-Sep	10	8	2	86		229	27	2	18					372
11-Sep	11	254						123	3					380
18-Sep	12	67	5	6	3	50	16	16	4			216		383
25-Sep	13	174	7				19	165						365
2-Oct	14	6	8	250		16	9	34	70				5	398
9-Oct	15	38					247	71	1					357
16-Oct	16	41	36	5	12	112	27	11	15			121		380
23-Oct	17	193					51	145						389
30-Oct	18	47	29	33	1	206	4	52	6					378
6-Nov	19	44					237	98					4	383
13-Nov	20	34		8	6	175	67	72	15					377
20-Nov	21	114					175	74	5				8	376
27-Nov	22	4		39	2	192	47	79	16					379
4-Dec	23	19	49				48	115	112				1	344
11-Dec	24	14	41		1	148	15	80	80			6	1	386
18-Dec	25	17	39				121	70	195					442
Total		**1385**	**577**	**657**	**46**	**1758**	**1573**	**1580**	**1113**		**14**	**592**	**169**	**9450**
% Use		**15%**	**6%**	**7%**	**0%**	**19%**	**17%**	**17%**	**12%**	**0%**	**0%**	**6%**	**2%**	**100%**

Balance of East and West flow is weighted toward West flow by 64% for Arrivals and 75% Departures. The rotation schedule utilized West flow configurations 13 weeks as primary and 12 weeks as secondary and East flow configuration were used 12 weeks as primary and 13 weeks as secondary. So, the imbalance in East and West flow is not a product of the rotation schedule but is likely a result of winds and/or other factors influencing air traffic controllers.

Arrivals		Departures	
East Flow	West Flow	East Flow	West Flow
36%	64%	25%	75%

Figure 14: East and West Flow of Week 1-25 FQ II Arrivals and Departures

Frequency of use of primary or secondary configuration use of each runway in the 25-week rotation schedule and the percentage use of each runway are shown in Table 5.

Table 5: 25 Week Percent FQ II Runway Use and Frequency in Rotation Schedule

25 Week Rotation Schedule Phase I Runway Use Frequency and Percent Use							
ARRIVAL RUNWAY	Configuration Use RRP Test Phase I	Primary or Secondary Frequency Weeks 1-25	RRP Phase I % Use	DEPARTURE RUNWAY	Configuration Use JDA RRP Test Phase II	Primary or Secondary Frequncy Weeks 1-25	RRP Phase I % Use
4R	1	4P/2S	6%	4L	0	0	1%
10L	2	2P/3S**	6%	28R	1	2P/1S	19%*
10C	0	1P/2S**	15%	28C	2	5P/5S	21%
15	1	2P/4S	7%	33	2	**8P/4S**	**25%**
22R	2	6P/6S	19%	22L	1	2P/4S	10%
28C	1	3P/2S**	17%	10C	2	4P/4S	9%
28R	1	2P/1S	12%	10L	1	2P/3S	5%
27L	1	2P/3S**	17%	9R	0	0	5%
9R	1	3P/2S**	2%	15	1	2P/4S	4%
	10	25P/25S			10	25P/25S	

* Departures on 28 R were only in the schedule 3 of the 25 weeks because of construction (623 Departures occurred in those weeks or 8.5% of total departures) 782 Departures or 10.5 % of total departures ocurred in
** construction subtitutions

Figure 15 illustrates runway use by large and heavy aircraft. Heavy and large aircraft used all the runways with the highest use of 17.6% on Runway 28C and 14.8% on Runway 28R. There were 3,256 heavy operations and 1,616 large aircraft operations during the 25-week FQ II period. The large and heavy aircraft operations combined accounted for 29% of FQ II operations during the 25 weeks.

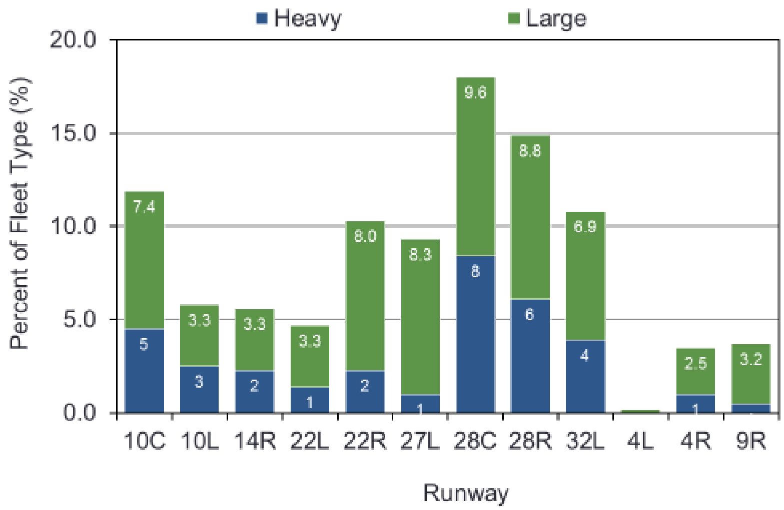


Figure 15: Week 1-25 Percent Use of FQ II Heavy and Large Aircraft Operations by Runway

7. OVERFLIGHTS

Overflights are a metric that provides a spatial representation of aircraft activity over a community. Overflights below 3,000' have the most impact on the noise environment. Flight tracks below 3,000 feet AGL for weeks 1-25 of the rotation program are shown in Figure 16.

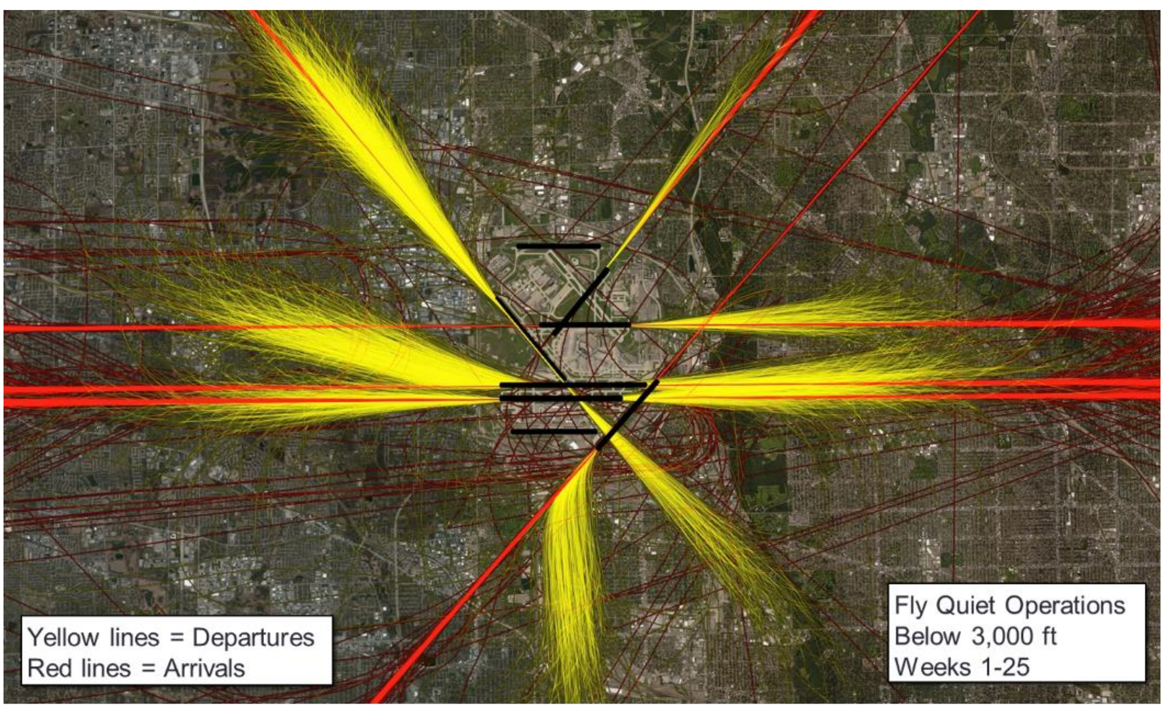


Figure 16: FQ II Operations Below 3,000 Feet AGL

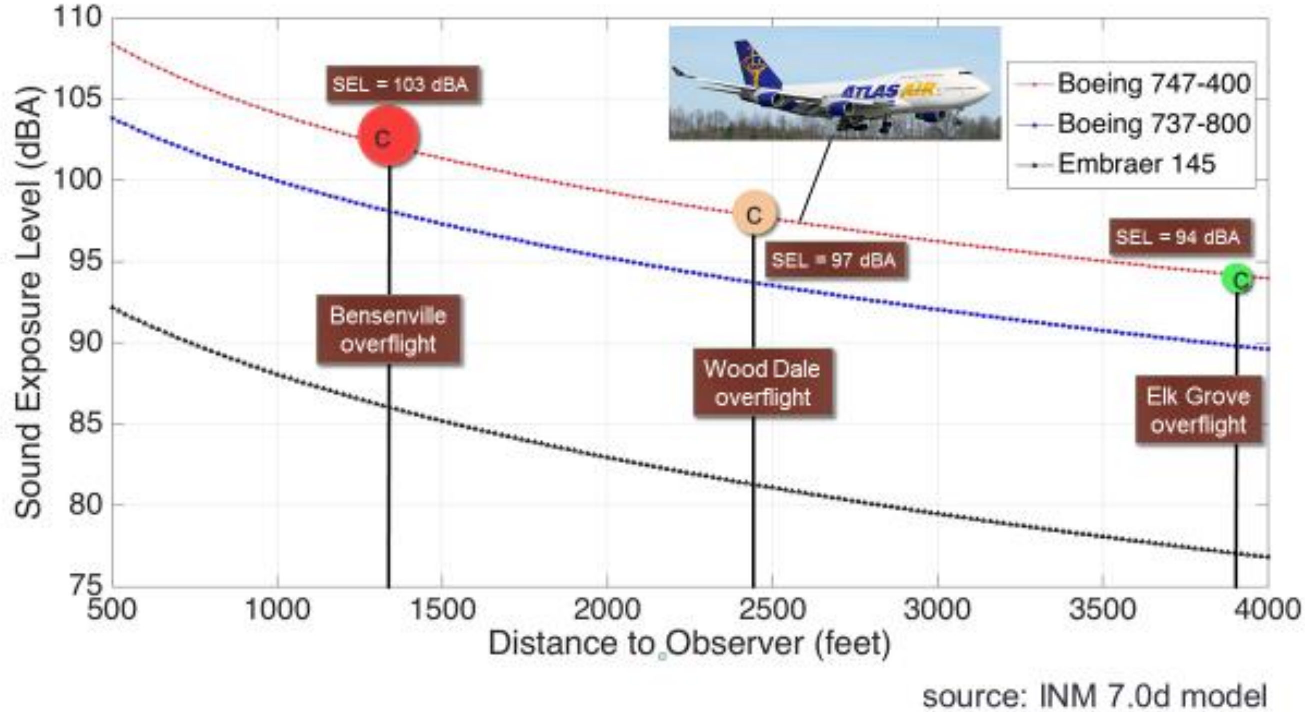


Figure 17: Sound Exposure Level Relative to Distance from Observer

The interpretation of the overflight analysis requires consideration of the overflight altitude. Figure 17 shows the typical overflight altitudes at three SOC towns during FQ II operations.

The average[1] overflight altitude at Bensenville is 1,300 feet. The average overflight at Wood Dale is 2,420 feet. The difference in the theoretical Sound Exposure Level (SEL) is 6 dBA for a heavy aircraft like a Boeing 747-400. The 6 dBA SEL difference represents four times the sound energy overflying Bensenville compared to Wood Dale.

Flight track data was parsed during the FQ II daily time periods for each week during the runway rotation program to capture the flight tracks that occurred each week. Figure 18 includes the Fly Quiet II flight tracks and operations for week 1 of the runway rotation program (see Appendix 2 for weeks 1-25).

Overflights over each SOC community were then counted for all flights during the Fly Quiet program period for each week of the runway rotation program as shown for Elk Grove Village in Figure 19. See Appendix 3 for Week 1-25 Overflights below 3,000 feet AGL for all SOC communities.

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[1] The average altitude is calculated considering all the flight track points that fall inside the town boundaries. Larger towns like Elk Grove have more variability in the overflight altitudes for a single overflight due to their size.

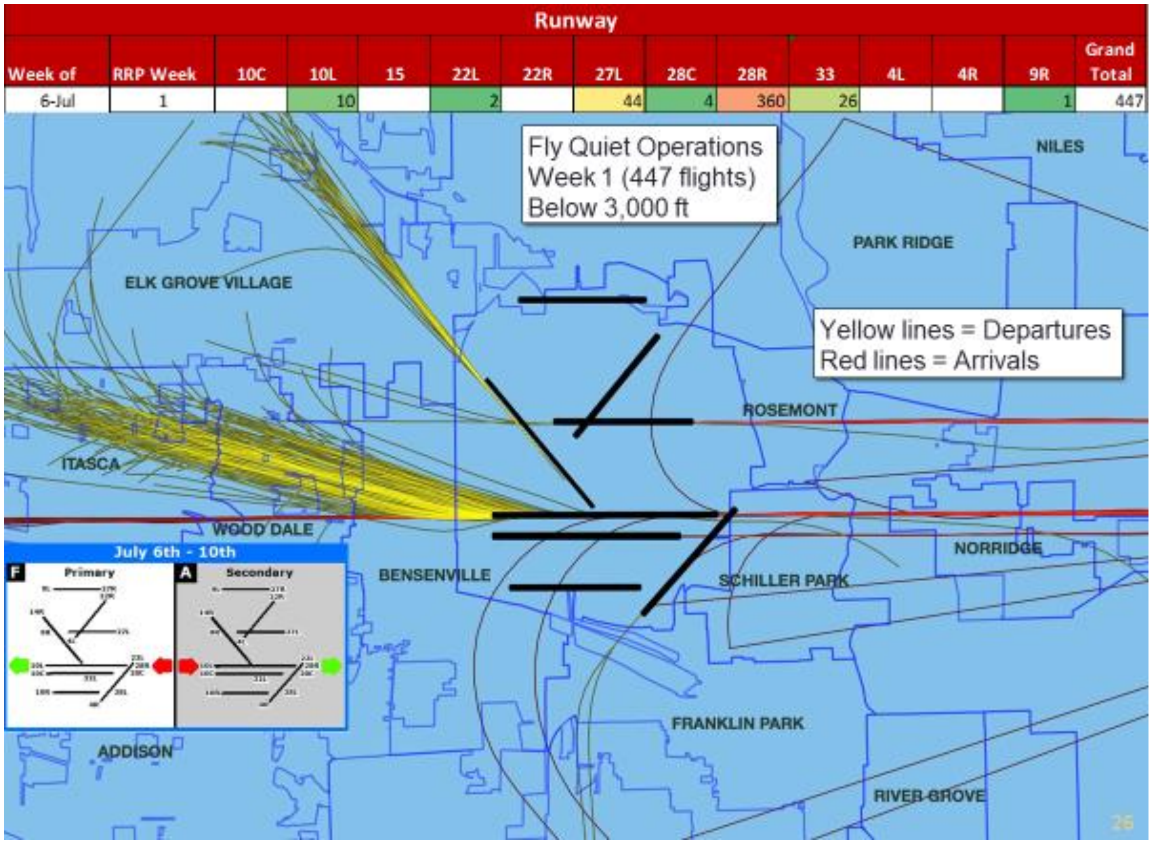


Figure 18: Week 1 FQ II Flight Track and Operations

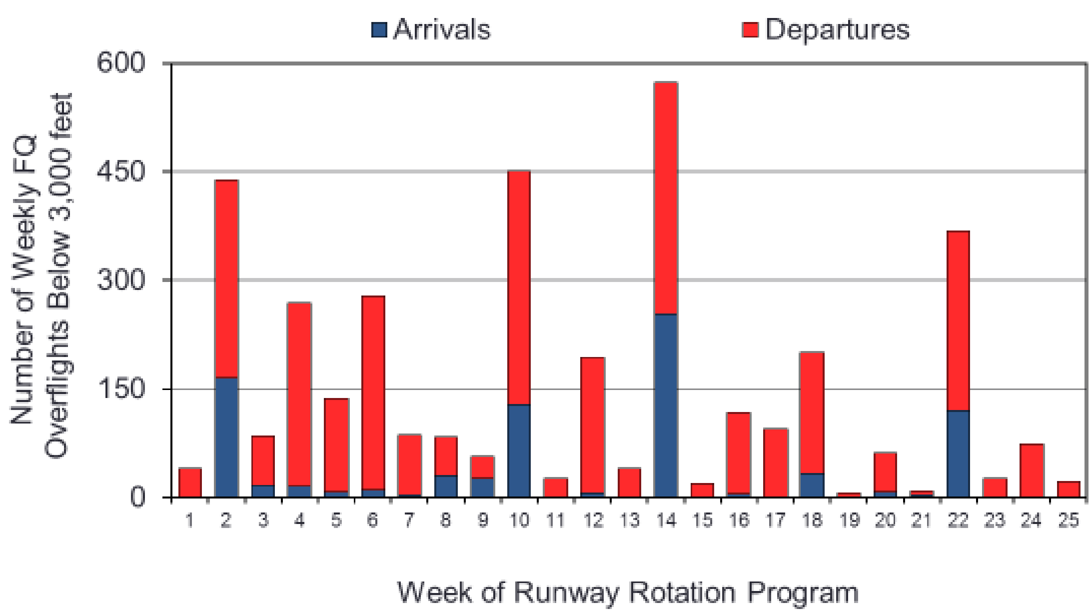


Figure 19: Week 1-25 Elk Grove Village Overflights Below 3,000 Feet AGL

Periods of relief for each SOC community are demonstrated in the overflight data and are predictable by the published runway rotation schedule.

Overflights below 3,000' for weeks 1-25 for 128 additional communities surrounding ORD are found in Appendix 3 and below in Figure 20.

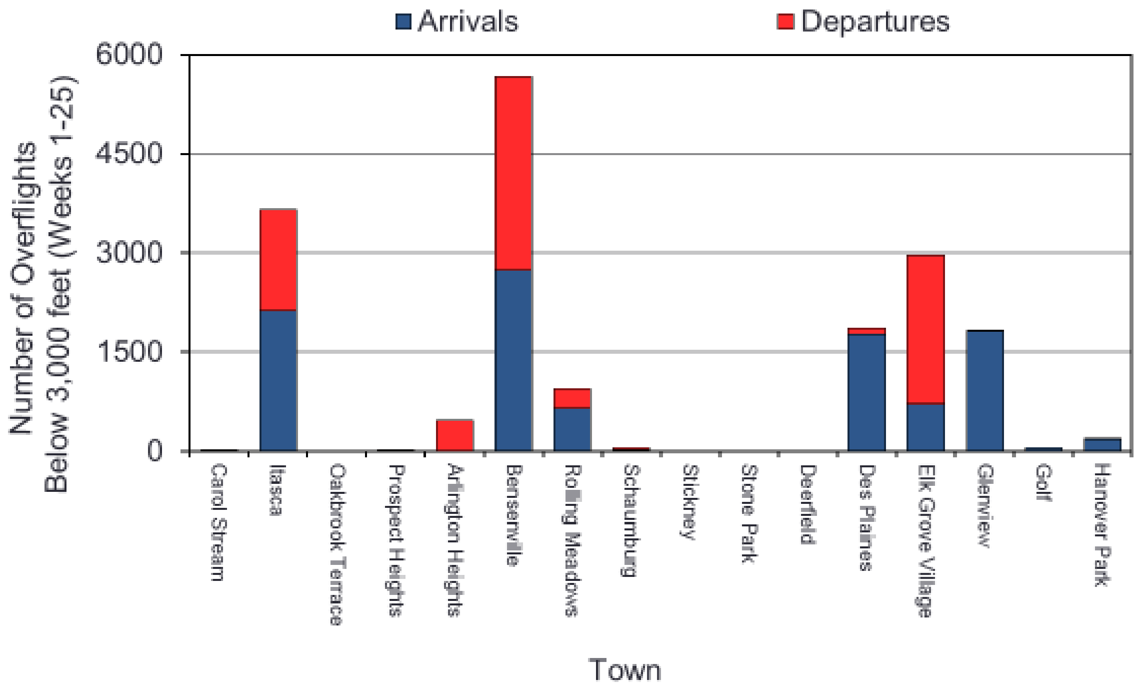


Figure 20: Week 1-25 O'Hare Community Overflights Below 3,000' AGL

8. NOISE ANALYSIS

Data provided by CDA included noise monitor data for 33 permanent noise sensors around ORD shown in Figure 21.

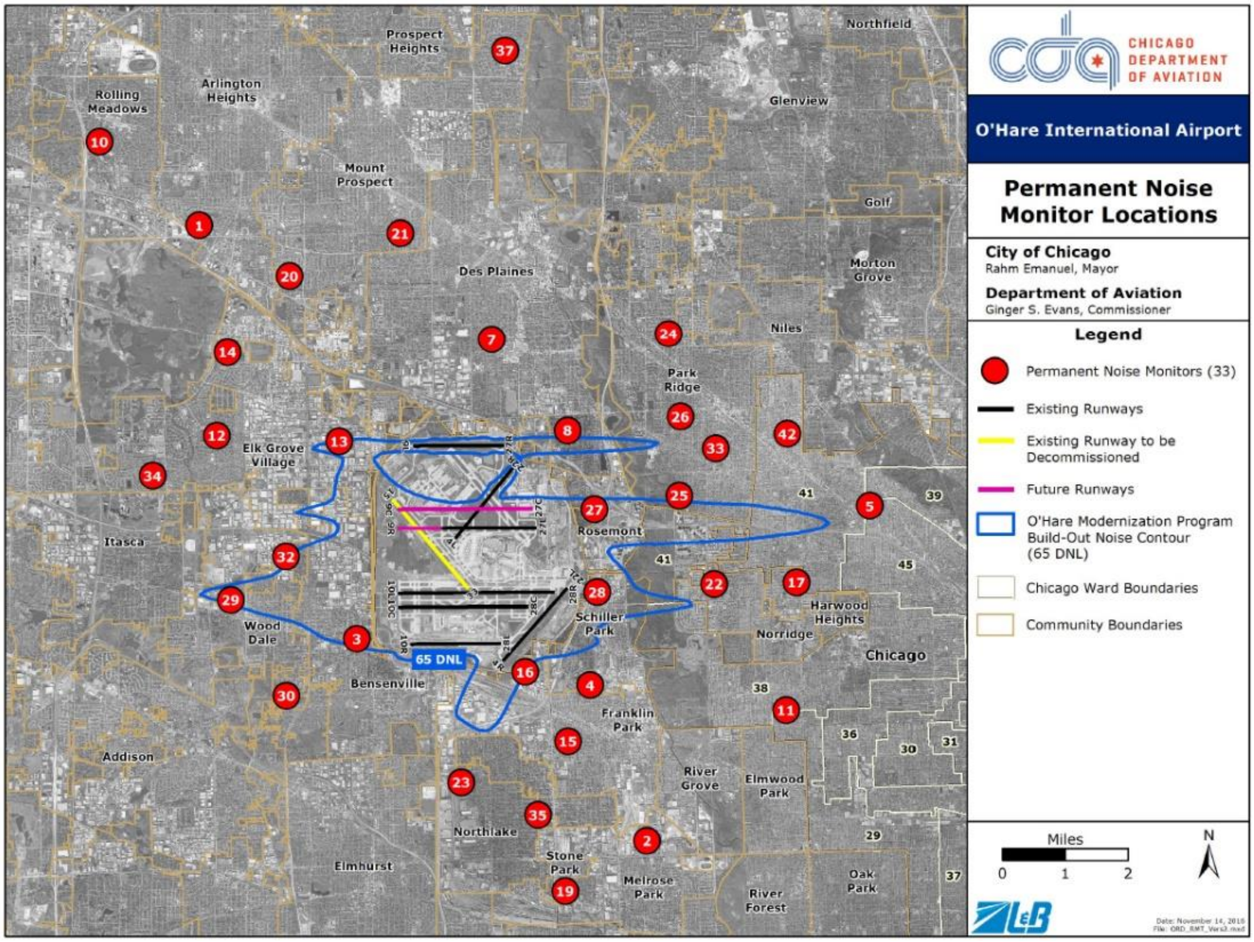


Figure 21: ORD Noise Monitor Locations

Sensors provide data representing the following noise metrics:

- Leq - equivalent noise level (dBA)
- SEL – sound exposure level (dBA)
- Maximum sound pressure level (dBA)
- Time duration of the event

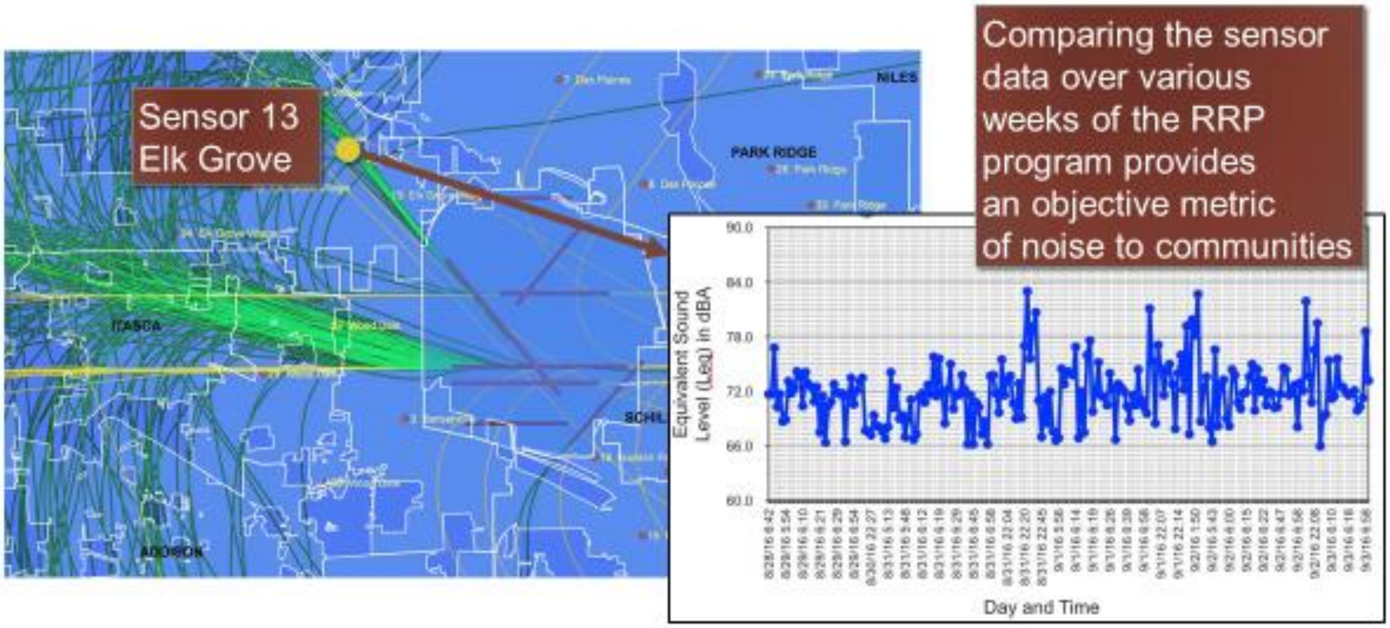


Figure 22: Equivalent Sound Level Data Noise Monitor 13 1600 Nicolaus Avenue Elk Grove Village

Noise monitor data for the 25 weeks of the rotation program included 1.7 million records from the ANMS system between July 6 and December 25, 2016. Approximately 26% of the records cannot be attributed to aircraft. Only records identified by aircraft events were used in the analysis presented in this report. 126,300 aircraft noise events were recorded during nighttime hours (> 22:00 hours and < 7:00 hours). There were 50,813 aircraft noise events during Fly Quiet II hours between July 6 and December 25, 2017.

9. NOISE IMPACTS BY MONITOR LOCATIONS IN SOC COMMUNTIES

Table 6 summarizes FQ II aircraft noise event data for other noise monitors in or near SOC communities. Appendix 4 for aircraft noise event data for additional noise monitor data by community.

Noise Monitor 29 (at Wood Dale) recorded the highest number of 4,199 events of which 4,156 exceeded 65 dB. Noise Monitor 28 in Schiller Park and Noise Monitor 13 in Elk Grove Village and Noise recorded the highest number of events above 75 dB Leq. Both monitors are located nearby heavily used runways (runway 33 departure end for monitor 13 and runways 28C and 28R approach ends for monitor 28).

Table 6: Total Aircraft Noise Events During FQ II at Selected Noise Monitor Locations Weeks 1-25

Monitor	Town	96 N. Mason Street	All Events	Leq >= 65 dB	Leq >= 75
3	Bensenville	9879 Ivanhoe Avenue	2632	2614	327
4	Schiller Park	6314 Rosendale Avenue	1309	504	17
12	Elk Grove Village	1600 Nicholas Avenue	589	387	45
13	Elk Grove Village	351 Briarwood Lane	2715	2715	1740
14	Elk Grove Village	5005 Planfield Avenue	1857	1813	83
22	Norridge	1427 Granville Avenue	4057	3503	587
25	Park Ridge	6010 Ruby Street	2814	557	12
27	Rosemont	4934 ½ Harold Avenue	3268	1611	57
28	Schiller Park	427 Grove Avenue	3154	3135	1466
29	Wood Dale	219 Aspen Road	4199	4156	912
30	Wood Dale	744 Edgewood Avenue	355	315	4
32	Wood Dale	1240 Somerset Lane	2425	2379	393
34	Elk Grove Village	96 N. Mason Street	1666	371	1

Figure 23 illustrates the spatial location of noise monitors near the airport and the FQ II flight paths below 3,000’ AGL for weeks 1-25.

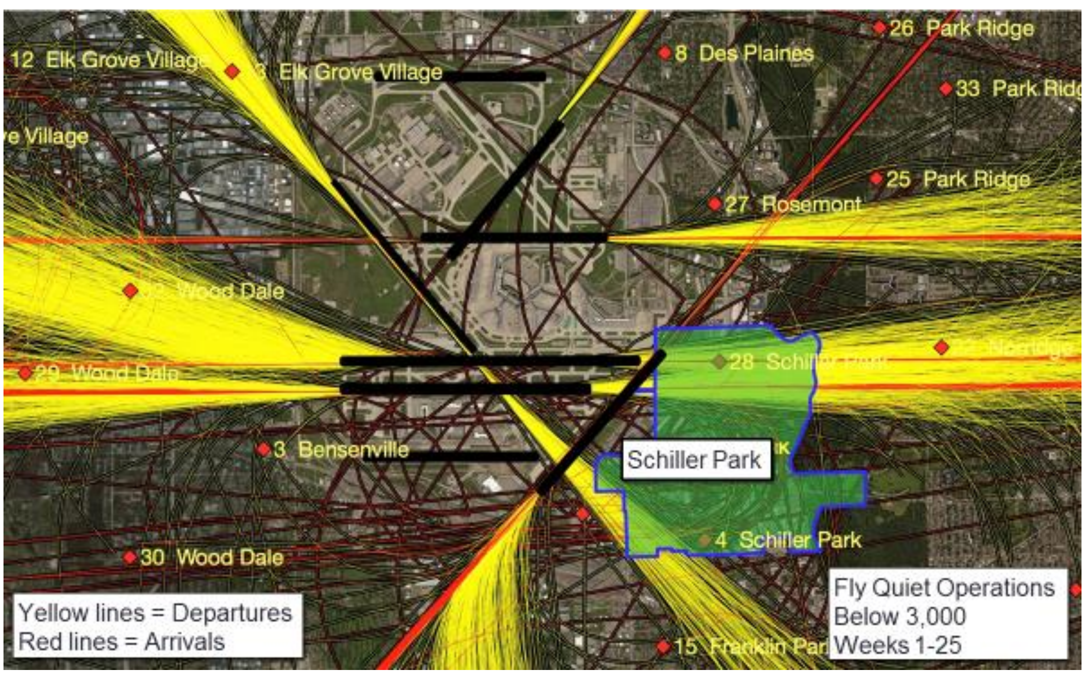


Figure 23: Overflights < 3,000 ' AGL FQII Schiller Park

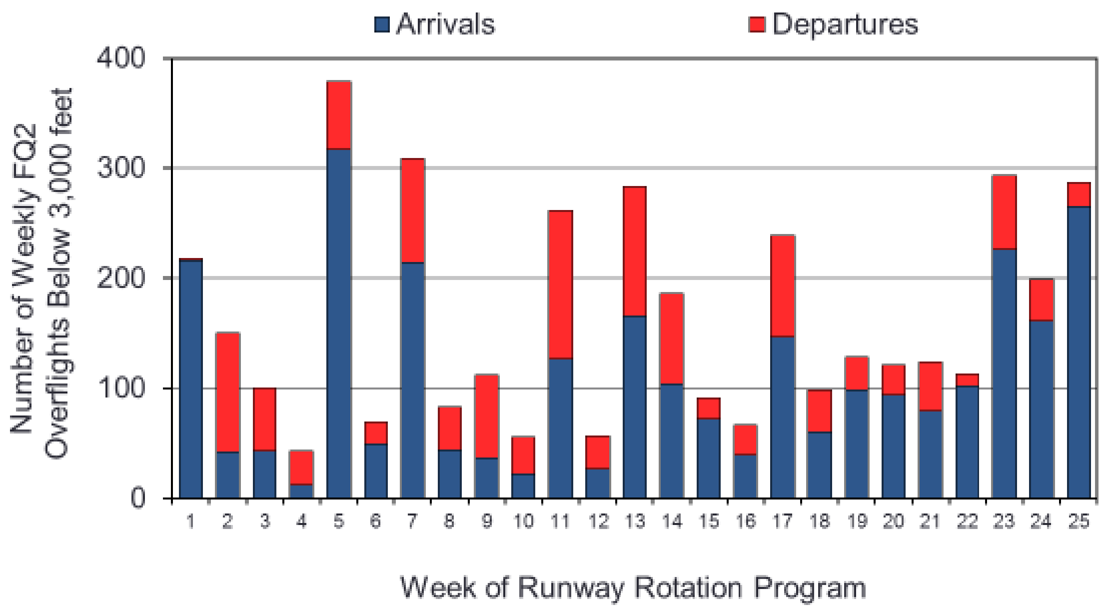


Figure 24: Weeks 1-25 FQ II Shiller Park Arrival and Departure Overflights < 3,000' AGL

Figure 25 illustrates noise events detected by noise monitor 28 in Shiller Park. The number of events recorded In week 25 exceed the number of overflights below 3'000' AGL shown in Figure 24 which would indicate that the noise monitor is picking up impacts from flights outside the boundaries of Schiller Park. Of 374 noise events detected in week 25, all 374 exceeded 65 dB and 200 exceeded 75 dB.

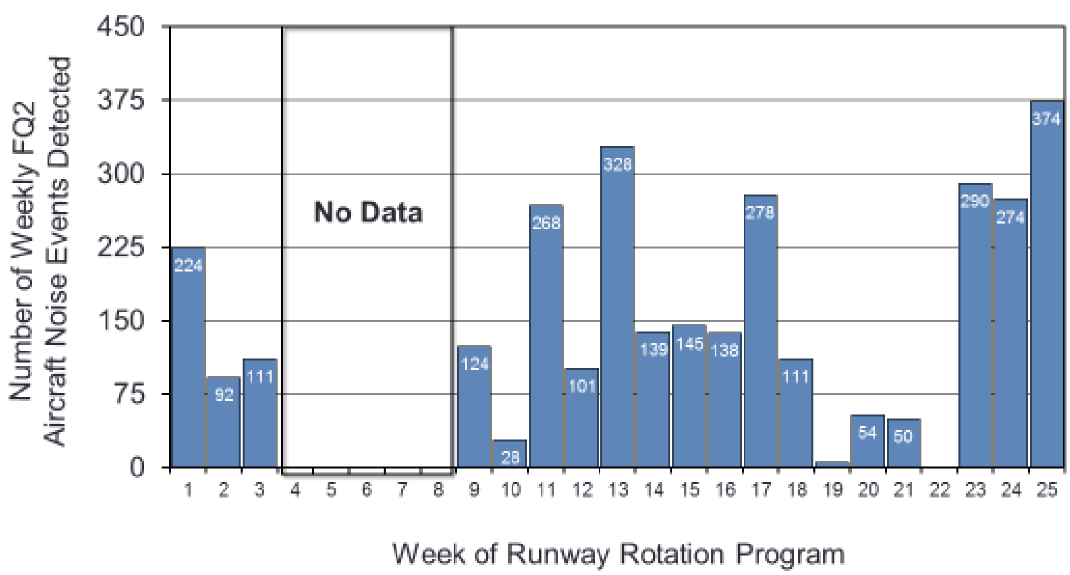


Figure 25: Number of Weekly Noise Events Noise Monitor 28 Schiller Park

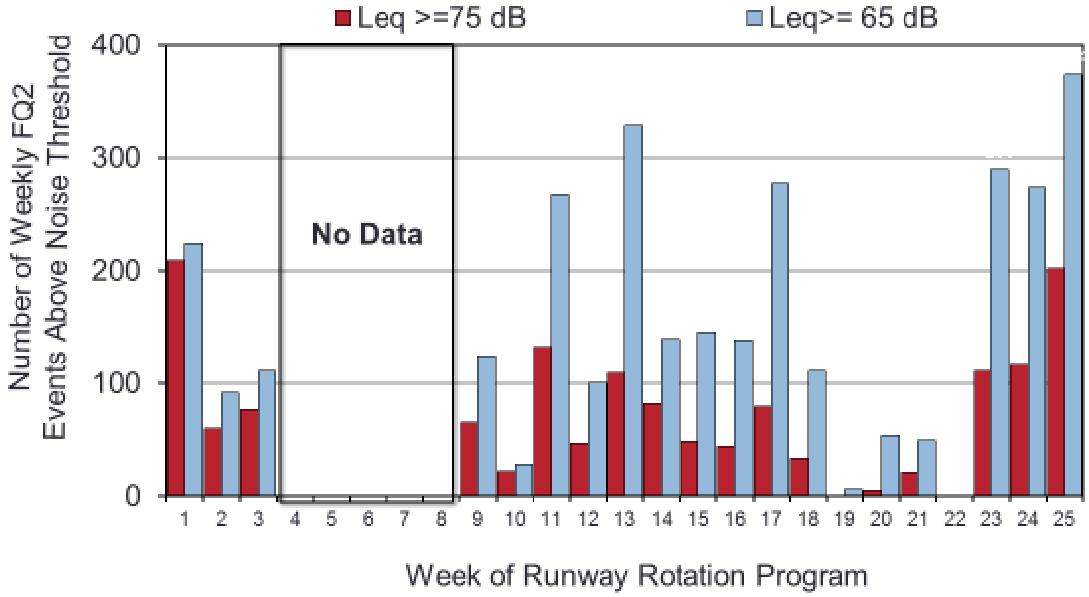


Figure 26: Weekly Noise Events > 65dB and >75dB Noise Monitor 28 Shiller Park

Elk Grove noise monitor 13 is directly aligned with runway 15/33. Weekly overflight events below 3,000 feet AGL for Elk Grove Village are shown in Figure 28.

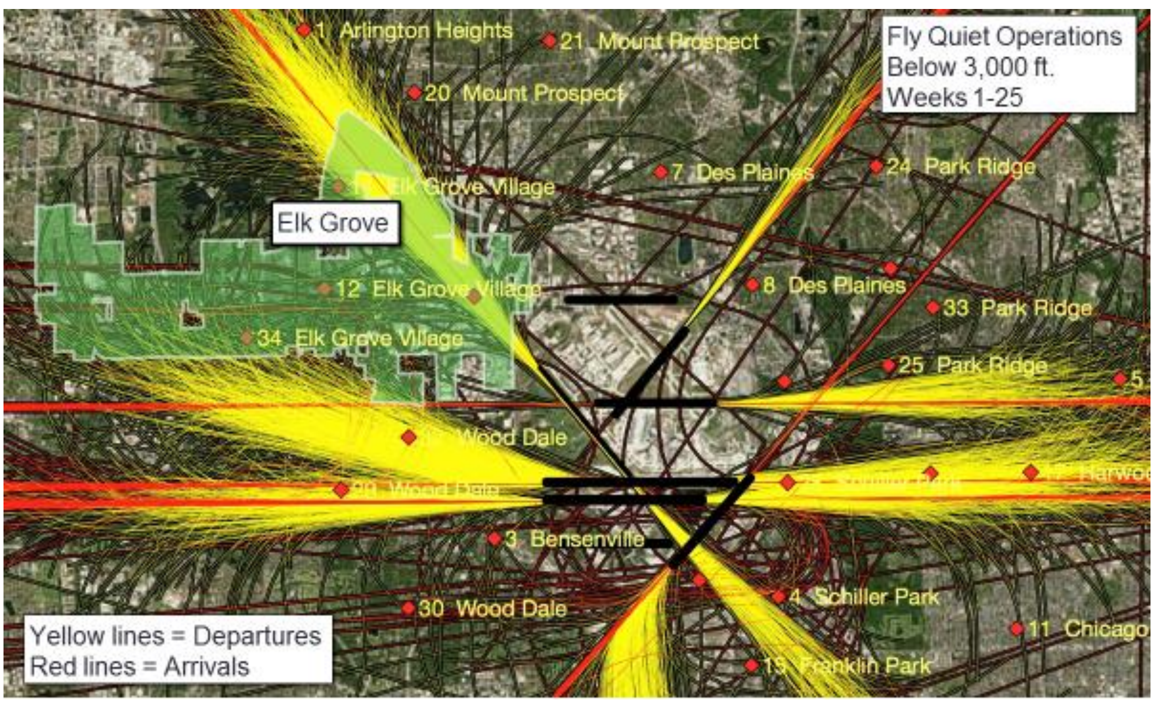


Figure 27: Noise Monitor 13 1600 Nicolaus Avenue Elk Grove Village

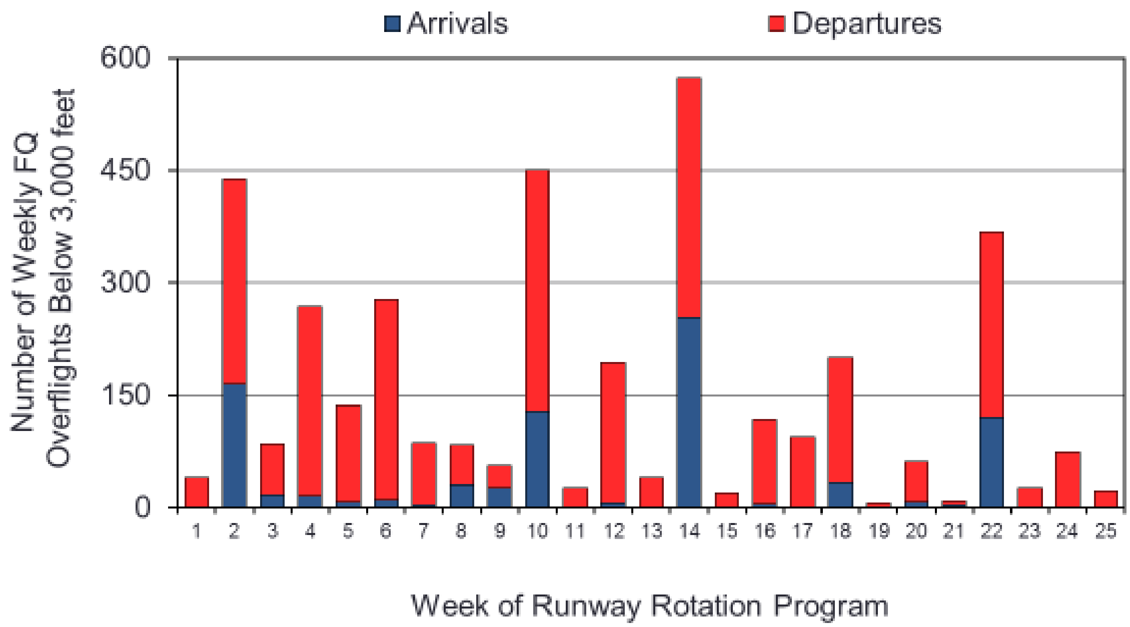


Figure 28: Weeks 1-25 Overflights Below 3,000 feet AGL Elk Grove Village

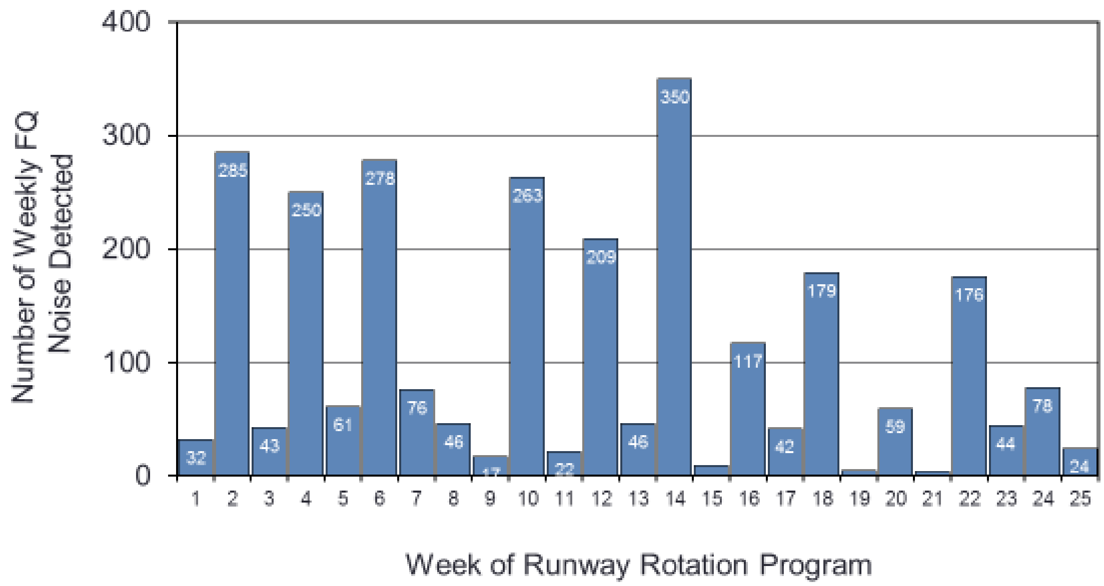


Figure 29: Number of Weekly FQ II Noise Events Noise Monitor 13 Elk Grove Village

The number of weekly aircraft noise events detected by noise monitor 13 in Elk Grove Village is shown in Figure 29. Correlation between weekly overflights and aircraft noise events is evident. However, several Elk Grove overflights are out of the range of noise monitor 13.

The number of noise events above 65 dB and 75 dB for noise monitor sensor 13 are shown in Figure 30. In week 14, all 350 aircraft noise events recorded exceeded 65 dB and 276 of the events exceeded 75 dB. The noise monitor 13 is located about one mile from and aligned with the extended centerline of runway 15/33. This monitor is affected by all departures on runway 33 and all arrivals on runway 15.

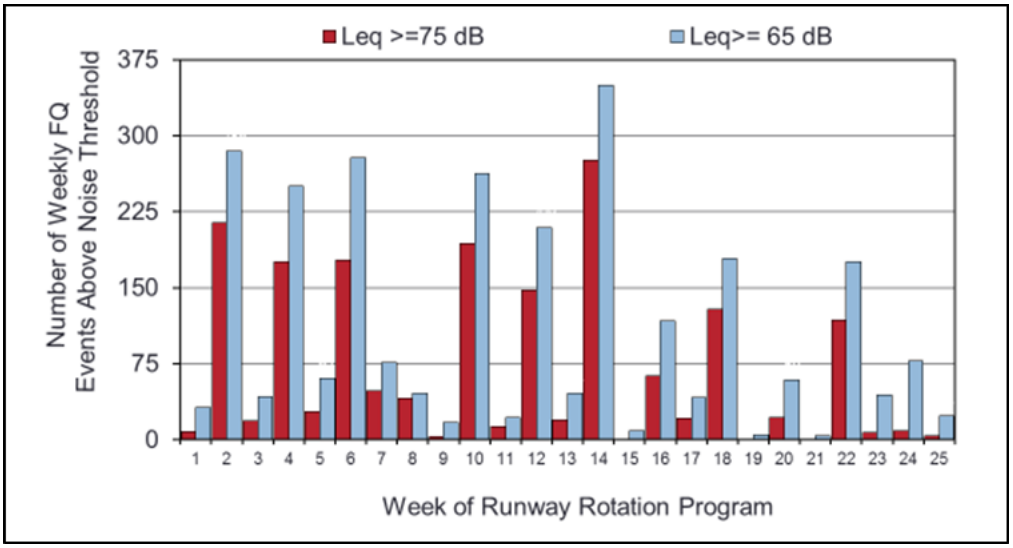


Figure 30: Weekly FQ II Noise Events Above 65 dB and 75 dB Noise Monitor 13 Elk Grove Village

Noise Monitor 13 is most impacted by runway 33 departures and runway 15 arrivals. The high number of Leq values exceeding 65 dB and 75 dB correlate with increased complaints in the 3rd Quarter of 2016 (the first 12 weeks of the rotation program). See Appendix 4 for additional noise monitor data located in or near SOC communities.

Figure 31 plots the cumulative density of Leq events for all four Elk Grove Village noise monitors. 64% of noise events at noise monitor 13 are above 75 dB Leq. See Appendix 5 for cumulative density plots of other SOC community noise monitors.

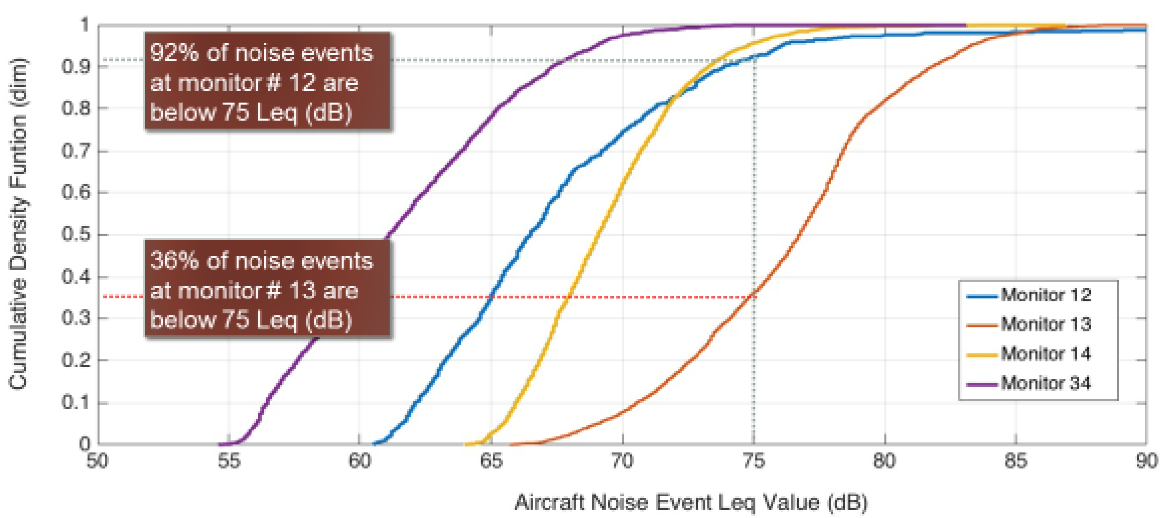


Figure 31: Cumulative Density of Noise Events by Leq Value (dB) Noise Monitors 12,13,14 and 34

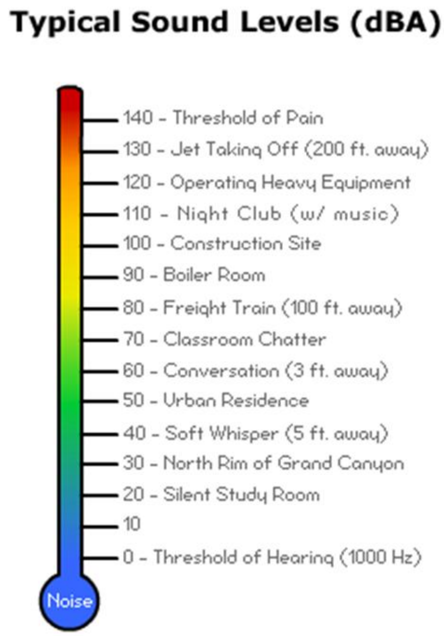


Figure 32: OSHA Technical Manual Decibel Scale

10. COMPLAINT DATA

CDA provided complaint data for the first twelve weeks of the rotation test program. No complaint data was received for the last 13 weeks of the rotation test. Total complaints are trending up 22% for 3rd quarter of 2016 which includes the first 12 weeks of the runway rotation test as compared to 3rd quarter of 2015. However, nighttime complaints decreased by 14% in the same period as shown in Table 7. Complaints peaked during shoulder hour periods of peak operations as illustrated in Figure 33.

Table 7: ORD Noise Complaint Data Third Quarters 2015 and 2016

ORD Complaints	All Hours		% Change	Nighttime		% Change
	2016	2015		2016	2015	
Sept	434,796	388,767	11.8%	66,106	81,396	-18.8%
Aug	503,447	420,716	19.7%	79,994	96,976	-17.5%
Jul	512,849	382,999	33.9%	84,534	92,111	-8.2%
3Q	**1,451,092**	**1,192,482**	**22%**	**230,634**	**270,483**	**-14.7%**

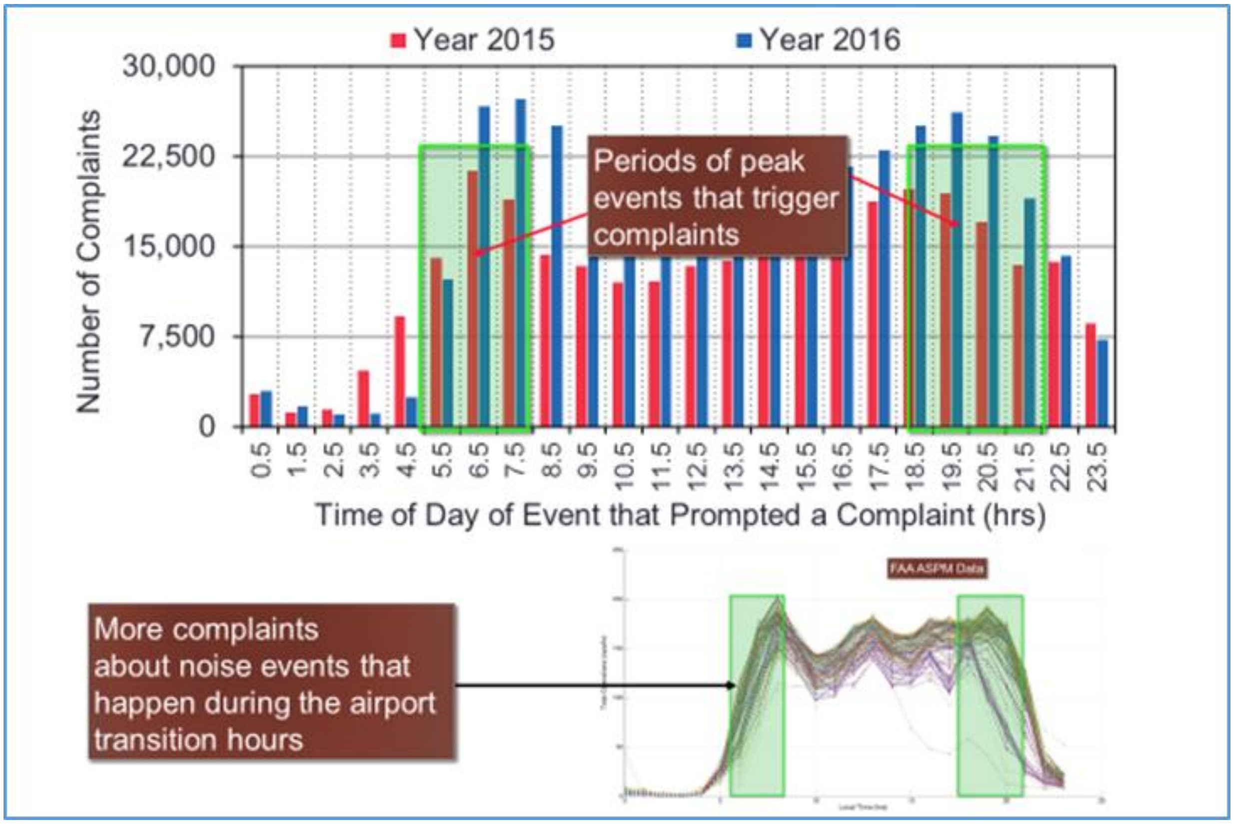


Figure 33: 2015 and 2016 Complaints by Time of Day

The trend for total nighttime complaints for all SOC communities decreased 25% in the 3Q 2016 as compared to 3Q 2015 as shown in Table 8. Elk Grove Village, Addison, Elmhurst and Wood Dale nighttime complaints increased. Possible causes for the increases include heavy shoulder hour activity and runway use increases.

Table 8: SOC Community Complaints Third Quarter 2015 and 2016

SOC Community	3Q 2015		3Q 2016	
	Night Time Complaints	Individual Complaintants	Night Time Complaints	Individual Complaintants
Addison	79	11	119	5
Bensenville	92,211	76	56,217	81
Elk Grove	11,110	5,149	14,184	8,171
Elmhurst	183	41	1,417	119
Hanover Park	3	2	9	2
Itasca	17,014	212	5,855	37
Roselle	553	15	436	250
Schiller Park	4,872	72	4,559	22
Wood Dale	19,364	10,669	26,369	624
All Communities	145,389	16,247	109,165	9,311

Complaint data from CDA's October and November ANMS reports was compiled in Table 9 and Table 10 for SOC communities and the total nighttime complaints for all SOC communities decreased by 50% in October and 41% in November.

Total ORD nighttime complaints decreased 29% in October and 31% in November. Total ORD complaints for all hours increased .6 % in October and decreased 9% in November.

Table 9: CDA ANMS October 2015 and 2016 Nighttime Complaint Data

SOC Community	Oct-15		Oct-16	
	Night Time Complaints	Individual Complaintants	Night Time Complaints	Individual Complaintants
Addison	10	1	18	3
Bensenville	29,729	59	10,109	3,648
Elk Grove	4,042	2,208	3428	1485
Elmhurst	164	9	479	34
Hanover Park	4	1	2	1
Itasca	9,237	65	2,292	13
Roselle	251	6	419	8
Schiller Park	1,494	19	701	10
Wood Dale	6,250	3,227	8,208	61
All Communities	51,181	5,595	25,656	5,263

Table 10: CDA ANMS November 2015 and 2016 Nighttime Complaint Data

SOC Community	Nov-15		Nov-16	
	Night Time Complaints	Individual Complaintants	Night Time Complaints	Individual Complaintants
Addison	9	1	10	3
Bensenville	21,447	31	6,419	2,586
Elk Grove	2,421	838	3,042	1,335
Elmhurst	76	3	227	16
Hanover Park	1	1	0	0
Itasca	1,489	15	595	7
Roselle	93	3	96	5
Schiller Park	1,364	17	341	13
Wood Dale	3,044	1,023	6,806	269
All Communities	29,944	1,932	17,536	4,234

Wood Dale nighttime complaints are up consistently across the 3rd Quarter, October and November of 2016. High use of Runways 28R and 28C likely contributed to Wood Dale complaint increases. Elk Grove Village complaints were up in the 3rd Quarter of 2016 which also was concurrent with high use of runway 33. Elk Grove Village is also impacted by runway 28R departures as discussed further in Section12 of this report.

11. RRP PHASE II TEST CONFIGURATION RECOMMENDATIONS

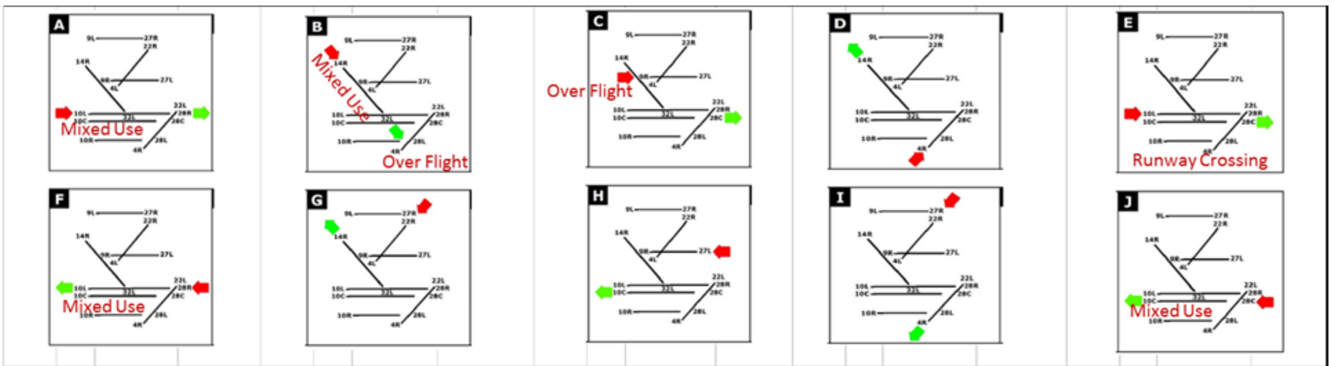


Figure 34: Runway Rotation Program Configurations A-J

Runway configurations shown in Figure 34 were utilized in the 25-week runway rotation program test. Table 11 lists runway utilization by runway rotation program primary and secondary configuration.

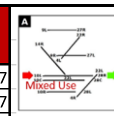
Percent use of primary and secondary configuration runways was lowest for configurations A and F (because of construction substitutions) and highest for configurations C and H. Percent use of A and F primary and secondary configuration runways without the weeks of construction substitutions increases to 76%. Configurations utilizing the shorter runways had similar percent compliance of use of primary and secondary runways. B and G had 64% compliance and D and I had 64% compliance. During those weeks, runway 10L/28R was the next most used runway.

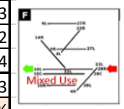
Configurations A-J as used in the 25-week schedule of the rotation program test resulted in over use of some runways and imbalance in noise impacts as demonstrated in Section 9. Runways 33 and 22R are utilized in 12 of the 25 weeks. Runway 4L is not used at all and 27L and 9R are used only 4 of the 25 weeks.

Table 12 compiles the frequency of runway use resulting from configurations A-J as used in the 25 week rotation schedule and the percentage use during FQ II that resulted for each runway.

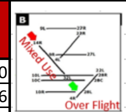
Table 11: Runway Utilization by RRP Primary and Secondary Configurations

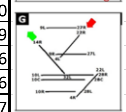
P/S Configuration	Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total	Percent P/S Runway Use
F/A	6-Jul	1		10		2		44	4	360	26			1	447	48.0%
A/F	14-Aug	7	30	226	3	1		6	3	295	72			1	637	
F/A	25-Sep	13	255	44		21		20	287	2	37			7	673	
A/F	6-Nov	19	74			4		240	316		2			16	652	
F/A	18-Dec	25	17	61		4		122	88	588	2			12	894	
Total			376	341	3	32	0	432	698	1245	139	0	0	37	3303	
Percent Use			11.4%	10.3%	0.1%	1.0%	0.0%	13.1%	21.1%	37.7%	4.2%	0.0%	0.0%	1.1%	100.0%	



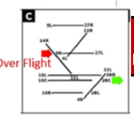


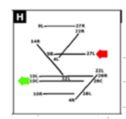
P/S Configuration	Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total	Percent P/S Runway Use
B/G	10-Jul	2	37	26	265		74	74	1	95	100			48	720	64.0%
G/B	7-Aug	6	24	102	12		266	6	4	74	262			16	766	
G/B	4-Sep	10	8	9	114	28	229	27	5	93	186			1	700	
B/G	2-Oct	14	13	9	351	21	16	9	58	80	64			68	689	
G/B	30-Oct	18	71	29	47	5	206	5	136	11	137			19	666	
G/B	27-Nov	22	4		50	61	192	47	112	81	129				676	
Total			157	175	839	115	983	168	316	434	878	0	0	152	4217	
Percent Use			3.7%	4.1%	19.9%	2.7%	23.3%	4.0%	7.5%	10.3%	20.8%	0.0%	0.0%	3.6%	100.0%	



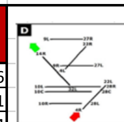


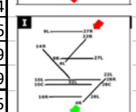
P/S Configuration	Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total	Percent P/S Runway Use
H/C	17-Jul	3	34	58				234	122	87	34			103	672	86.8%
C/H	28-Aug	9	180	12		1		68	61	52	4			132	510	
H/C	9-Oct	15	57			6		250	309	5				18	645	
C/H	20-Nov	21	143	16		4		177	205	42	1			32	620	
Total			414	86	0	11	0	729	697	186	39	0	0	285	2447	
Percent Use			16.9%	3.5%	0.0%	0.4%	0.0%	29.8%	28.5%	7.6%	1.6%	0.0%	0.0%	11.6%	100.0%	



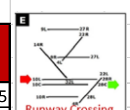


P/S Configuration	Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total	Percent P/S Runway Use
D/I	24-Jul	4	57	56	25	29	27	18	3	39	239		225	8	726	63.0%
I/D	21-Aug	8	18	35	32	231	263	15	13	41	17	19	27		711	
D/I	18-Sep	12	89	12	7	44	50	16	19	15	181	25	216		674	
D/I	16-Oct	16	56	49	5	91	112	27	29	46	106		121	14	656	
I/D	13-Nov	20	55		14	92	175	67	142	75	42			7	669	
D/I	11-Dec	24	14	79		112	148	15	99	149	77		6	40	739	
Total			289	231	83	599	775	158	305	365	662	44	595	69	4175	
Percent Use			6.9%	5.5%	2.0%	14.3%	18.6%	3.8%	7.3%	8.7%	15.9%	1.1%	14.3%	1.7%	100.0%	





P/S Configuration	Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total	Percent P/S Runway Use
J/E	31-Jul	5	72	70	18			3	459	38	52			3	715	74.9%
E/J	11-Sep	11	384	5		16			161	31	21			36	654	
J/E	23-Oct	17	281	1		24		54	245	22	35			28	690	
E/J	4-Dec	23	56	79		10		48	204	197	29			11	634	
Total			793	155	18	50	0	105	1069	288	137	0	0	78	2693	
Percent Use			29.4%	5.8%	0.7%	1.9%	0.0%	3.9%	39.7%	10.7%	5.1%	0.0%	0.0%	2.9%	100.0%	



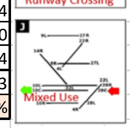


Table 12: 25 Week Rotation Schedule Phase I Configurations Runway Use Frequency

25 Week Rotation Schedule Phase I Runway Use Frequency and Percent Use							
ARRIVAL RUNWAY	Configuration Use RRP Test Phase I	Primary or Secondary Frequency Weeks 1-25	RRP Phase I % Use	DEPARTURE RUNWAY	Configuration Use RRP Test Phase I	Primary or Secondary Frequncy Weeks 1-25	RRP Phase I % Use
4R	1	4P/2S	6%	4L	0	0	1%
10L	2	2P/3S**	6%	28R	1	2P/1S	19%*
10C	0	1P/2S**	15%	28C	2	5P/5S	21%
15	1	2P/4S	7%	33	2	8P/4S	25%
22R	2	6P/6S	19%	22L	1	2P/4S	10%
28C	1	3P/2S**	17%	10C	2	4P/4S	9%
28R	1	2P/1S	12%	10L	1	2P/3S	5%
27L	1	2P/3S**	17%	9R	0	0	5%
9R	1	3P/2S**	2%	15	1	2P/4S	4%
	10	25P/25S			10	25P/25S	

* Departures on 28 R were only in the schedule 3 of the 25 weeks because of construction (623 Departures occurred in those weeks or 8.5% of total departures) 782 Departures or 10.5 % of total departures ocurred in the

** construction subtitutions

The configurations in Figure 35 are recommended for phase II of the rotation test to address operational deficiencies and improve runway use balance across all pavements.

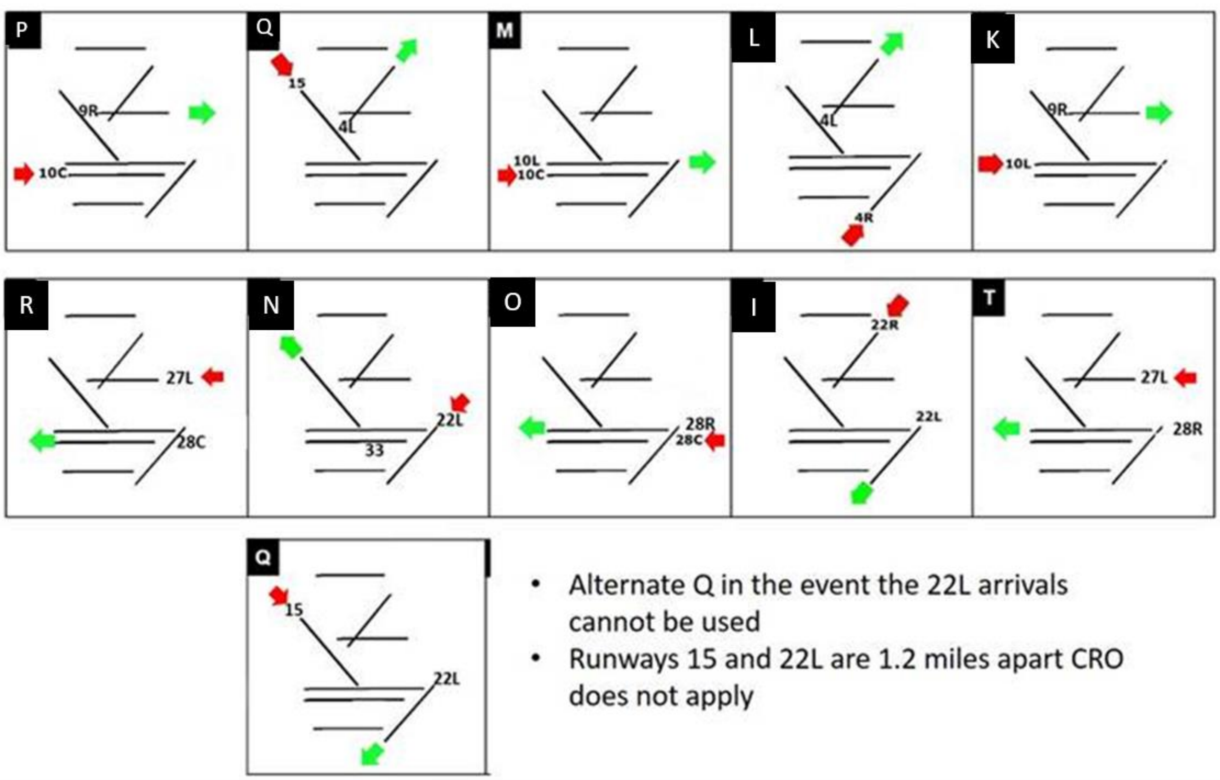


Figure 35: JDA Runway Rotation Test Phase II Configuration Recommendations

Configurations K-T remove all of the operational issues raised by the FAA including mixed operations, overflights, runway crossings and converging operations.

If applied to the same 25-week rotation schedule used in the rotation test program, the suggested JDA configurations K-T above balance frequency of use as follows:

- 7 of 8 departure runways are used a minimum of 2 and maximum of weeks as primary departure runways
- 7 of the 9 arrival runways are used a minimum of 2 and maximum of weeks as primary arrival runways
- 27L is used as primary arrival runway 5 weeks only because it repeats in the 25th week 3 pairs of parallel configurations and 2 pairs of diagonal configurations are maintained to achieve the desired east/west flow balance and diagonal and parallel runway use balance (if K-T are used in the same frequency in the 25 week rotation as A-J the first test – see Figure 36).
- 28R Arrivals and 10C Departures are not possible without inducing mixed operations or runway crossings

25 Week Rotation Schedule JDA Phase II Runway Use Frequency					
ARRIVAL RUNWAY	Configuration K-T Use JDA RRP Test Phase II	Frequency Weeks 1-25	DEPARTURE RUNWAY	Configuration K-T Use JDA RRP Test PH II	Frequency Weeks 1-25
4R	1	4P/2S	4L	2	6P/6S
10L	1	2P/2S	28R	2	4P/4S
10C	2	4P/5S	28C	1	3P/2S
15	1	2P/4S	33	1	4P/2S
22R	1	2P/4S	22L	1	2P/4S
22L	1	4P/2S	10C	0	0
28C	1	2P/2S	10L	1	2P/2S
28R	0	0	9R	2	4P/5S
27L	2	5P/4S			
	10	25P/25S		10	25P/25S

Figure 36: 25 Week Rotation Schedule JDA Phase II Configuration Runway Use Frequency

The elimination of the operational constraints of mixed use, overflights and runway crossings are expected to decrease use of 10C/28C and 10L/28R which were both utilized regularly throughout the 25-week schedule.

12. HEADING EVALUATIONS RUNWAYS 28R AND 28C

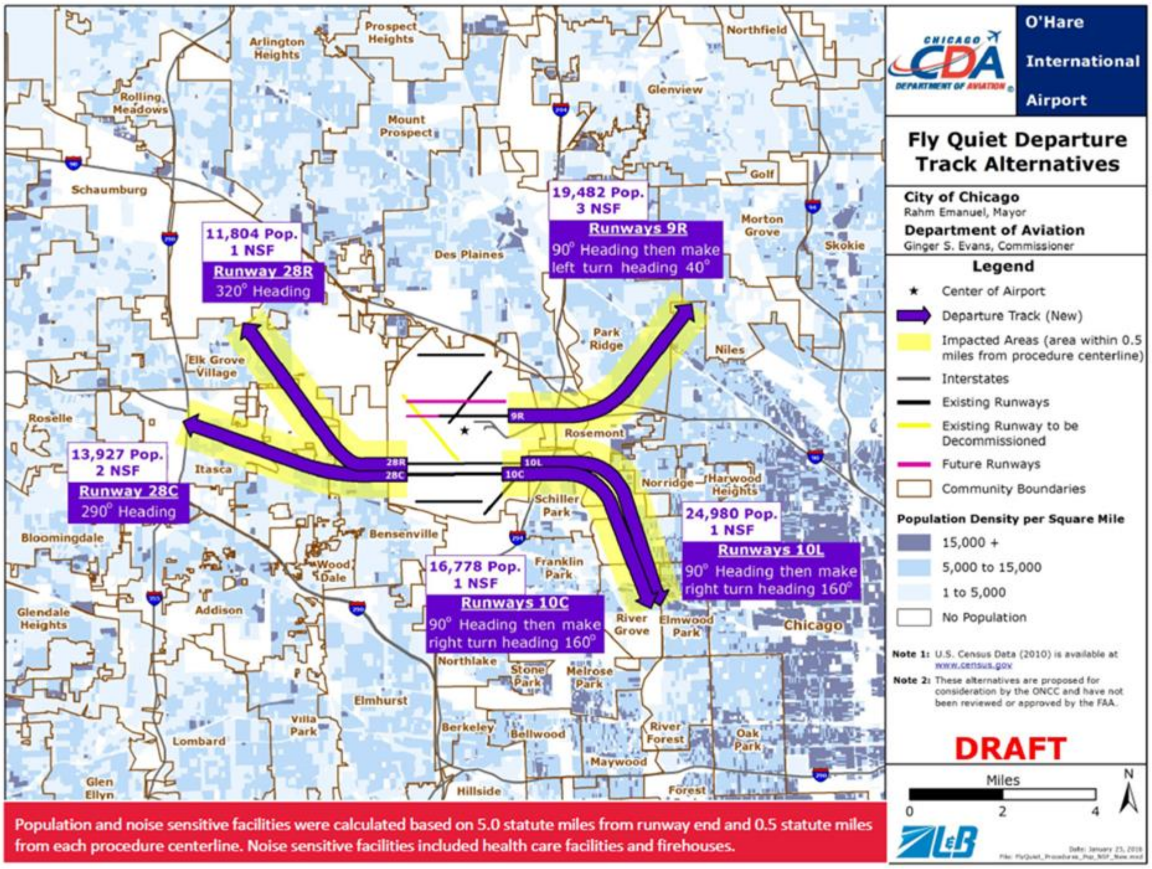


Figure 37: CDA Fly Quiet Departure Track Alternatives

A proposal to modify headings assigned to departures off several ORD runways to mitigate noise is currently tabled by ONCC but is expected to be revisited. Figure 37 depicts CDA's analysis as to population impacts by such proposed changes. Population impacts were calculated based 5 statute miles from runway end and 0.5 statute miles from each procedure centerline.

Because SOC communities to the West are most impacted by these proposed changes, a closer look at the actual flight paths and populations affected by various headings on Runways 28R and 28C is merited.

The evaluation focuses on populations affected by flights up to 3,000' AGL consistent with the overflight analysis in Section 7 of this report. To calculate impacted populations, observed flight track dispersion patterns from runways 28R and 28 C were used to create a polygon containing 99% of the flight tracks observed as illustrated in Figure 38.

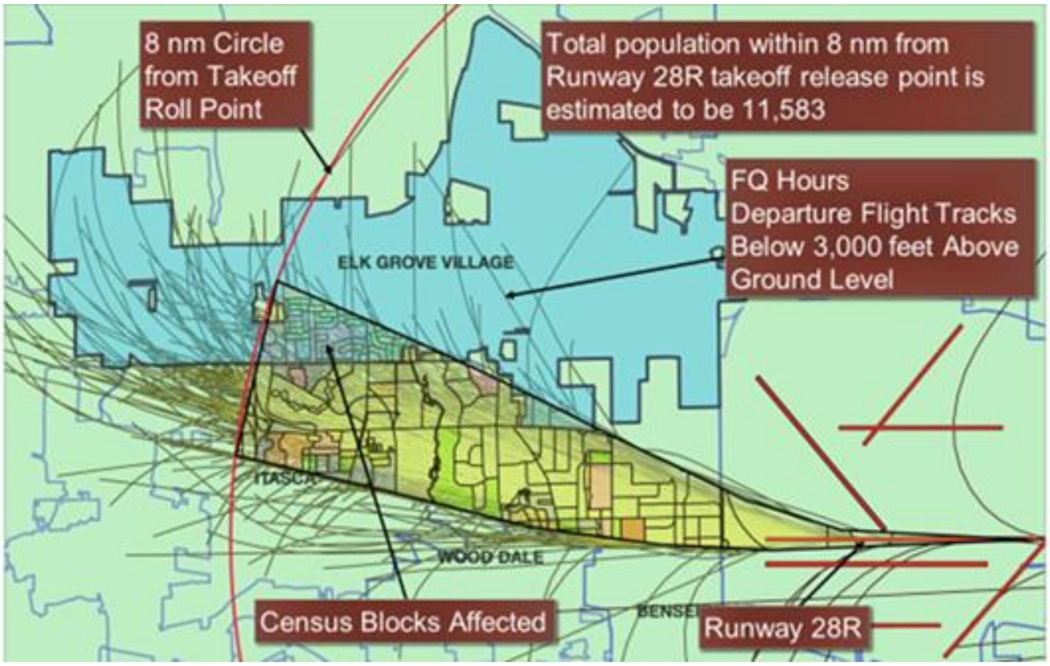


Figure 38: Runway 28R FQ Heading 290 Degrees

To determine the appropriate length of the polygon, altitude of typical aircraft was analyzed and found that most aircraft reach and altitude of 3,000' or above eight nautical miles from the starting point of the take-off roll (see Figure 39).

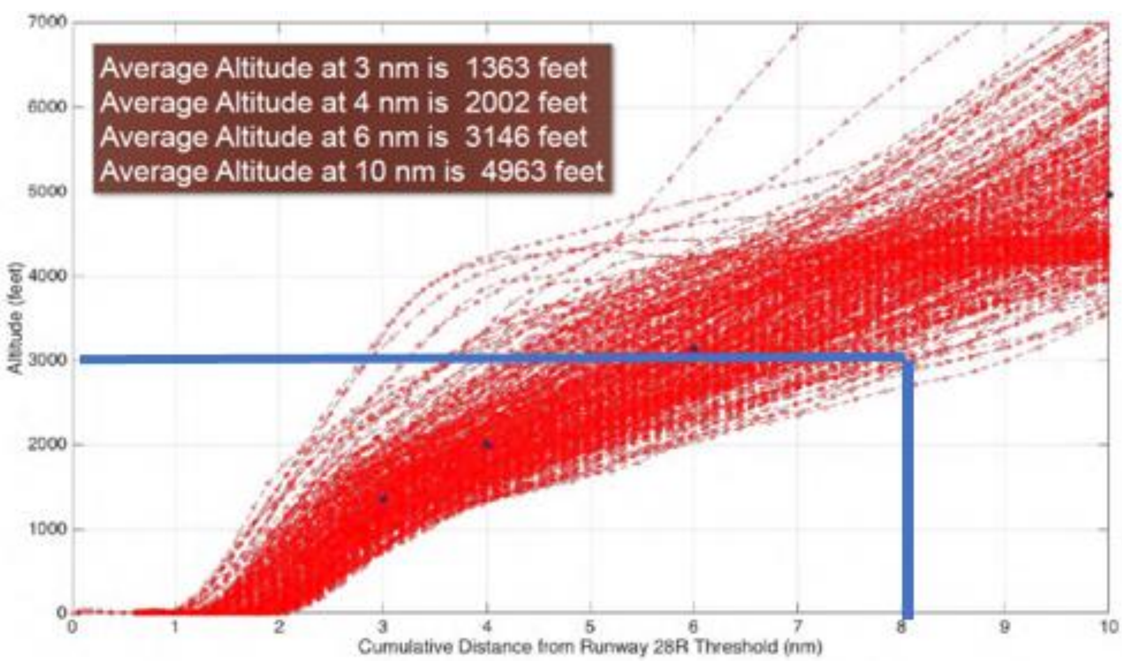


Figure 39: Vertical Profiles of Boeing 737-800 Runway 28R Departures

The polygons were then used to generate flight profiles of the new proposed headings off runways 28R and 28C and the census data population impacted by each polygon was counted.

a. Runway 28R Heading Population Impacts

Impacted population was counted for runway 28 R for 270 ° (Runway Heading) 290 ° and 320 ° based on the polygons illustrated in as shown in Figure 40.

The 290 ° heading population estimate of 11,583 impacted the fewest people. Estimated population impact by SOC community for the runway 28 R headings are shown in Figure 40.

Population Impacts by Runway 28R 8 nm from RWY TO Threshold			
Heading	**290**	**320**	**270 (RWY)**
EGV	4984	11815	0
Bensenville	1755	1755	2395
Wood Dale	1166	1314	7439
Itasca	3678	488	6065
Total	**11873**	**15692**	**15899**

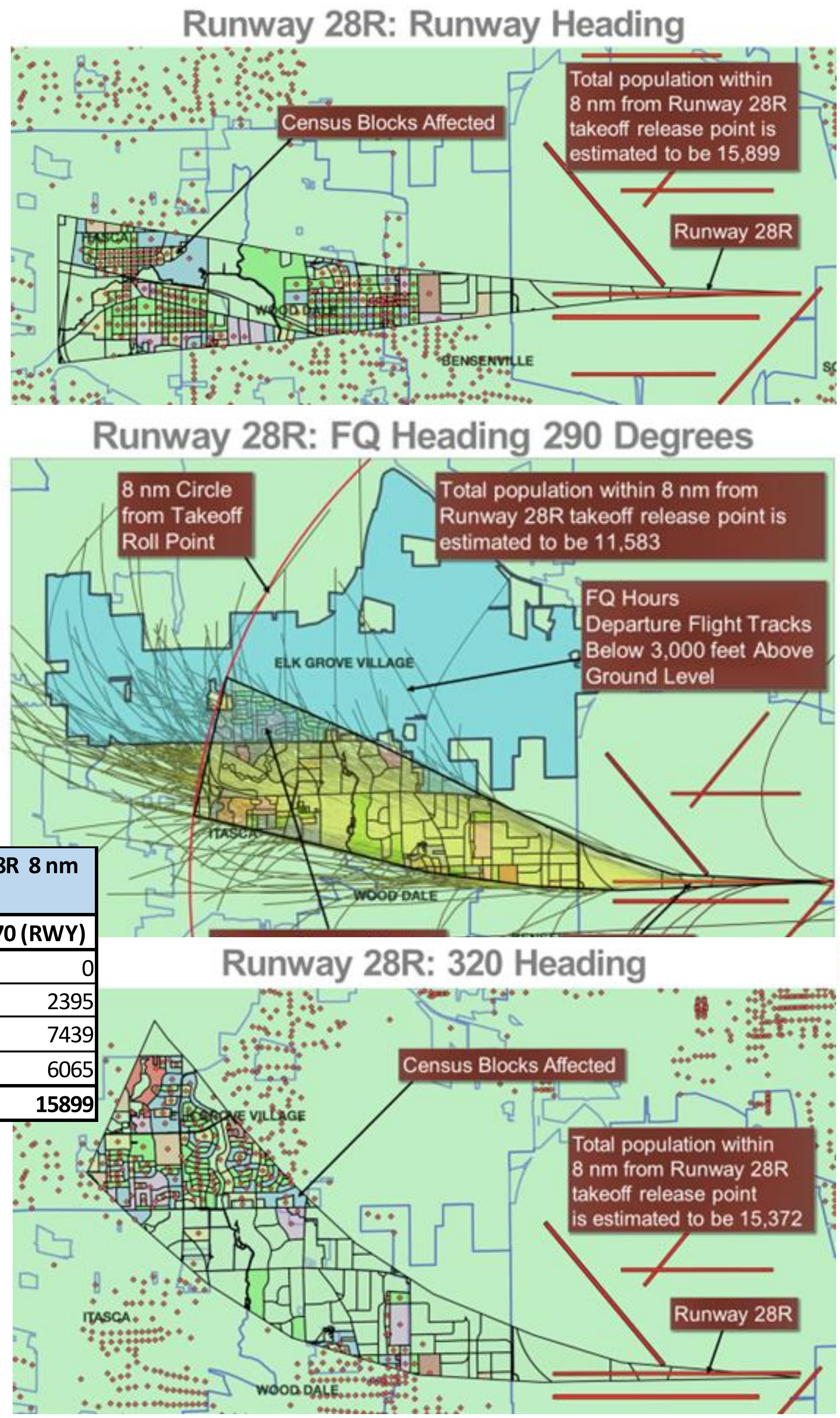


Figure 40: Communities Affected by Runway 28R Departures on Runway, 290° and 320° Headings

b. Runway 28C Heading Population Impacts

Population impacts were calculated for 28 C for 270 °(Runway Heading) 290 ° and 320 ° based on the polygons illustrated in Figure 41 .

The 290 ° heading population estimate of 12,680 impacted the fewest people. Estimated population impact by SOC community for the runway 28 C headings are shown in Figure 41.

Population Impacts by Runway 28C 8 nm from RWY TO Threshold			
Heading	**270 (RWY)**	**290**	**320**
Addison	91	0	0
Bensenville	3514	2982	1709
Wood Dale	8325	3088	2537
Itasca	4160	4507	2951
EGV	0	2103	6879
Total	**16090**	**12680**	**14076**

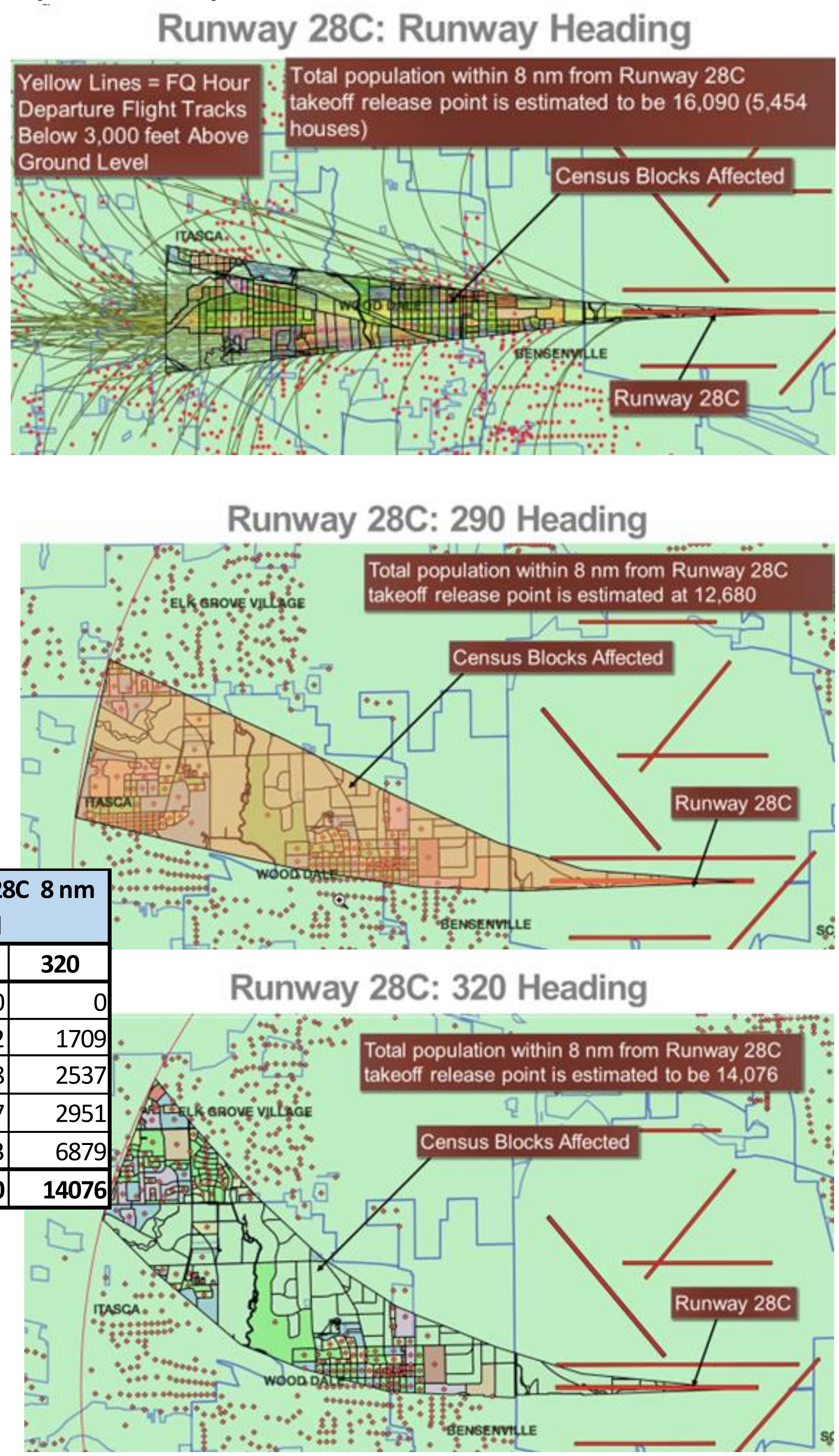


Figure 41: Communities Affected by Runway 28C Departures on Runway, 290° and 320° Headings

Because Elk Grove Village is impacted significantly by the 290° and 320 ° headings off runways 28R and 28C, it is appropriate to also consider the population impacts off runway 33 and combined impacts by SOC community based on frequency of runway use.

c. Runway 33 Heading Population Impacts

Runway 33 Runway heading polygon and population impacts are shown in Figure 42.

Population Impacts by Runway 32L 8 nm from	
Heading	**RWY**
EGV	2462
Arlington Hts	3369
Mt Prospect	1811
Total	**7642**

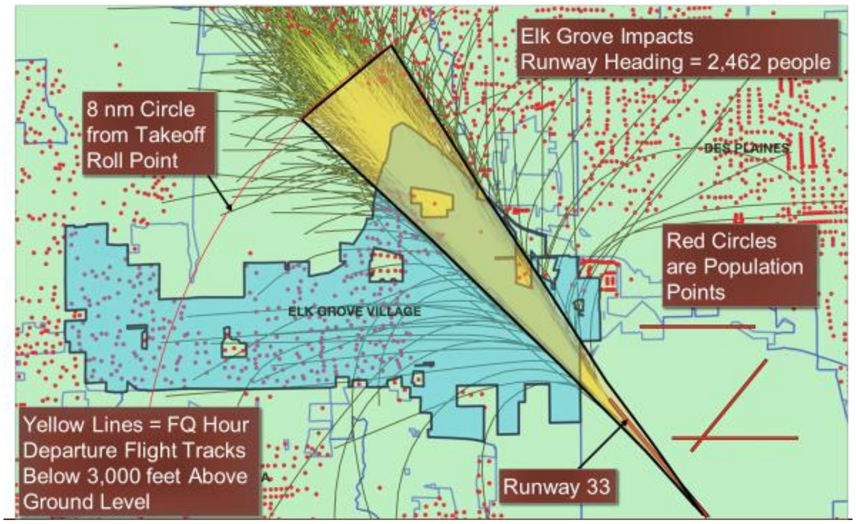


Figure 42: Communities Affected by Runway 33 on Runway Heading

A summary of heading population impacts runway is shown in Figure 43. Current headings used are highlighted in yellow.

Population Impacts by Runway 28R 8 nm from RWY TO Threshold			
Heading	**290**	**320**	**270 (RWY)**
EGV	4984	11815	0
Bensenville	1755	1755	2395
Wood Dale	1166	1314	7439
Itasca	3678	488	6065
Total	**11873**	**15692**	**15899**

Population Impacts by Runway 28C 8 nm from RWY TO Threshold			
Heading	**270 (RWY)**	**290**	**320**
Addison	91	0	0
Bensenville	3514	2982	1709
Wood Dale	8325	3088	2537
Itasca	4160	4507	2951
EGV	0	2103	6879
Total	**16090**	**12680**	**14076**

Population Impacts by Runway 33 8 nm from RWY TO Threshold	
Heading	**320**
EGV	2462
Arlington Hts	3369
Mt Prospect	1811
Total	**7642**

Figure 43: Summary of Runways 28C, 28R and 33 Heading Population Impacts

The 290 ° heading on 28C and 28R produce the lowest population impacts. However, the 290 ° heading on 28C introduces impact to Elk Grove. If the 290 ° heading is pursued the combined frequency of impact to Elk Grove Village should be reduced through configuration use in the 25-week schedule.

Current runway heading impacts (290° on 28R and Runway Heading on 28C) are shown in Figure 44. Different populations are impacted by departures on 28R and 28C for all communities including Bensenville. Use of both runways should be employed to provide periods of relief to impacted residents.

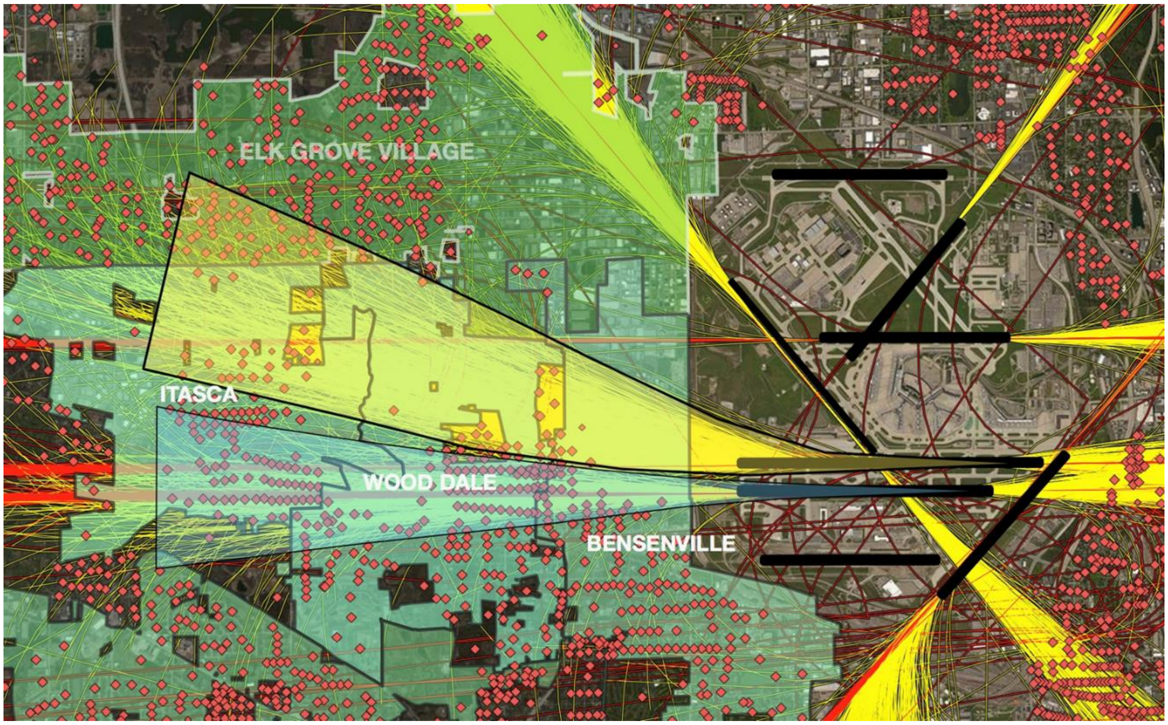
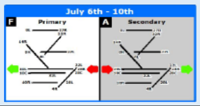
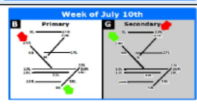
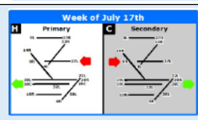
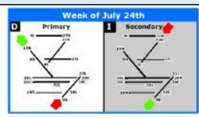
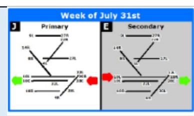
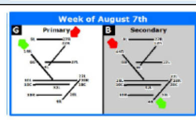
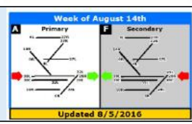
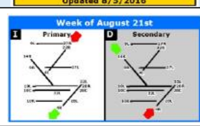
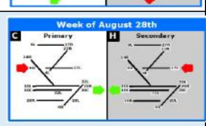
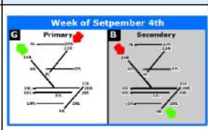
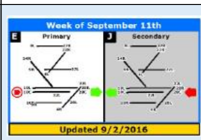
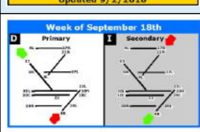
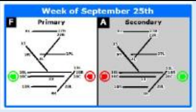
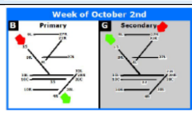
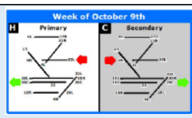
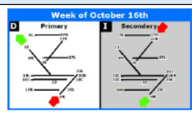
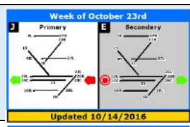
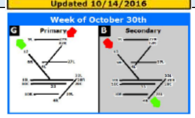
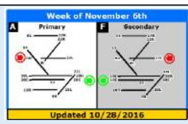
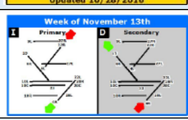
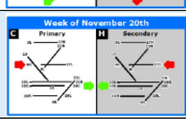
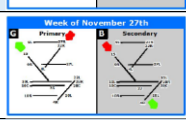
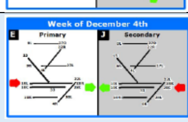
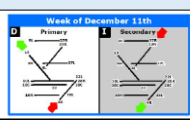


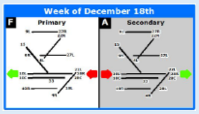
Figure 44: Impact Polygon for the 290° Heading Runway 28R and Runway Heading on Runway 28C

13. APPENDICES

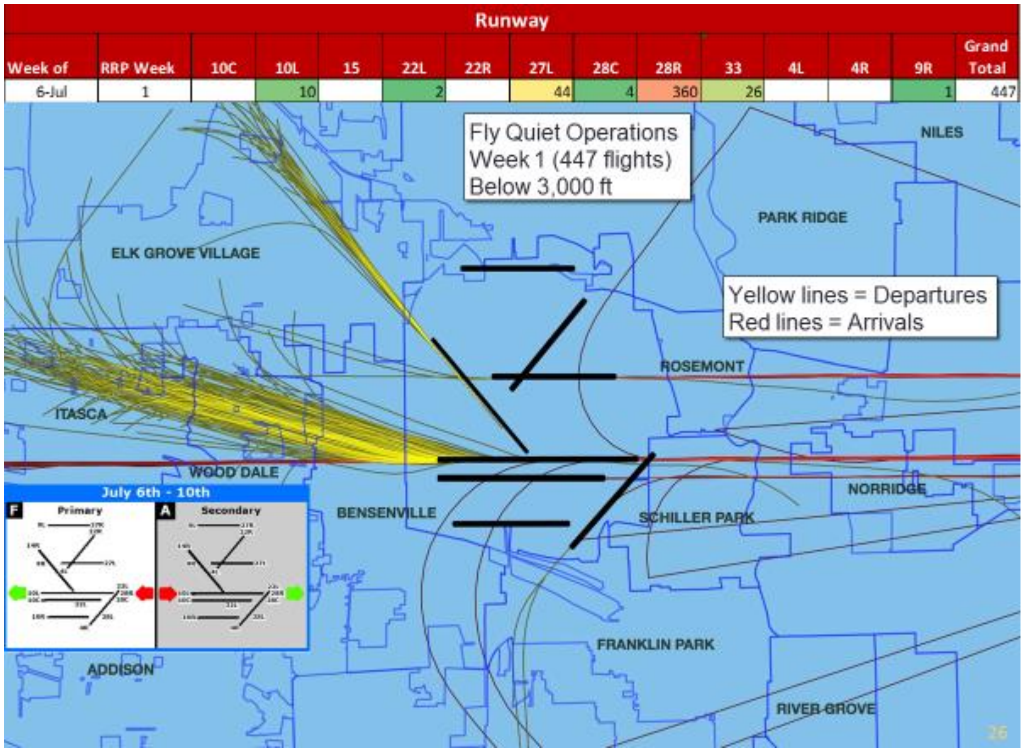
Appendix 1: CDA FQ Reporting Summary

RRP Test Week	Week of	FQ RRP Test Configuration	% of Nightime (10PM to 7AM) hours in FQ	FQ II Operations	% Operations w/in FQ Time			Alt RW Requests Granted	CDA Comments RRP Test Delays or Other RWY Use	Duration		Gap
					Primary	Secondary	Total P/S			FQ	RRP	
1	6-Jul		77	110	82	1	83	0		6:58	4:39	2:19
2	10-Jul		74	103	37	24	61	10	7/10,11,12 FAA Flight tests RW Equip, 7/13 Weather ORD	6:42	4:32	2:10
3	17-Jul		65	95	49	12	61	13	7/18,19,20 FAA Flight Tests RW Equip, 7/17,21,23 Weather ORD	5:52	2:31	3:21
4	24-Jul		72	104	64	8	72	15	7/24,28,29 Weather ORD	6:26	4:42	1:44
5	31-Jul		76	103	65	14	79	3	8/4 Weather ORD	6:50	5:15	1:35
6	7-Aug		77	110	69	2	71	7	8/7 Strong Winds ORD 8/12 Weather US	6:54	4:28	2:26
7	14-Aug		71	91	35	46	82	0	8/14,18,19 Weather US	6:25	5:07	1:18
8	21-Aug		79%	101	67	7	74	19		7:06	5:47	1:19
9	28-Aug		74	76	27	22	48	7	9/1 WeatherUS, 8/30,31 Flight Checks	6:41	2:46	3:55
10	4-Sep		81	95	60	17	78	15	9/7 Weather US	7:15	6:00	1:15
11	11-Sep		82	94	58	25	83	1		7:20	6:28	0:52
12	18-Sep		81	96	59	13	72	10	9/21, 9/23 Weather ORD	7:18	5:06	2:12
Cumulative weeks 1-12			**75**	**97**	**55**	**17**	**72**	**8**	**11 Weather ORD 6 Weather US 8 Flight Check**	**6:48**	**4:46**	**2:02**

RRP Test Week	Week of	FQ RRP Test Configuration	% of Nightime (10PM - 7AM) hours in FQ	FQ II Operations	% Operations w/in FQ			Alt RW Requests Granted	CDA Comments RRP Test Delays or Other RWY Use	Duration		Gap
					Primary	Secondary	Total P/S			FQ	RRP	
13	25-Sep		79	97	42	38	80	0	Demand precluded mixed use/Safety Inspections	7:09	6:09	1:00
14	2-Oct		79	92	51	12	63	6	Demand precluded mixed use/ORD weather 10/7/Safety Inspections	7:07	4:24	2:43
15	9-Oct		81	93	75	3	78	3	Safety Inspections	7:17	4:51	2:26
16	16-Oct		79	94	34	29	64	17	Weather ORD 10/16/Safety Inspections	7:05	4:36	2:29
17	23-Oct		79	99	35	41	76	1	Demand precluded mixed use/aircraft incident 10/28/ Safety Inspections	7:06	6:26	0:40
18	30-Oct		77	95	52	7	59	14	Demand precluded mixed use/Weather ORD 11/2/Construction 11/4&5/Safety	6:53	3:03	3:50
19	6-Nov		82	95	5	69	74	0	Airfield Gr Ops/Safety Inspections	7:32	5:39	1:53
20	13-Nov		82	97	39	6	45	20	MDW Const Ops/Winds ORD 11/18&19/Airfield Gr Ops/Safety Inspections	7:21	3:11	3:10
21	20-Nov		81	89	6	49	55	9	11/21&22 Strong Winds ORD/Demand/Safety Inspections	7:19	3:30	3:49
22	27-Nov		81	97	47	7	55	16	11/27 Holiday Demand/11/28 Tstorms/12/2 Strong Winds ORD	7:16	3:56	3:20
23	4-Dec		80	91	13	33	46	5	RRP restricted RWY crossings/10C/28C rubber removal 12/4 Tstorms	7:11	2:27	4:44
24	11-Dec		78	99	12	37	49	18	12/11,12,16,17 Snow Removal	7:00	2:47	4:13
Cumulative weeks 1-24			**81**	**96**	**44**	**23**	**67**	**9**	**21 ORD Weather 9 Safety Insp 8 Flight Check 6 Weather US 4 Mixed Ops 4 Snow Removal 2 Const ORD 2 Arfld Grnd Ops 1 Aircraft Inc 1 Const MDW 1 RWY Crossing 1 Rubber Rem 1 Demand**	**7:00**	**4:28**	**2:32**

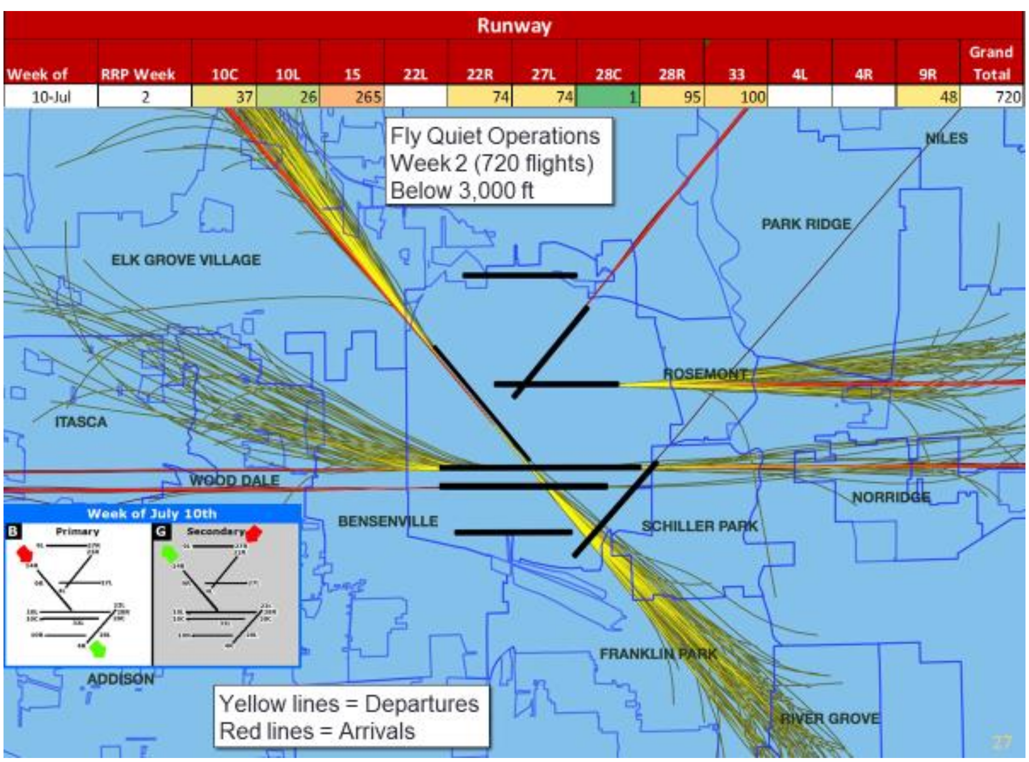
RRP Test Week	Week of	FQ RRP Test Configuration	% of Nightime (10PM - 7AM) hours in FQ	FQ II Operations	% Operations w/in FQ Time			Alt RW Requests Granted	CDA Comments RRP Test Delays or Other RWY Use	Duration		Gap
					Primary	Secondary	Total P/S			FQ	RRP	
25	17-Dec		83	130	64	7	71	0	Demand precluded mixed use 12/20 Navaid Maint 12/23 T Storms	7:26	5:31	1:55
Cumulative weeks 1-25			**81**	**97**	**45**	**22**	**67**	**8.5**	**22 ORD Weather 9 Safety Insp 8 Flight Check 6 Weather US 5 Mixed Ops 4 Snow Removal 2 Const ORD 2 Arfld Grnd Ops 1 Aircraft Inc 1 Const MDW 1 RWY Crossing 1 Rubber Rem 1 Demand 1 NavAid Maint**	**7:01**	**4:31**	**2:30**

Appendix 2: Flight Tracks and Runway Operations Weeks 1-25



		Runway												
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
6-Jul	1		10		2		44	4	360	26			1	447

Figure 45: Flight Tracks and Runway Operations Week 1



		Runway												
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
10-Jul	2	37	26	265		74	74	1	95	100			48	720

Figure 46: Flight Tracks and Runway Operations Week 2

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
17-Jul	3	34	58				234	122	87	34			103	672

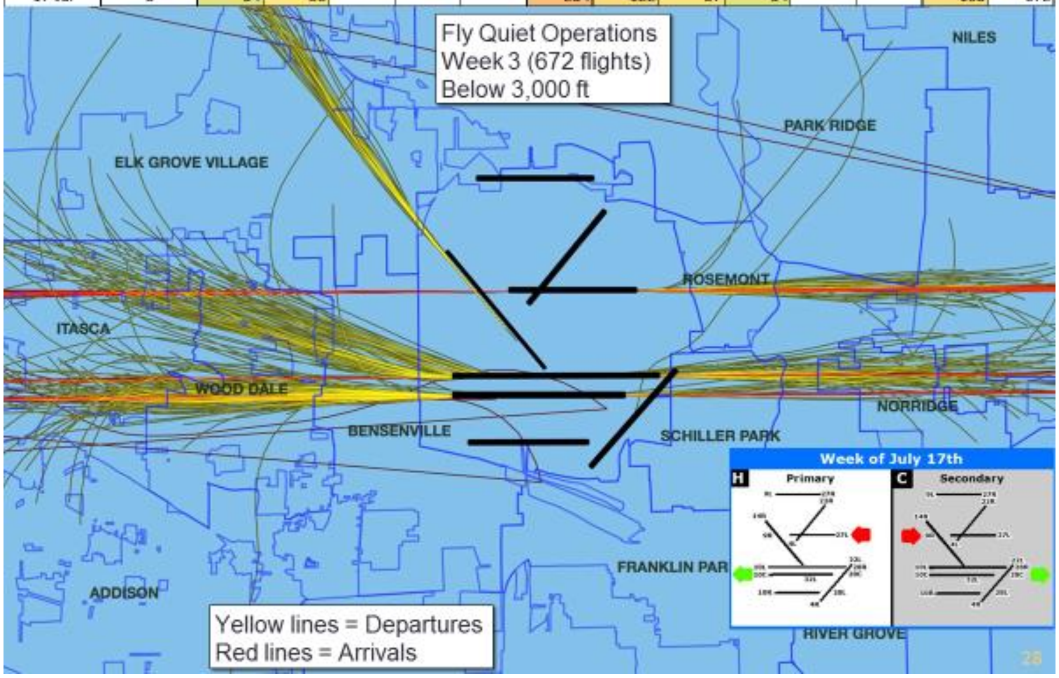


Figure 47: Flight Tracks and Runway Operations Week 3

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
24-Jul	4	57	56	25	29	27	18	3	39	239		225	8	726

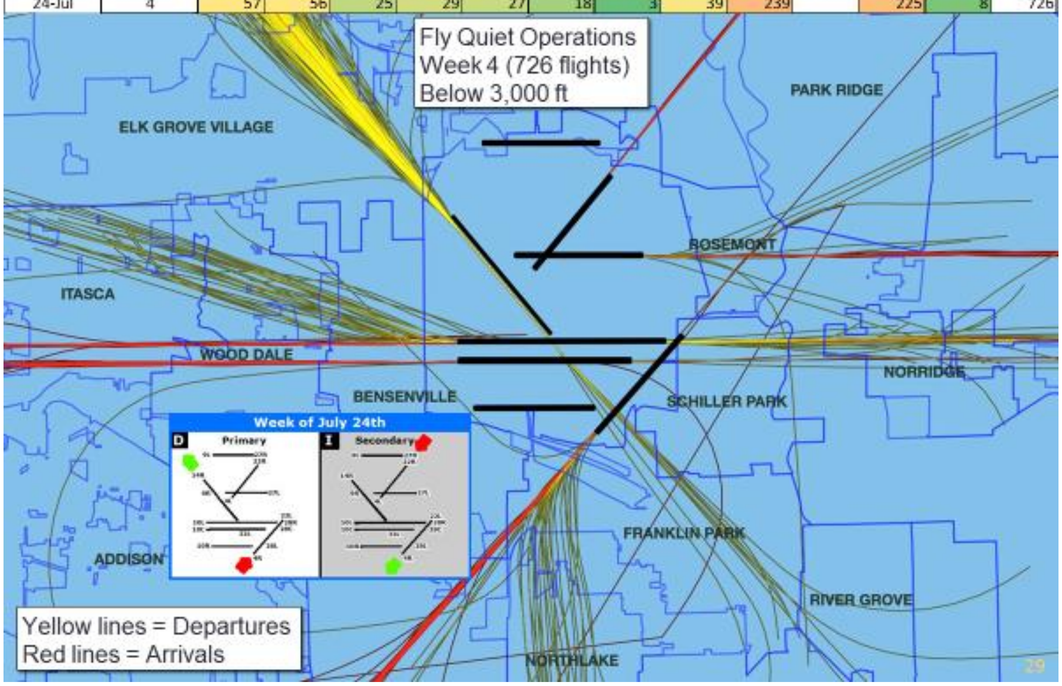


Figure 48: Flight Tracks and Runway Operations Week 4

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
31-Jul	5	72	70	18			3	459	38	52			3	715

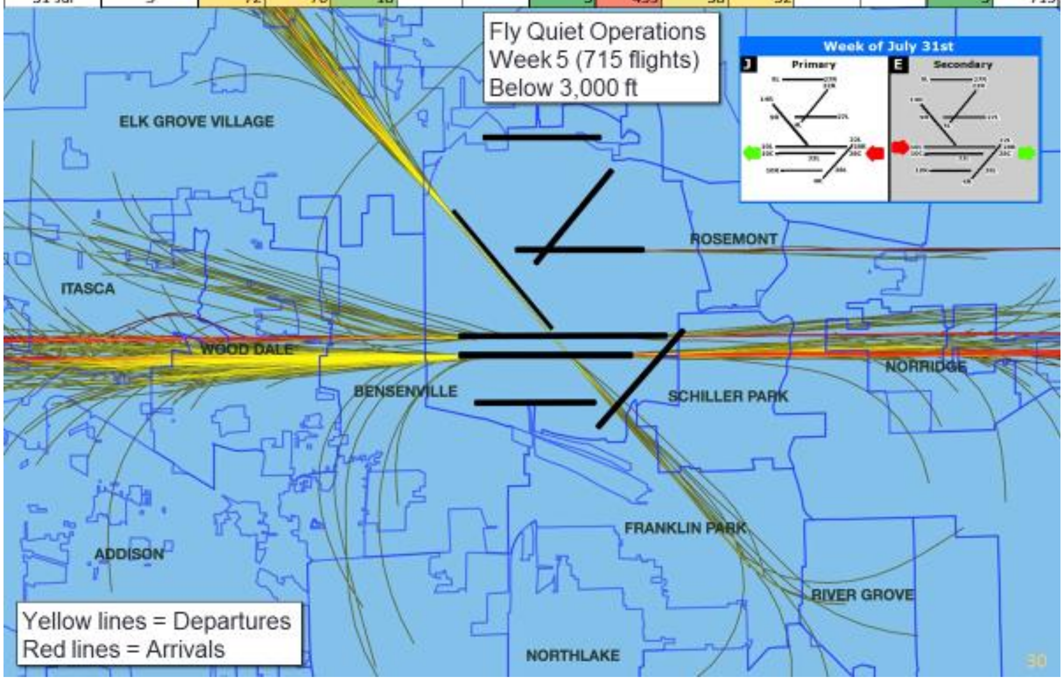


Figure 49: Flight Tracks and Runway Operations Week 5

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
7-Aug	6	24	102	12		266	6	4	74	262			16	766

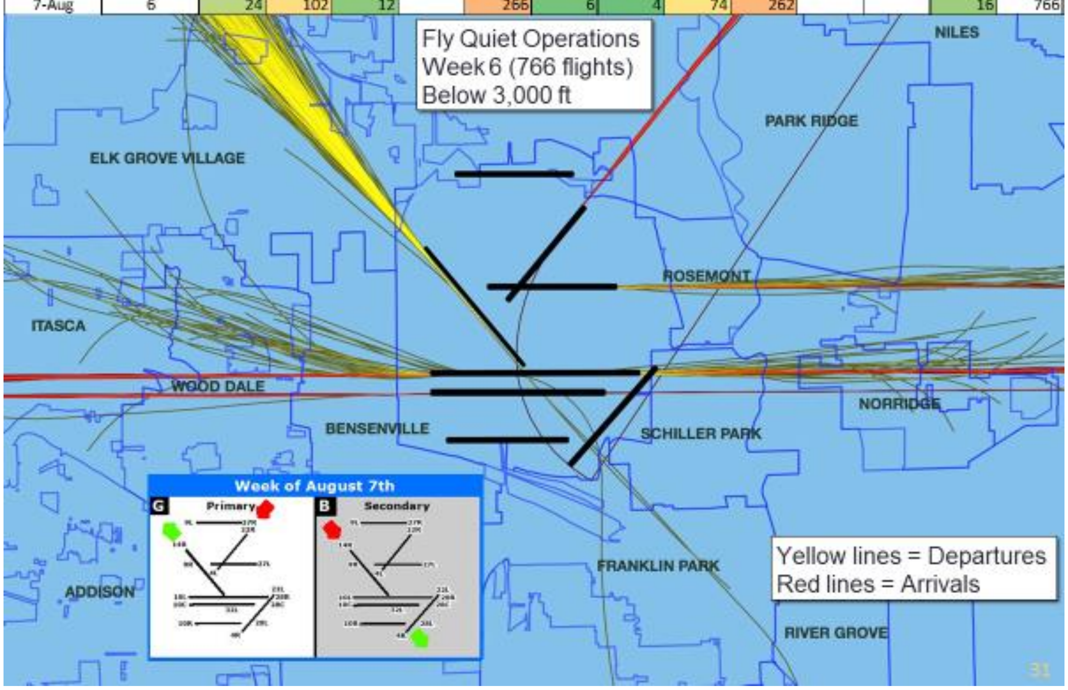
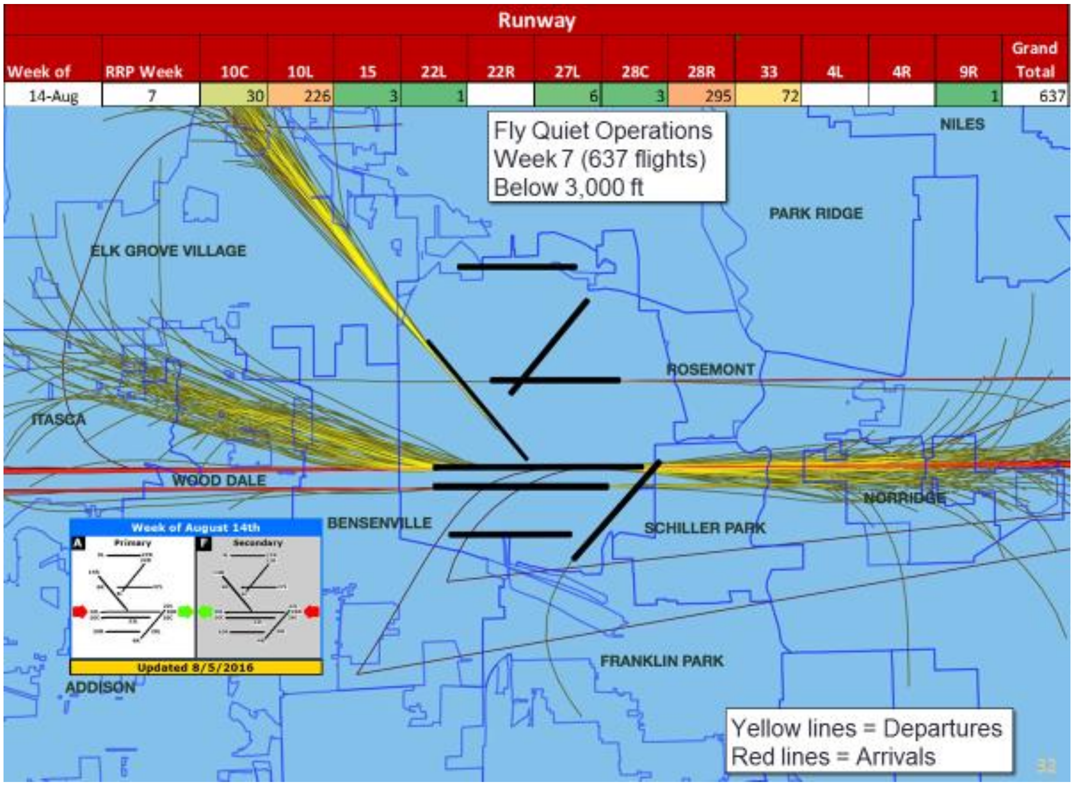
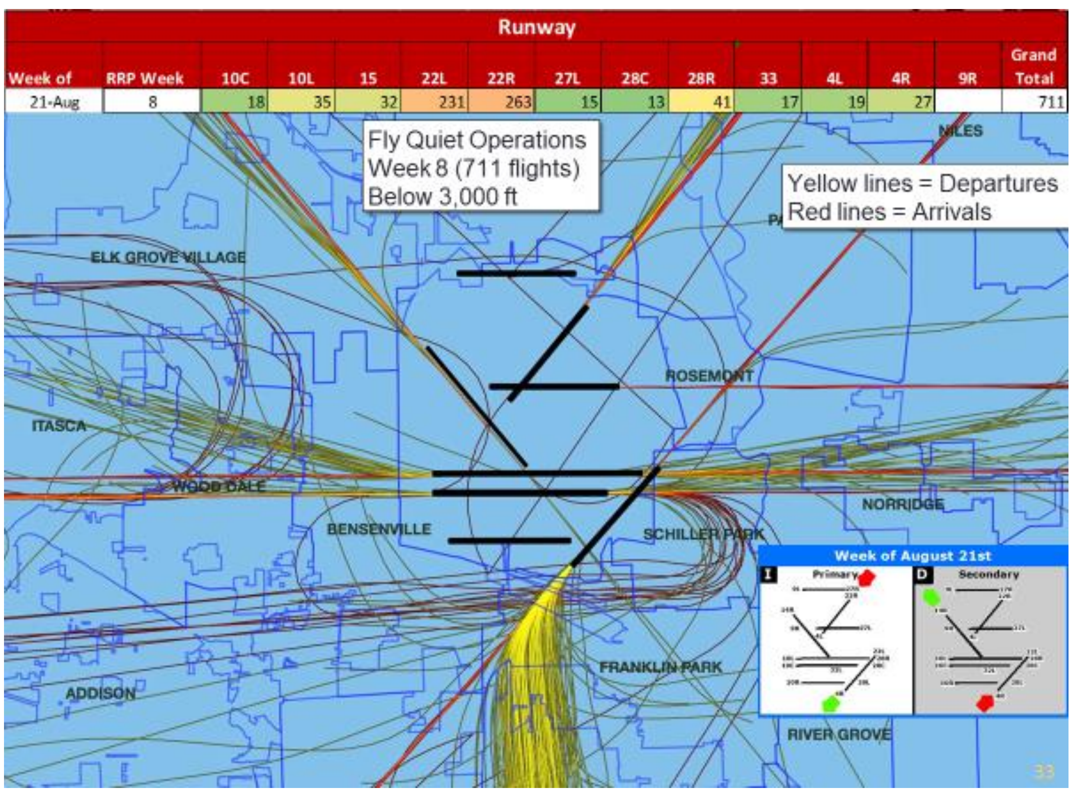


Figure 50: Flight Tracks and Runway Operations Week 6



Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
14-Aug	7	30	226	3	1		6	3	295	72			1	637

Figure 51: Flight Tracks and Runway Operations Week 7



Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
21-Aug	8	18	35	32	231	263	15	13	41	17	19	27		711

Figure 52: Flight Tracks and Runway Operations Week 8

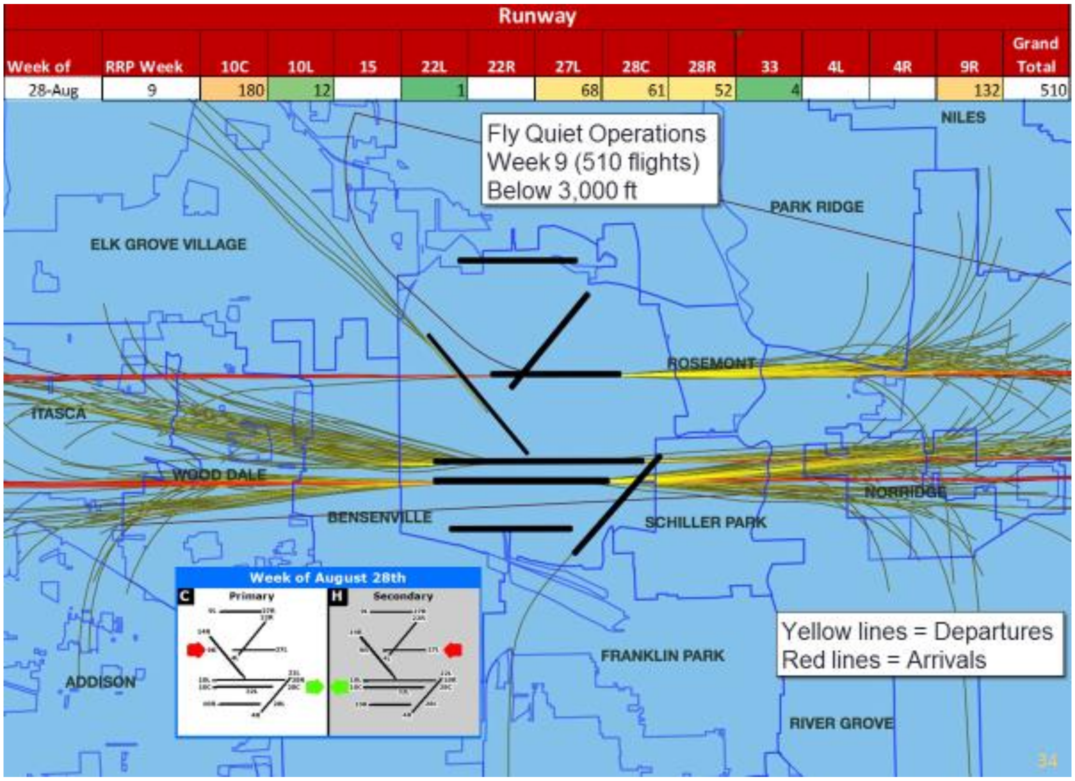


Figure 53: Flight Tracks and Runway Operations Week 9

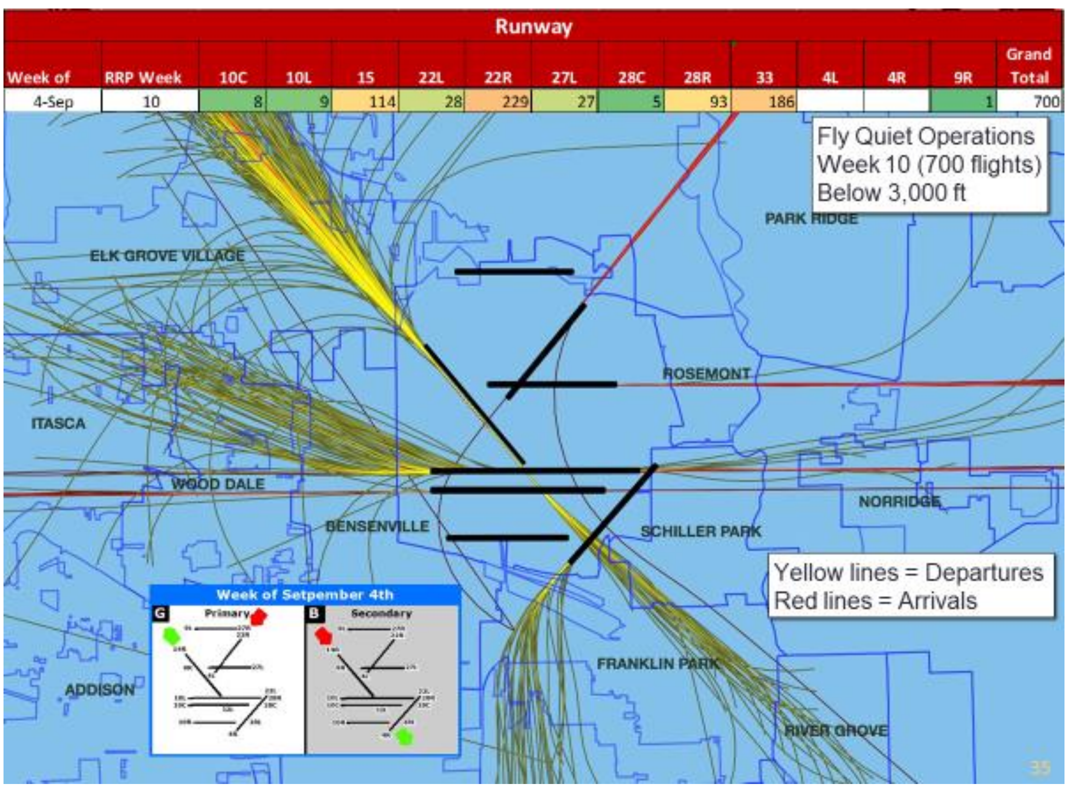


Figure 54: Flight Tracks and Runway Operations Week 10

Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
		Runway												
11-Sep	11	384	5		16			161	31	21			36	654

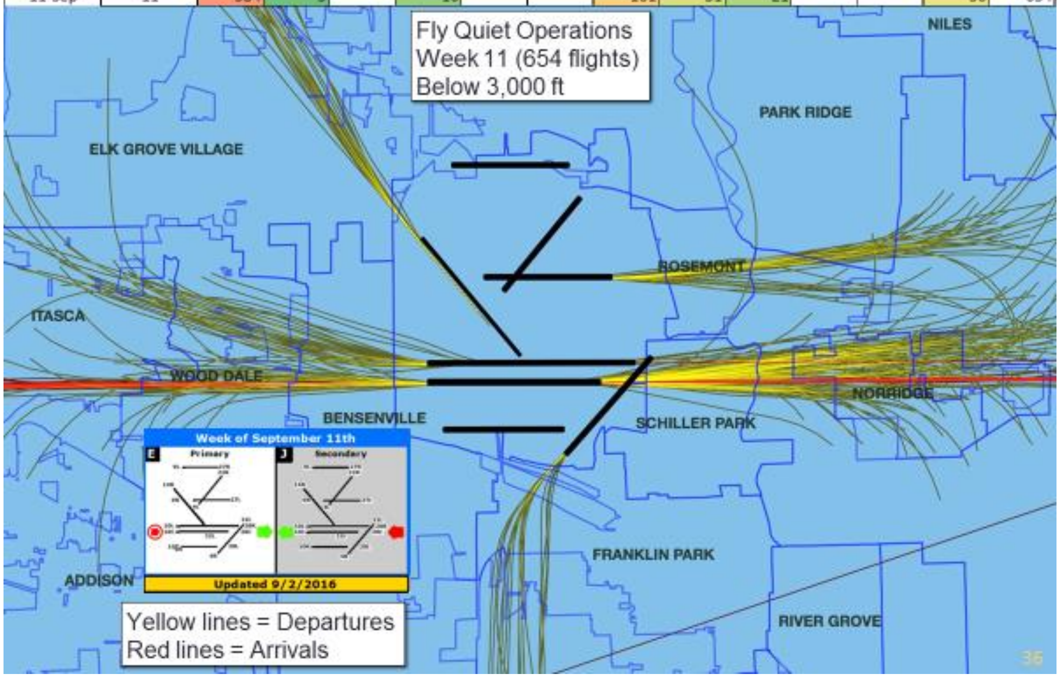


Figure 55: Flight Tracks and Runway Operations Week 11

Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
		Runway												
18-Sep	12	89	12	7	44	50	16	19	15	181	25	216		674

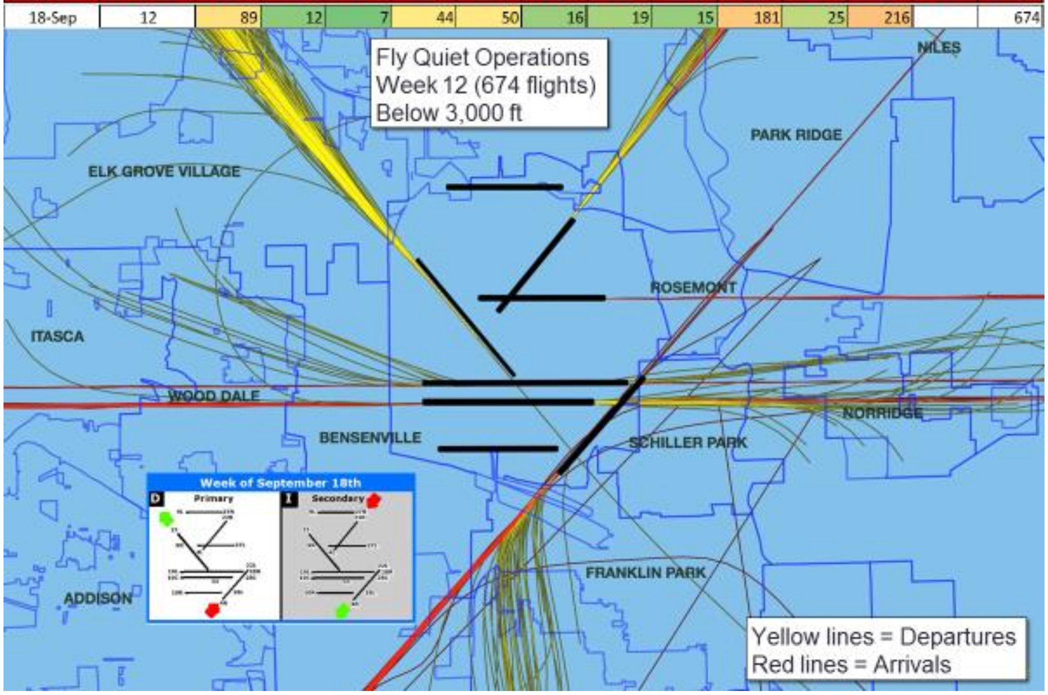
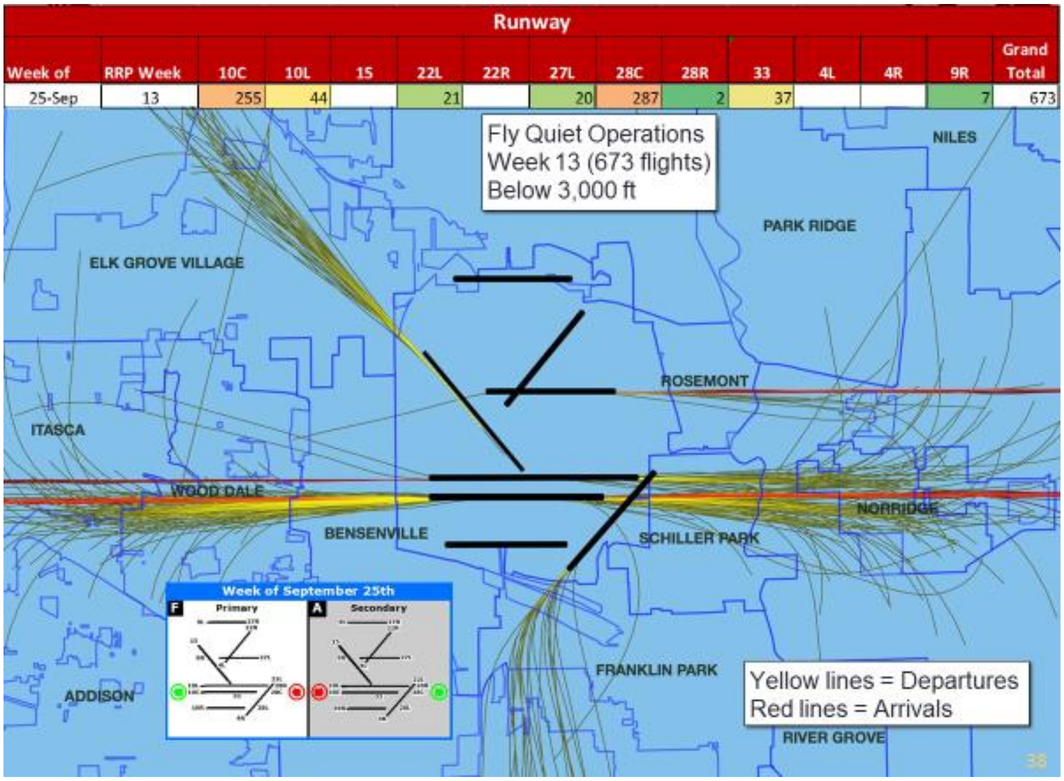
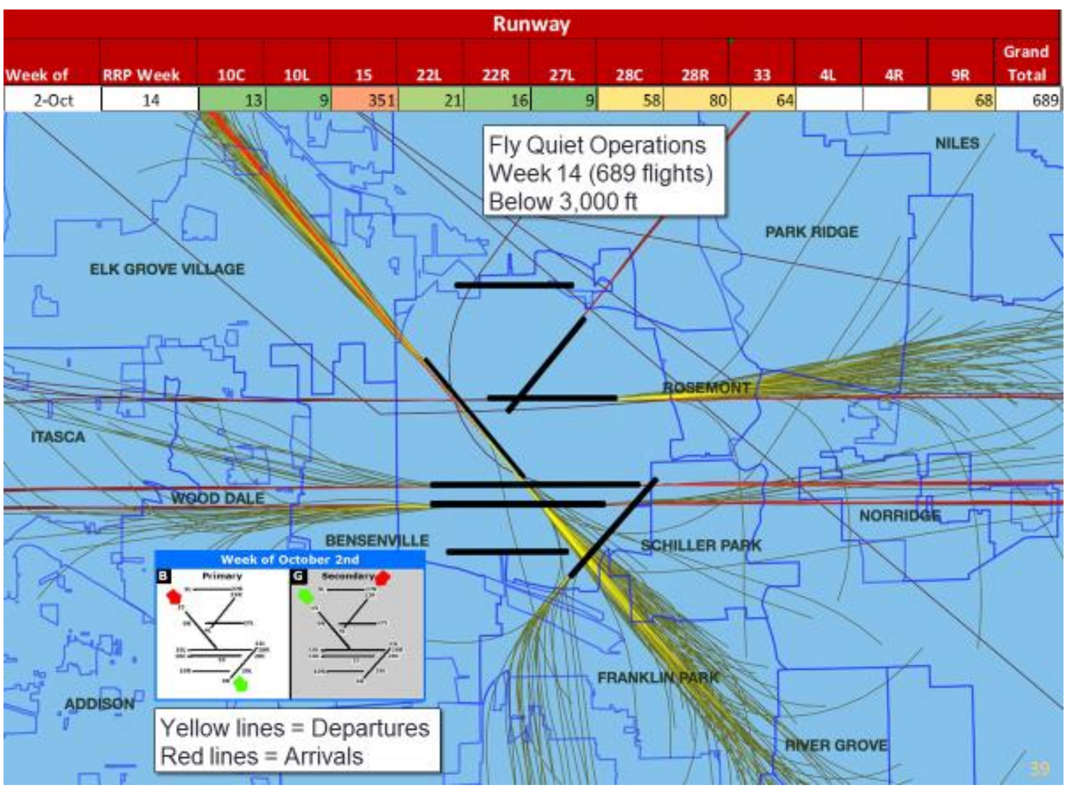


Figure 56: Flight Tracks and Runway Operations Week 12



Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
25-Sep	13	255	44		21		20	287	2	37			7	673

Figure 57: Flight Tracks and Runway Operations Week 13



Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
2-Oct	14	13	9	351	21	16	9	58	80	64			68	689

Figure 58: Flight Tracks and Runway Operations Week 14

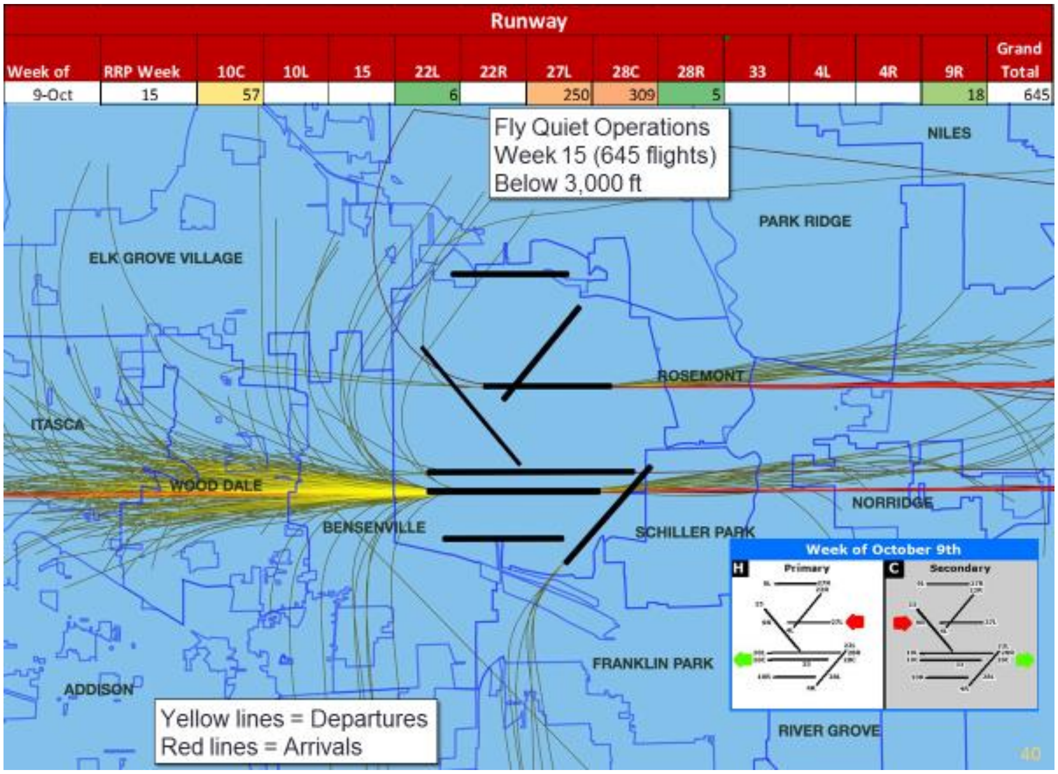


Figure 59: Flight Tracks and Runway Operations Week 15

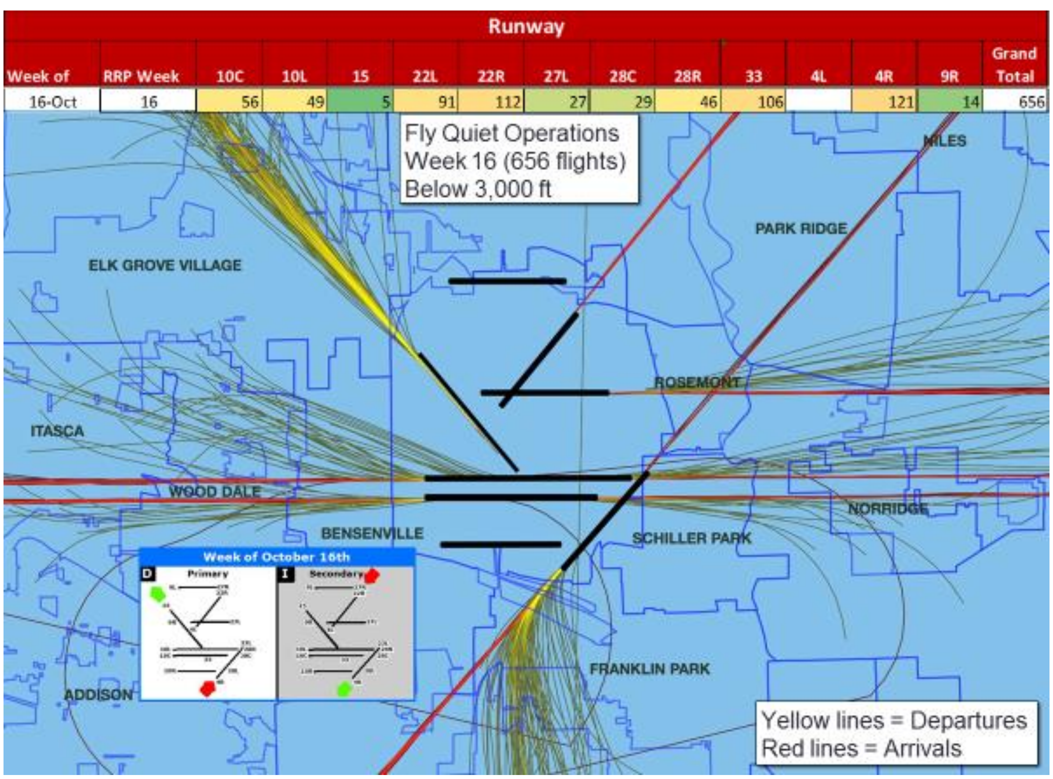


Figure 60: Flight Tracks and Runway Operations Week 16

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
23-Oct	17	281	1		24		54	245	22	35			28	690

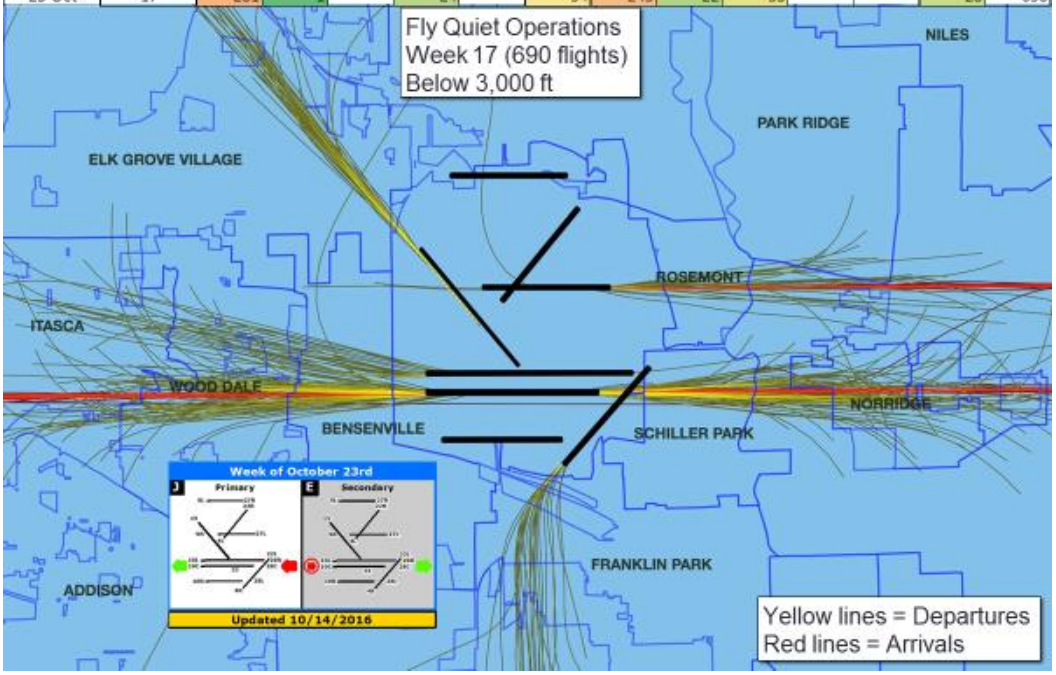


Figure 61: Flight Tracks and Runway Operations Week 17

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
30-Oct	18	71	29	47	5	206	5	136	11	137			19	666

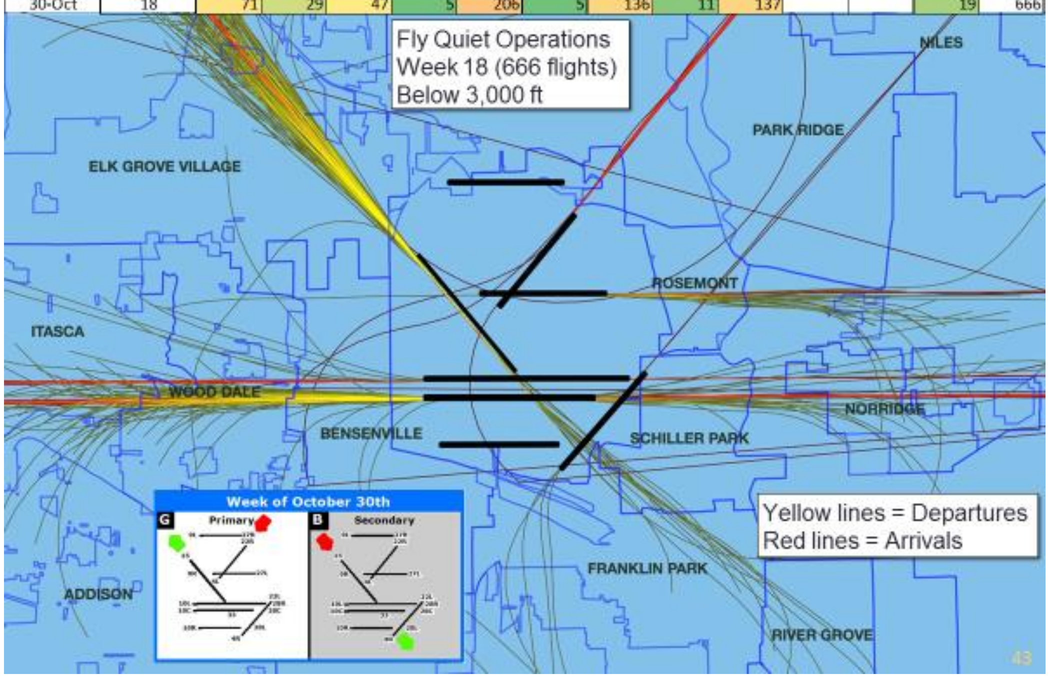


Figure 62: Flight Tracks and Runway Operations Week 18

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
6-Nov	19	74			4		240	316		2			16	652

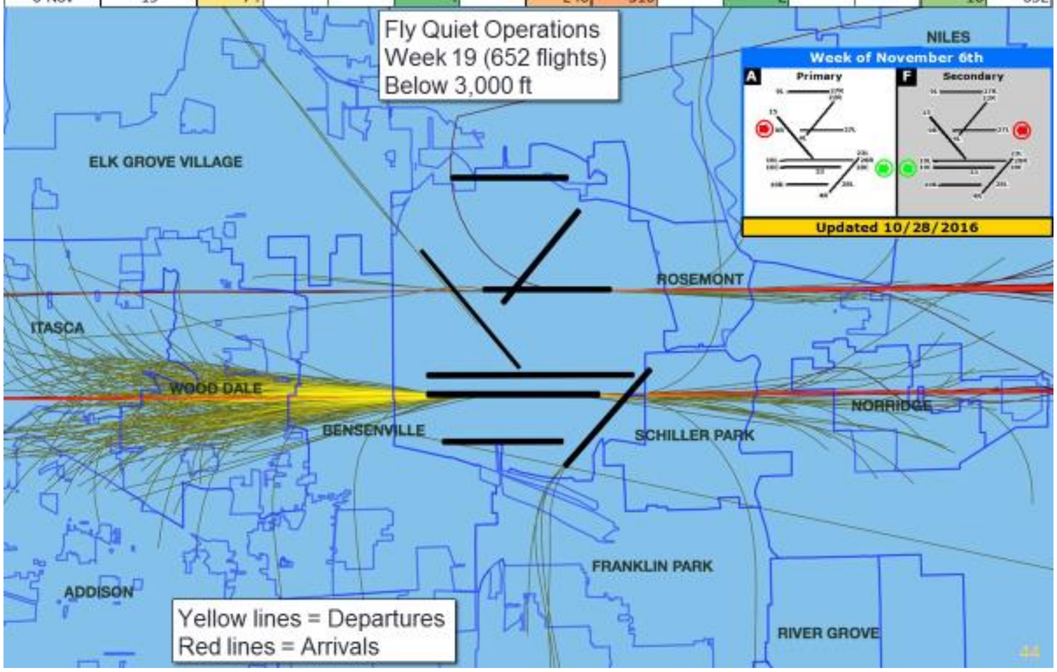


Figure 63: Flight Tracks and Runway Operations Week 19

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
13-Nov	20	55		14	92	175	67	142	75	42			7	669

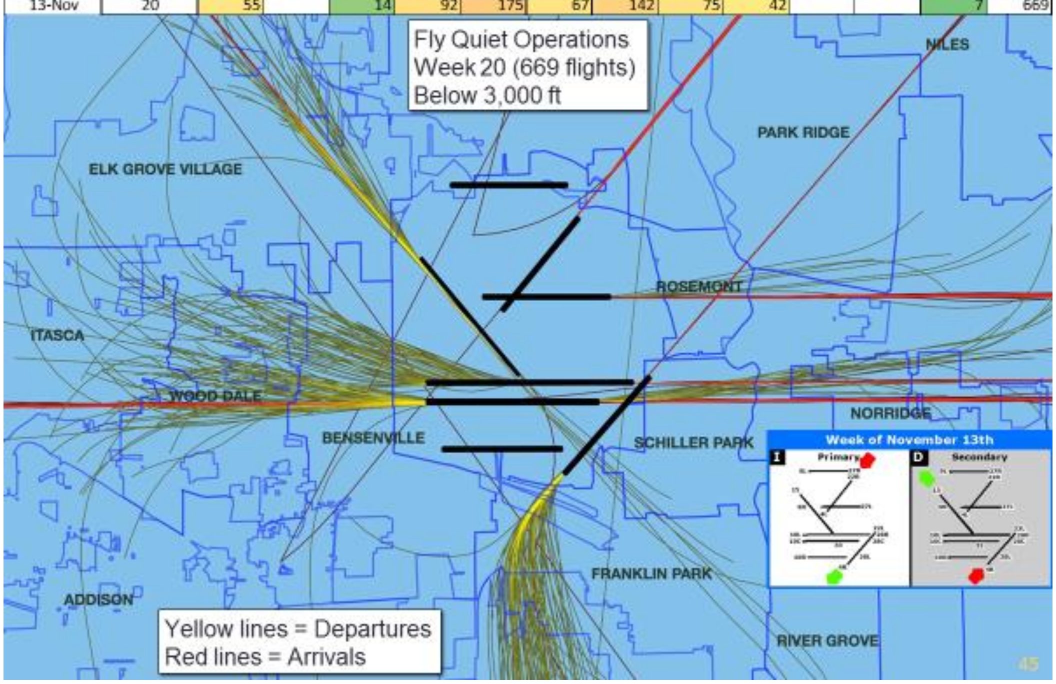


Figure 64: Flight Tracks and Runway Operations Week 20

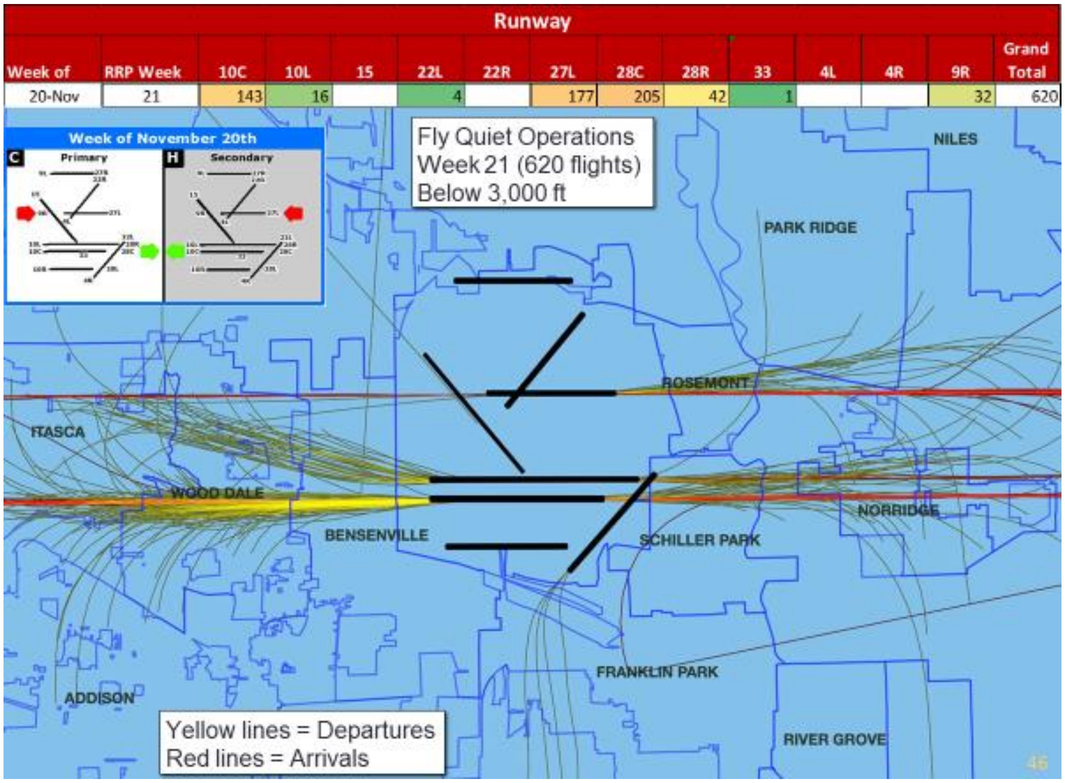


Figure 65: Flight Tracks and Runway Operations Week 21

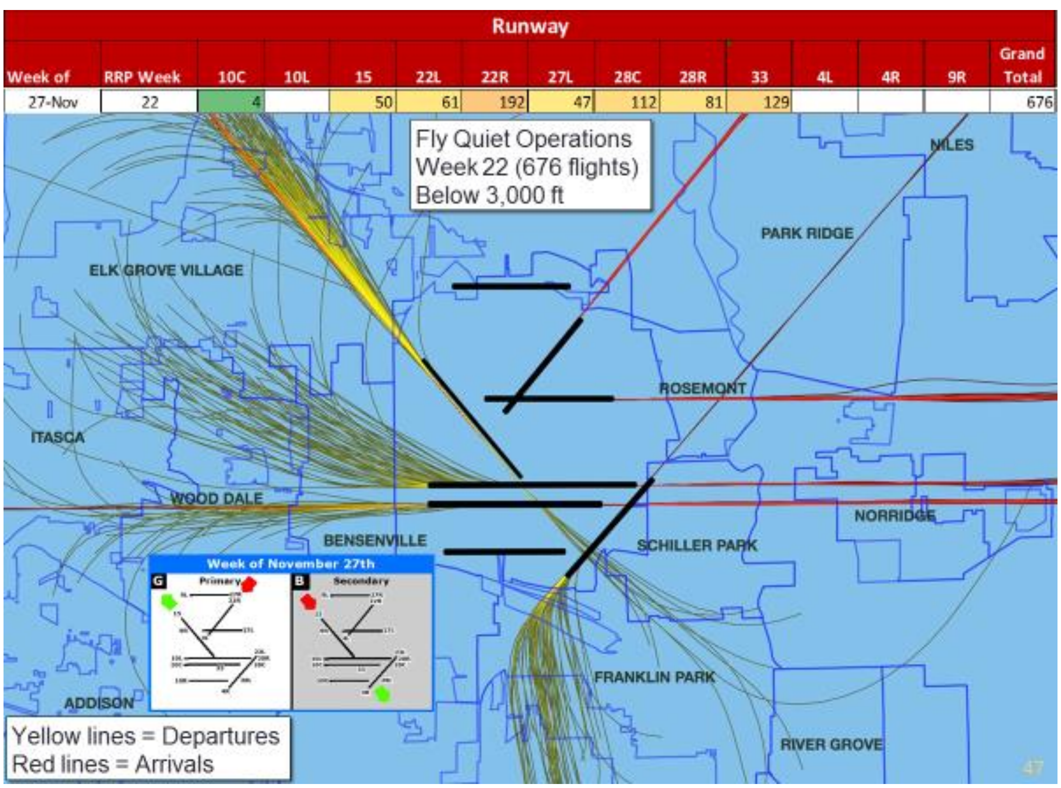


Figure 66: Flight Tracks and Runway Operations Week 22

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
4-Dec	23	56	79		10		48	204	197	29			11	634

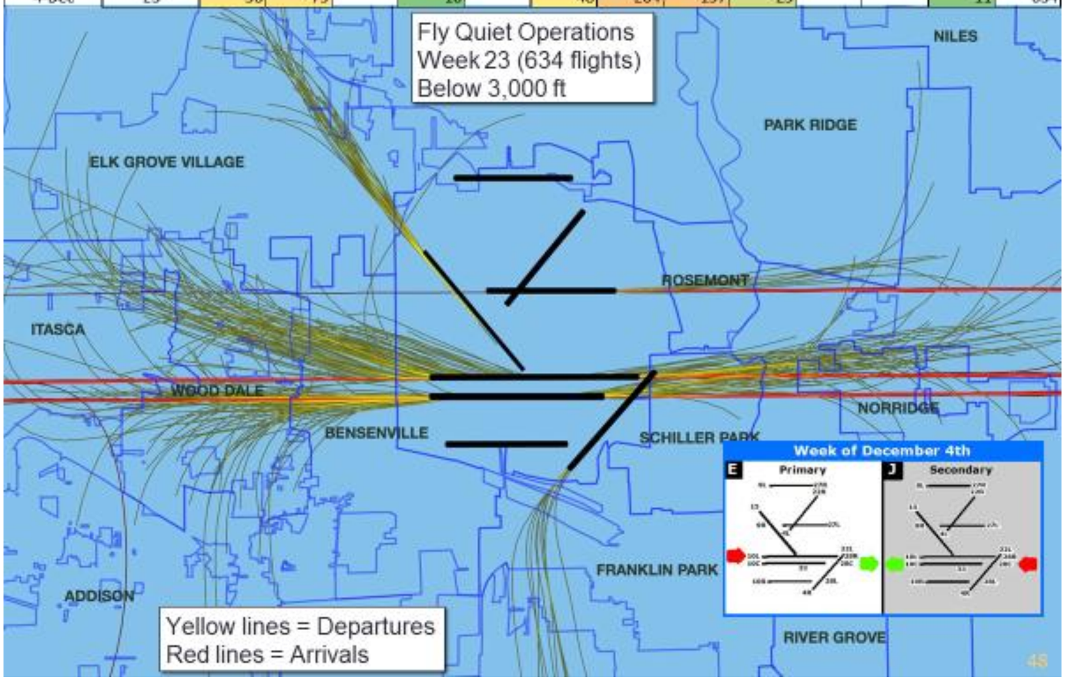


Figure 67: Flight Tracks and Runway Operations Week 23

Runway														
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
11-Dec	24	14	79		112	148	15	99	149	77		6	40	739

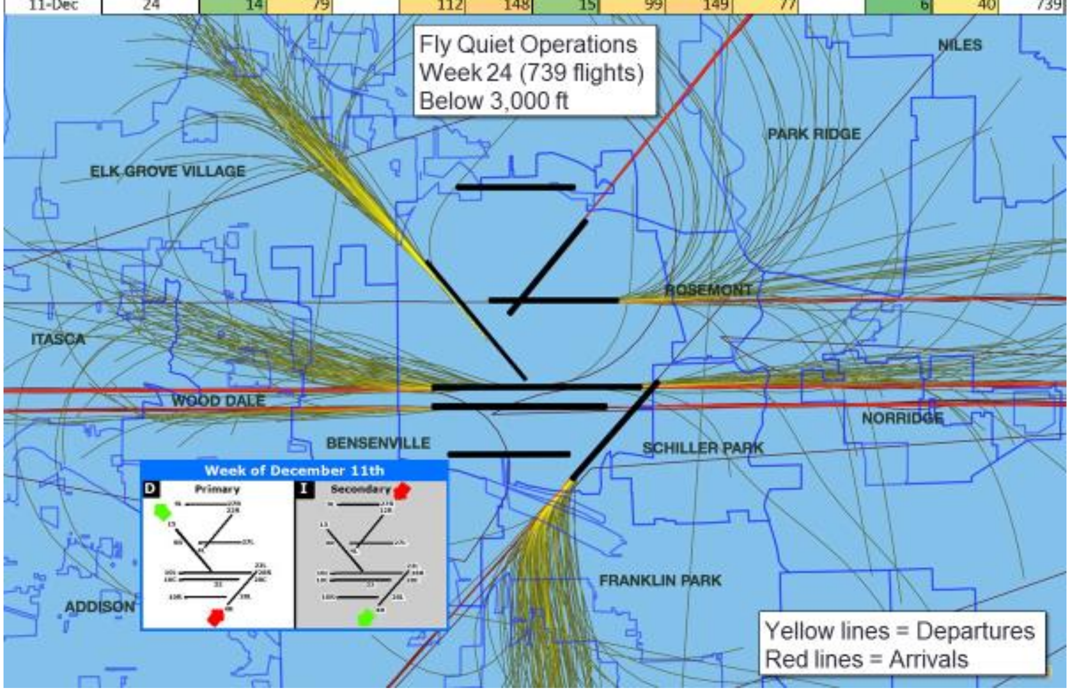


Figure 68: Flight Tracks and Runway Operations Week 24

	Runway													
Week of	RRP Week	10C	10L	15	22L	22R	27L	28C	28R	33	4L	4R	9R	Grand Total
18-Dec	25	17	61		4		122	88	588	2			12	894

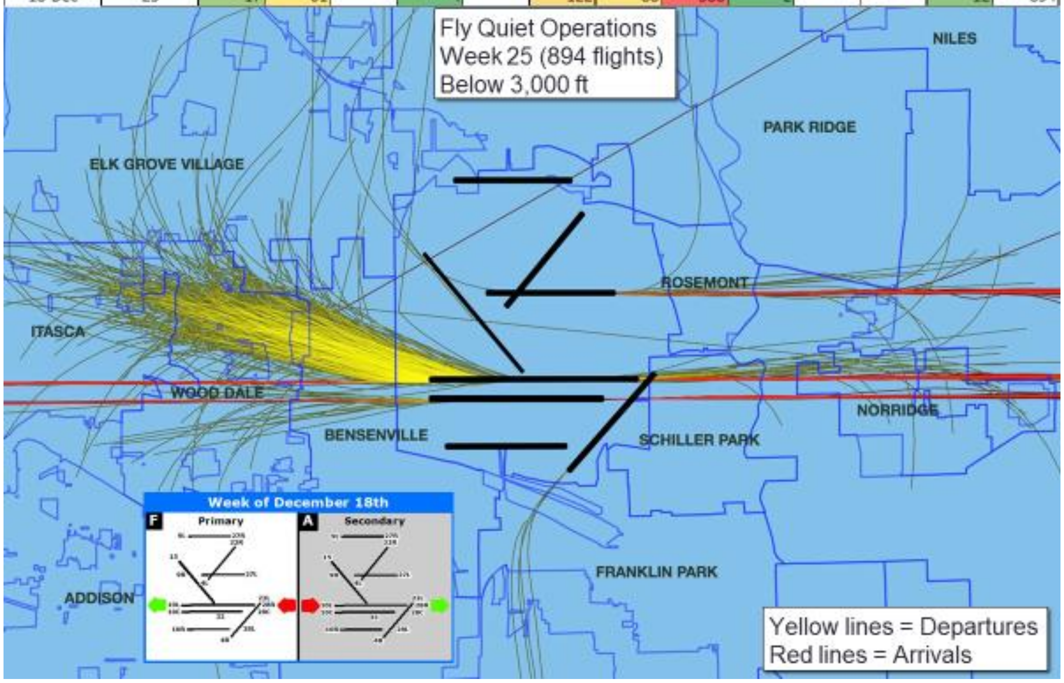


Figure 69: Flight Tracks and Runway Operations Week 25

Appendix 3: Overflights Below 3,000 Feet AGL by Community by Week 1-25

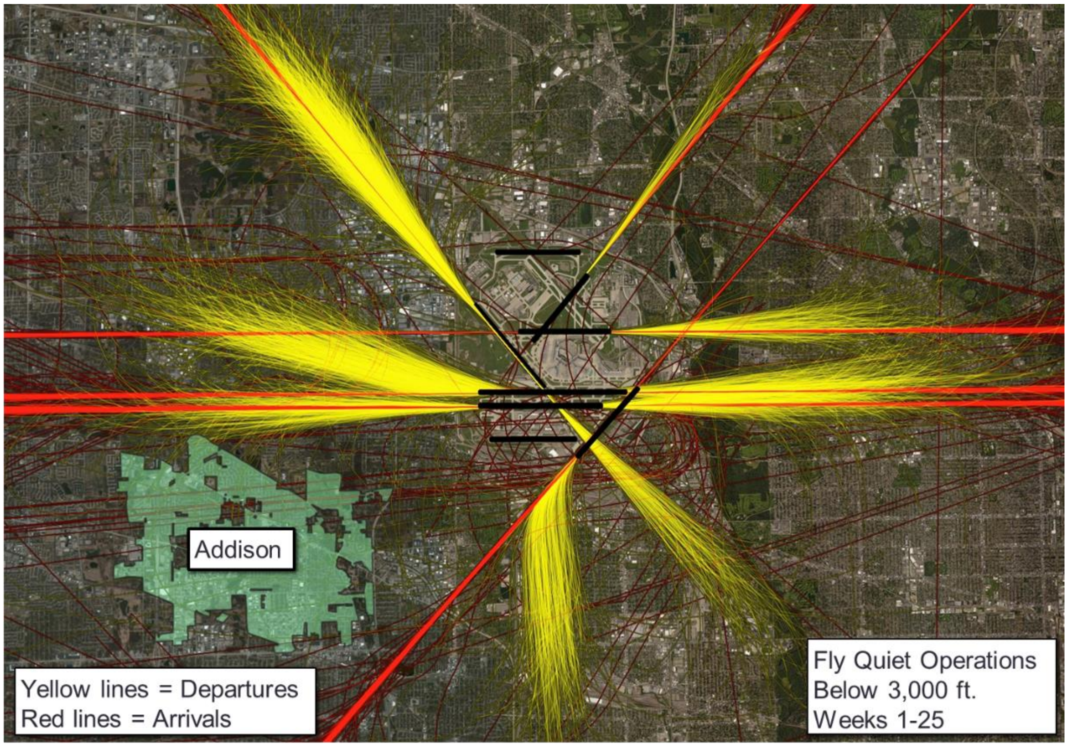


Figure 70: Addison Flight Tracks of Overflights < 3,000' AGL Weeks 1-25

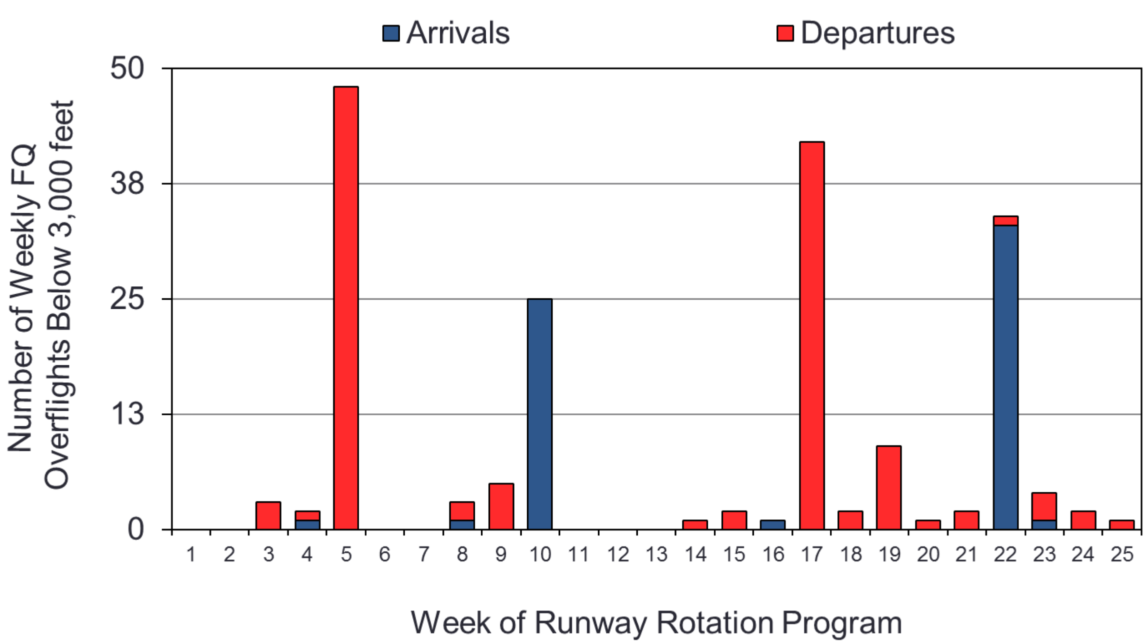


Figure 71: Addison Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

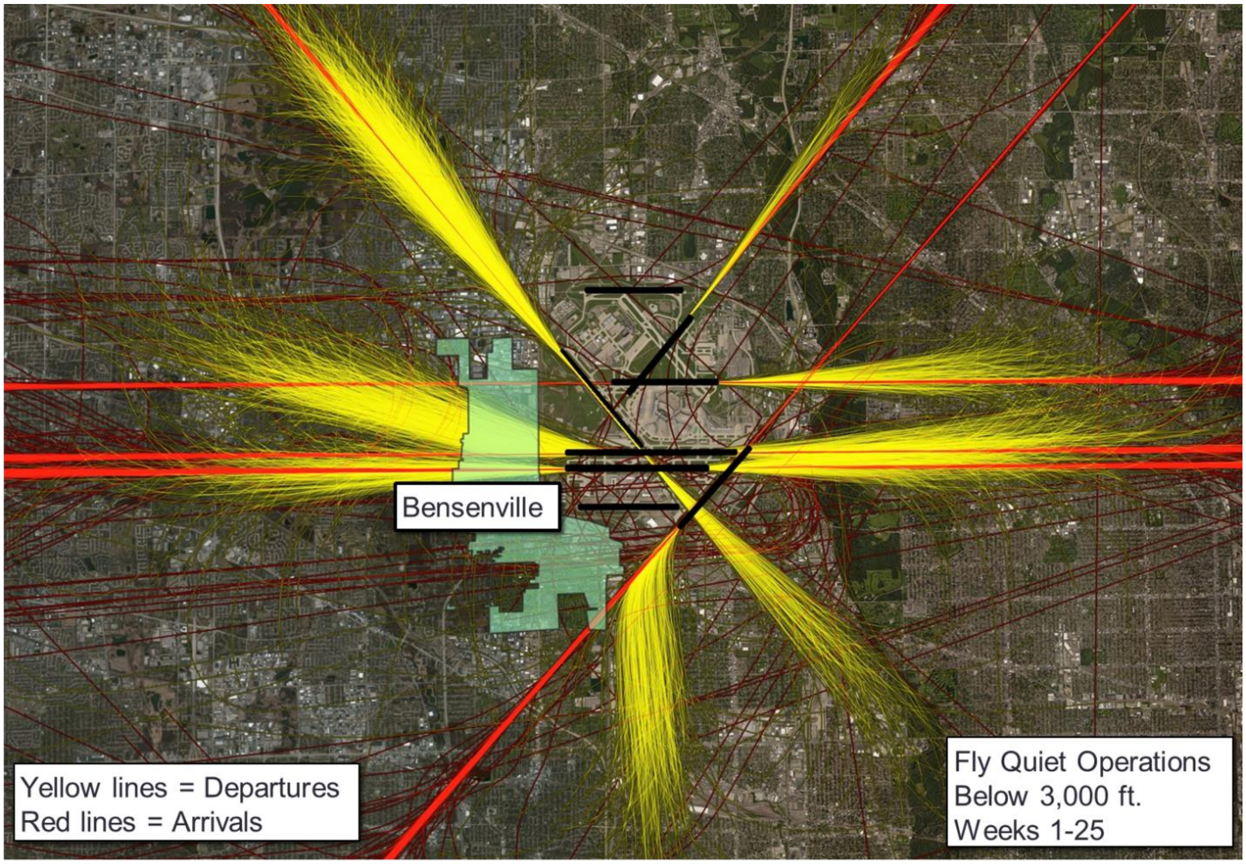


Figure 72: Bensenville Flight Tracks of Overflights < 3,000' AGL Weeks 1-25

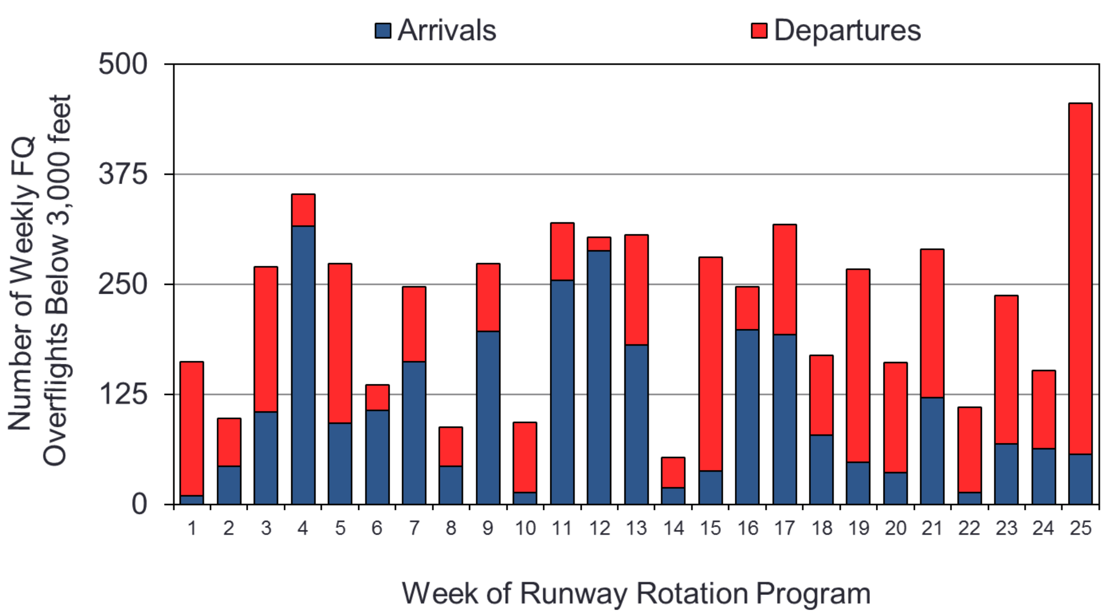


Figure 73: Bensenville Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

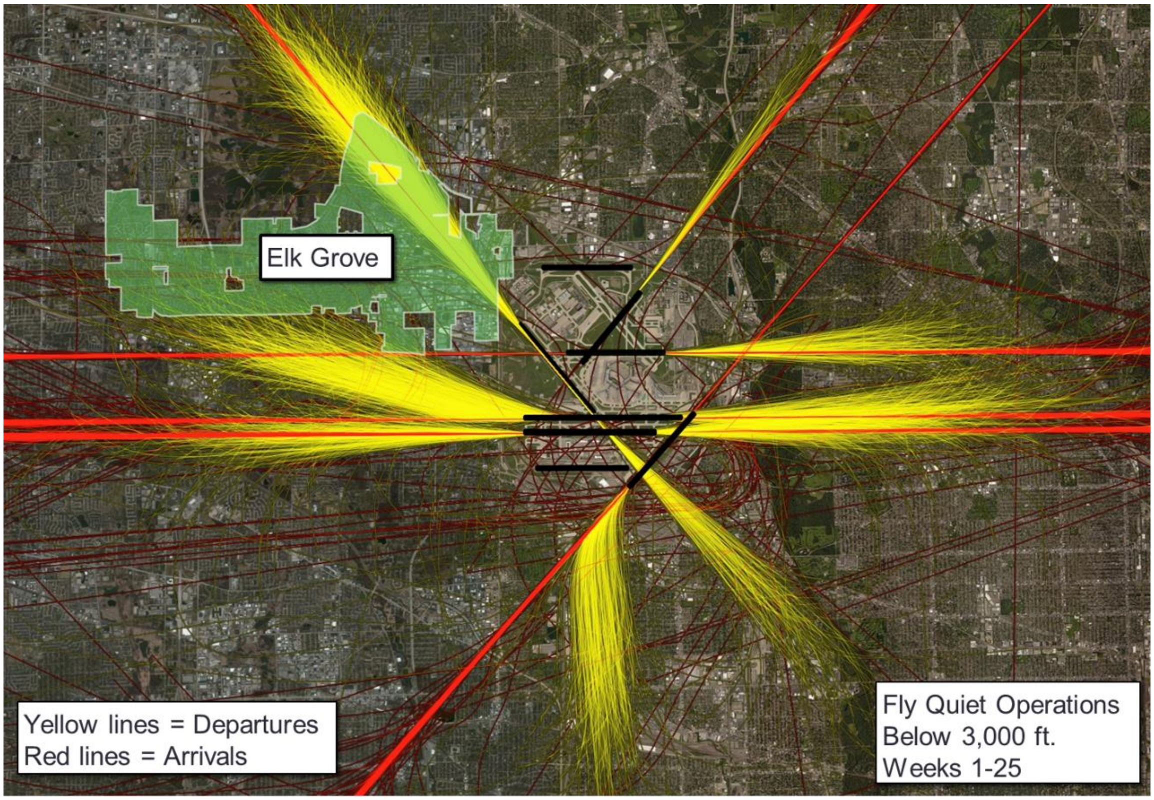


Figure 74: Elk Grove Village Flight Tracks Overflights < 3,000' AGL Weeks 1-25

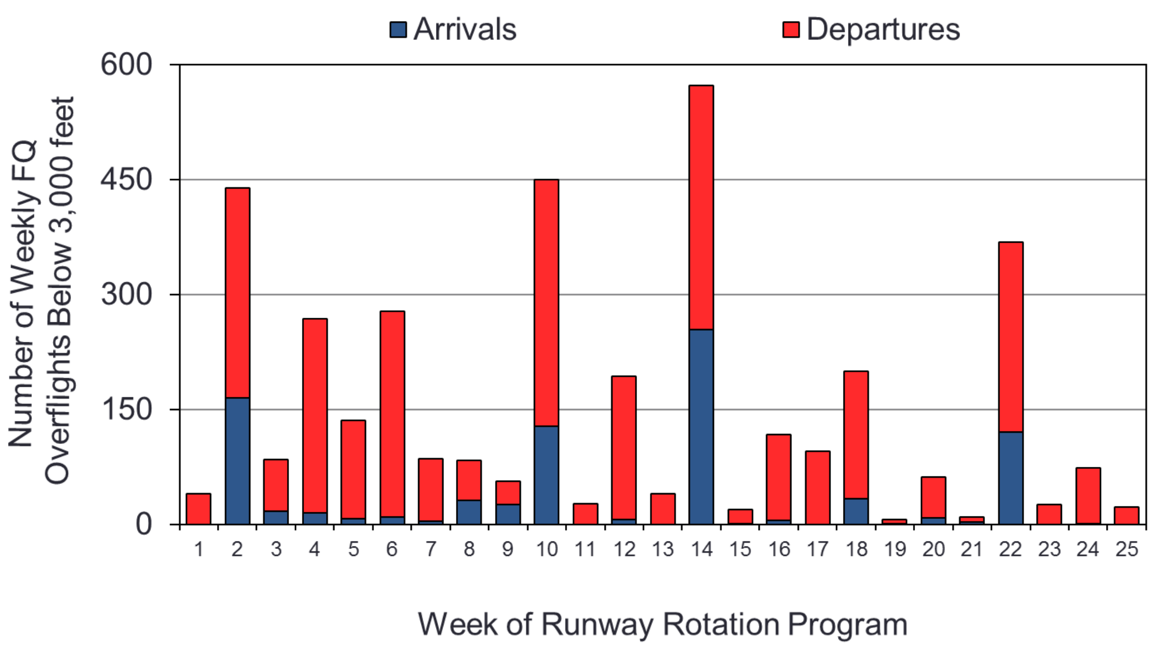


Figure 75: Elk Grove Village Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

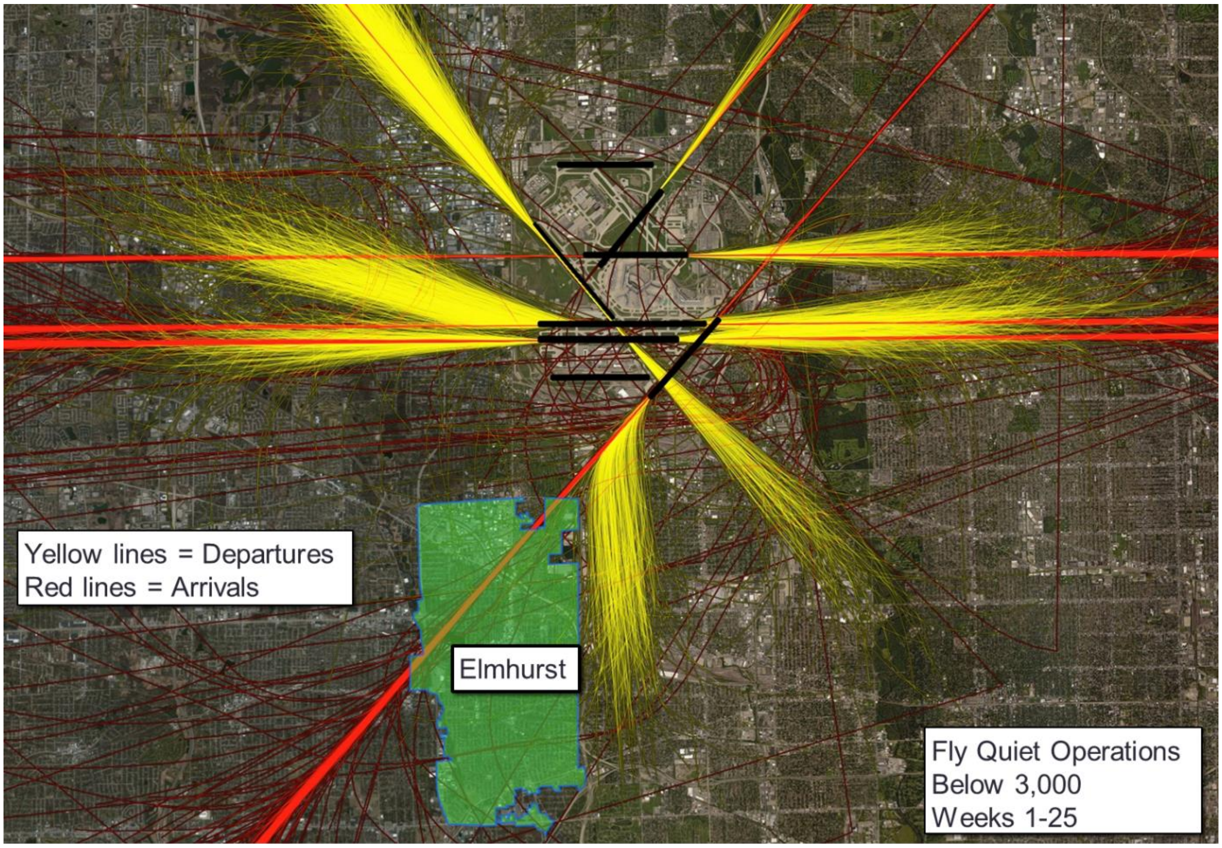


Figure 76: Elmhurst Flight Tracks Overflights < 3,000' AGL Weeks 1-25

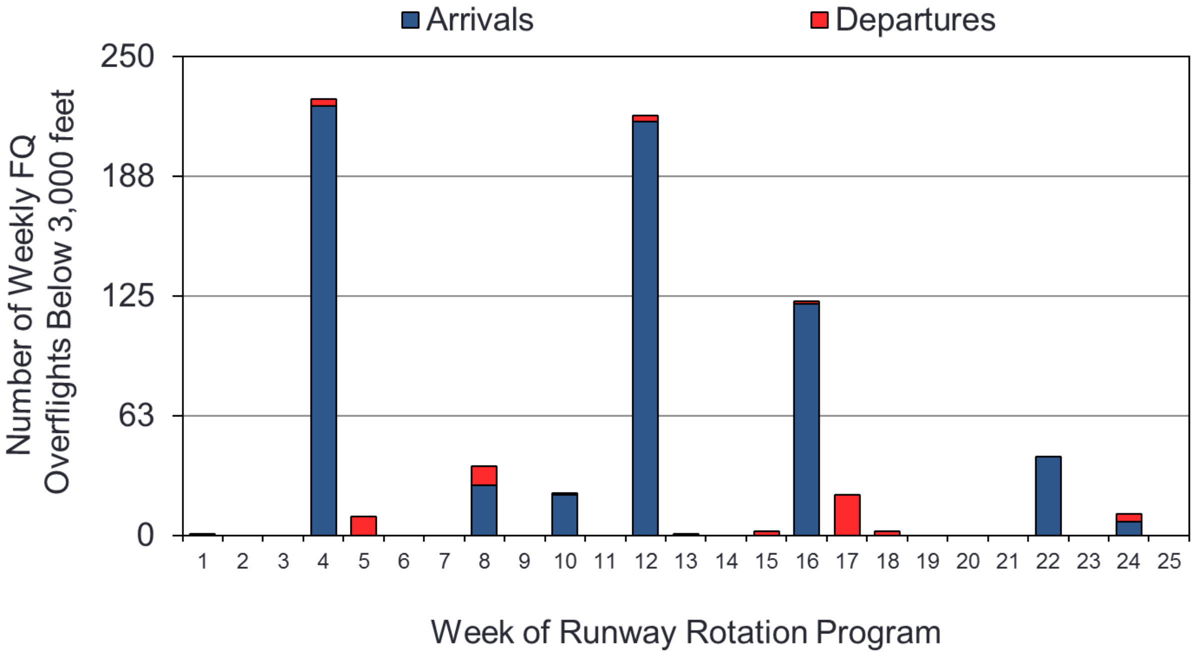


Figure 77: Elmhurst Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

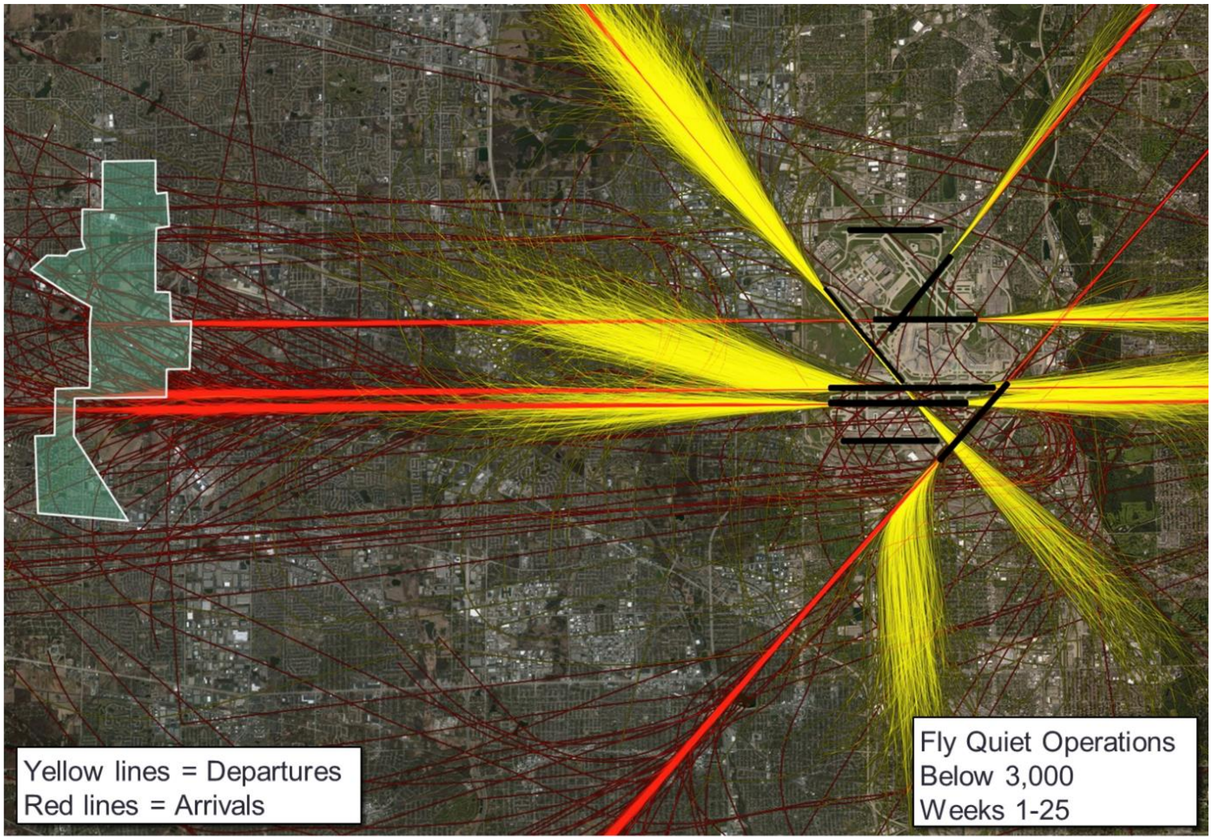


Figure 78: Hanover Park Flight Tracks Overflights < 3,000' AGL Weeks 1-25

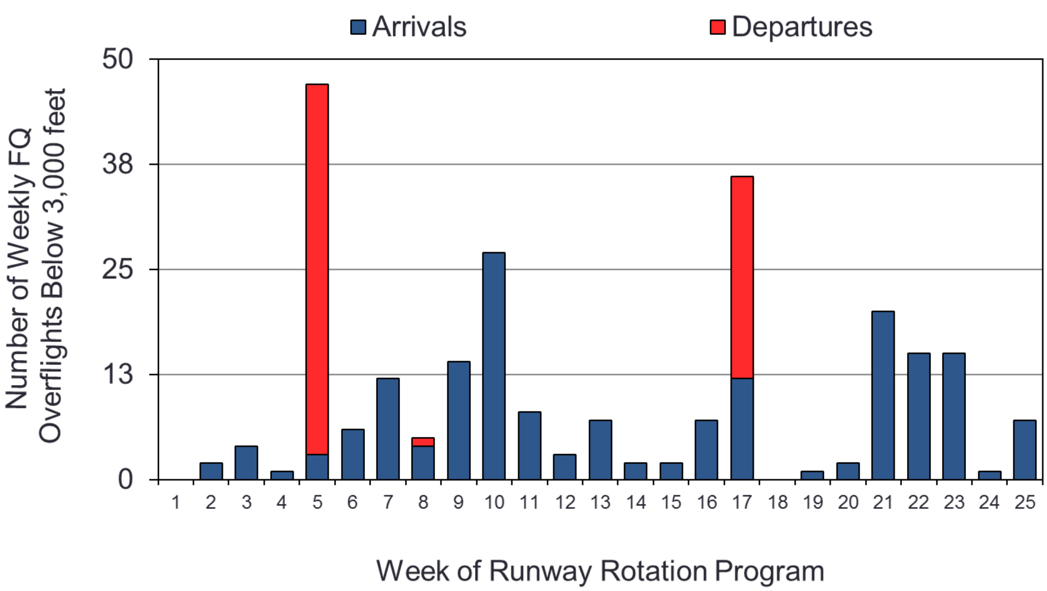


Figure 79: Hanover Park Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

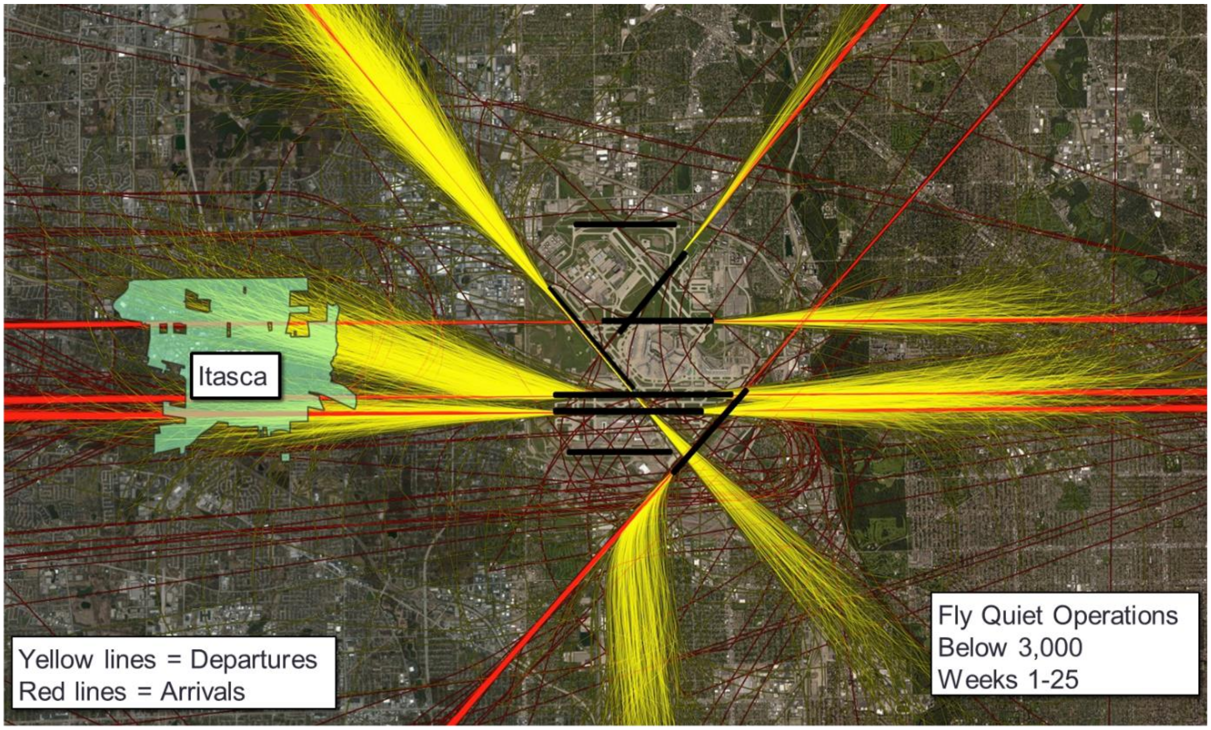


Figure 80: Itasca Flight Tracks Overflights < 3,000' AGL Weeks 1-25

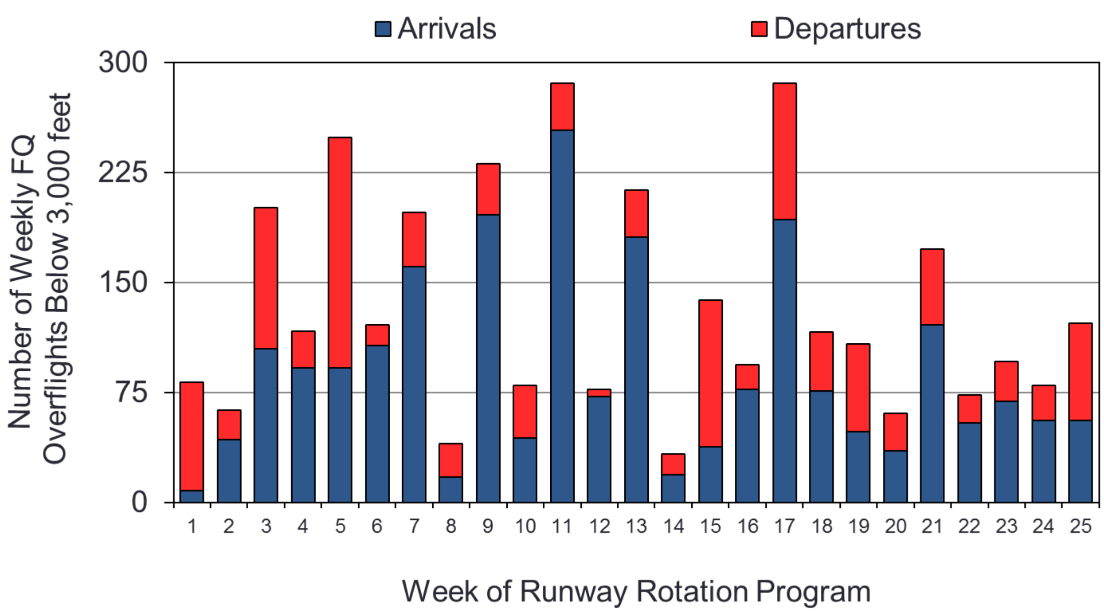


Figure 81: Itasca Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

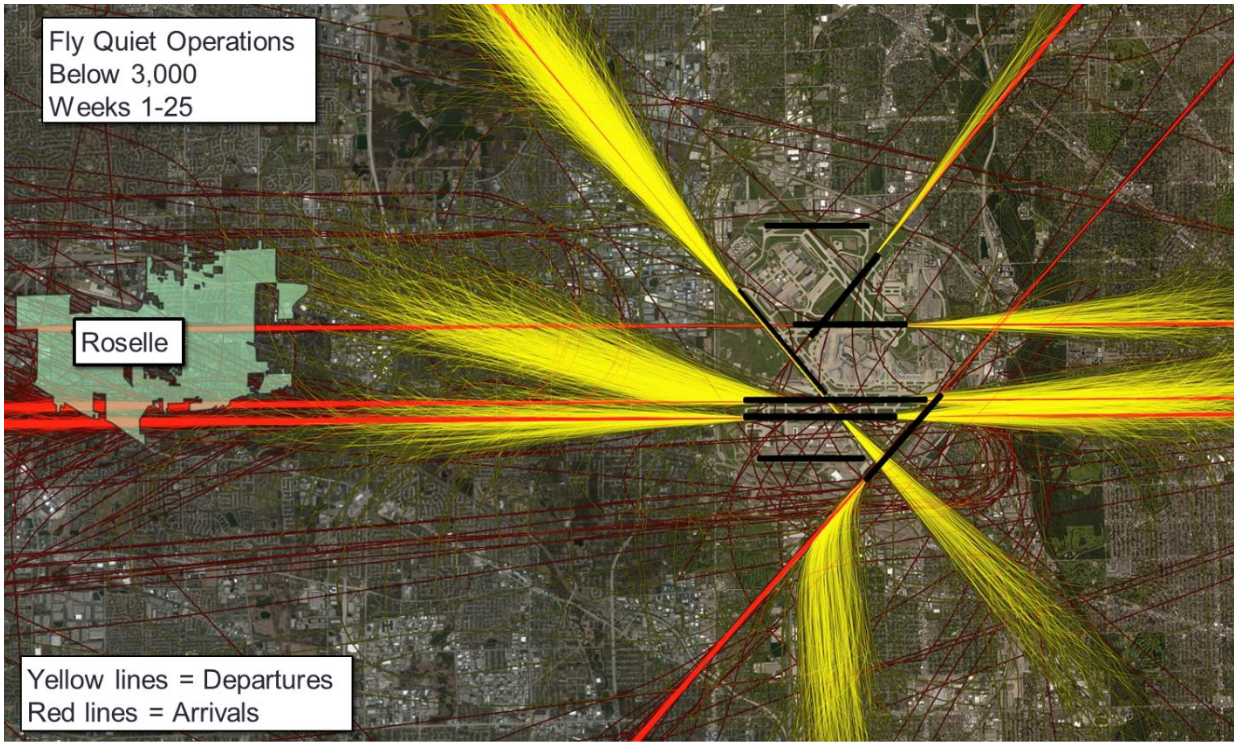


Figure 82: Roselle Flight Tracks Overflights < 3,000' AGL Weeks 1-25

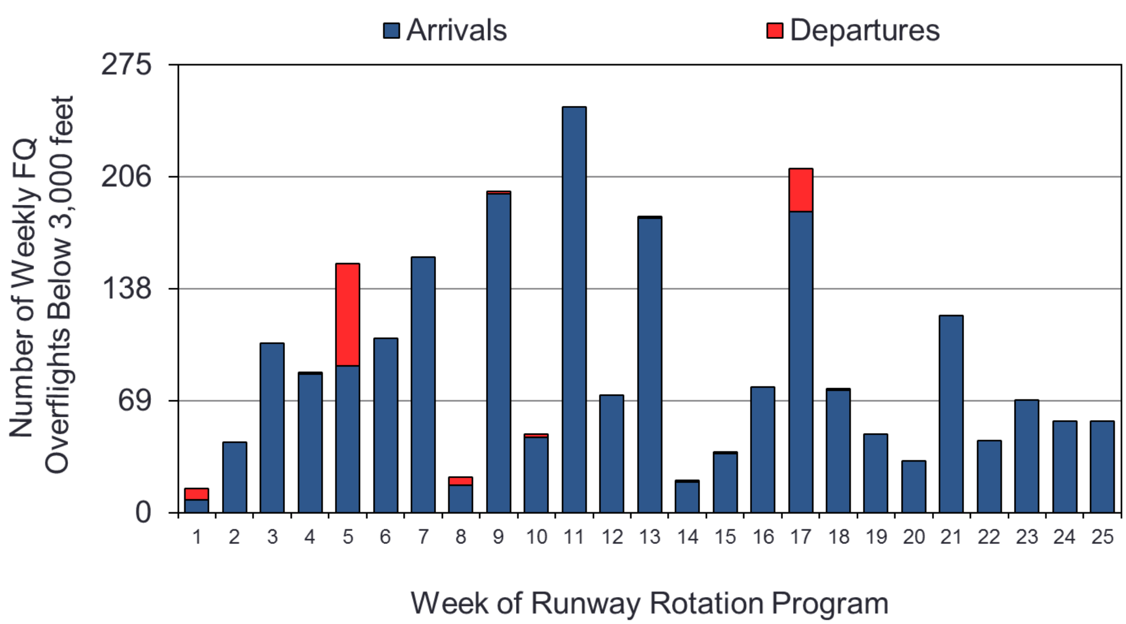


Figure 83: Roselle Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

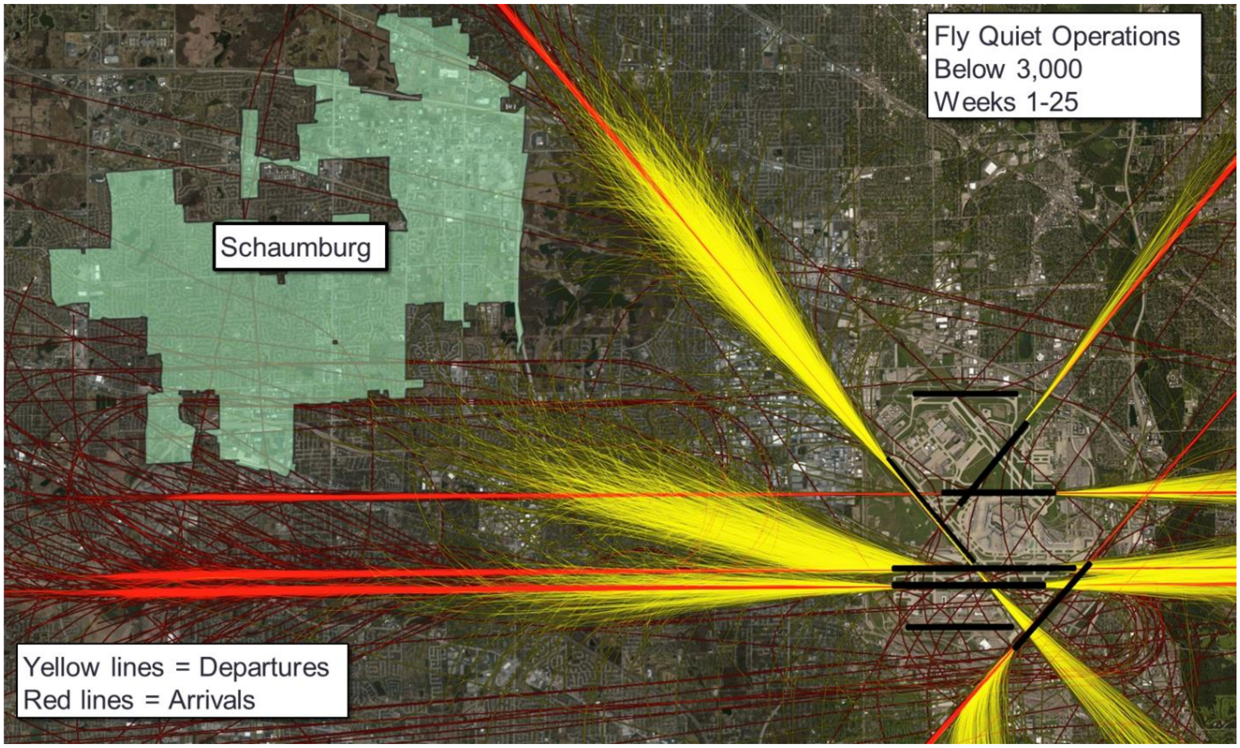


Figure 84: Schaumburg Flight Tracks Overflights 3,000' AGL Weeks 1-25

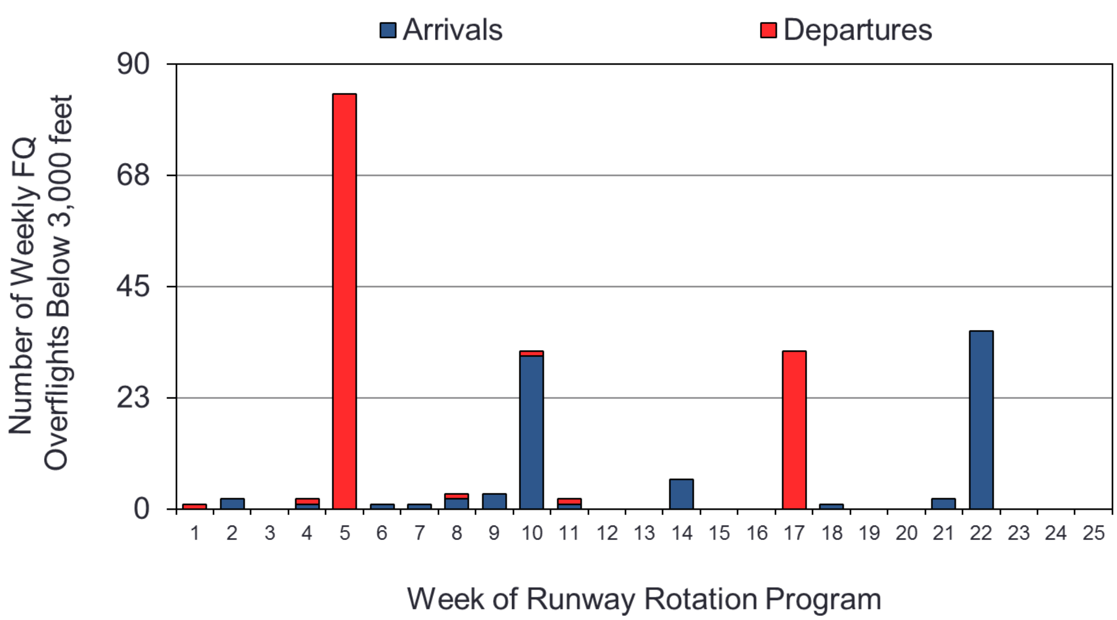


Figure 85: Schaumburg Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

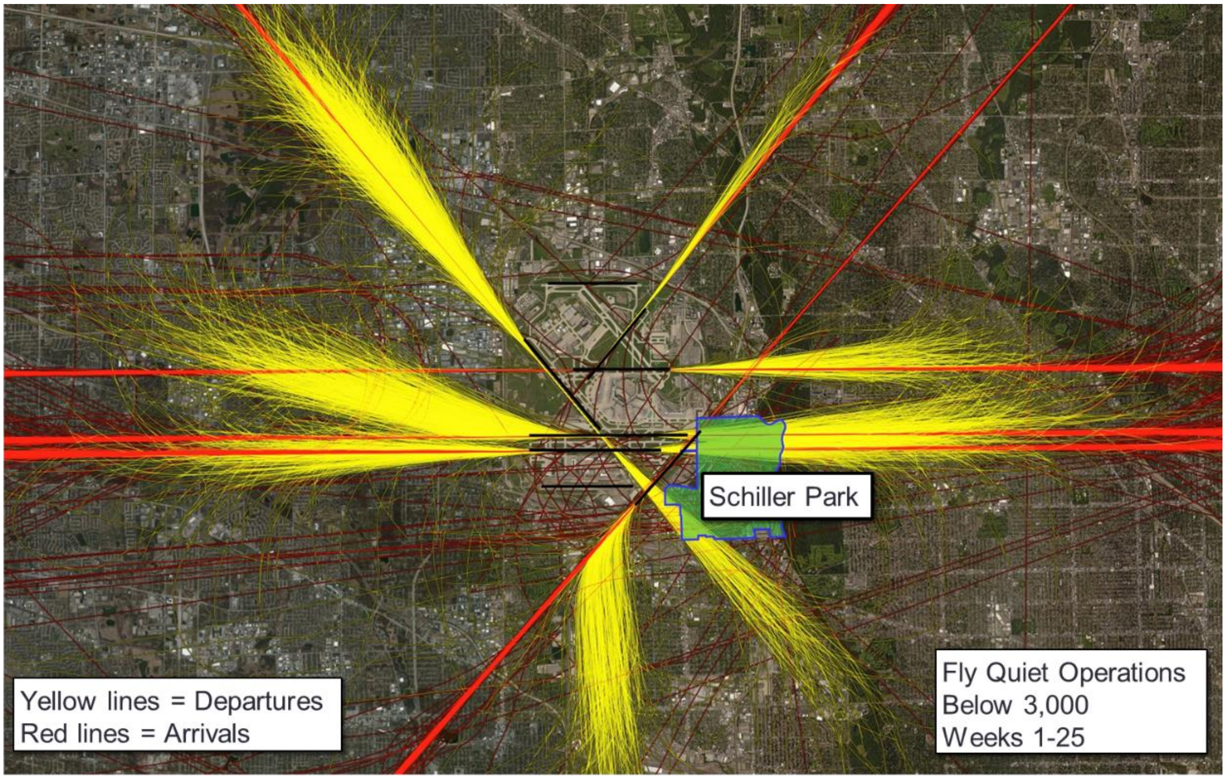


Figure 86: Schiller Park Flight Tracks Overflights 3,000' AGL Weeks 1-25

Figure 87 Wood Dals Flight Tracks Overflights 3,000' AGL Weeks 1-25

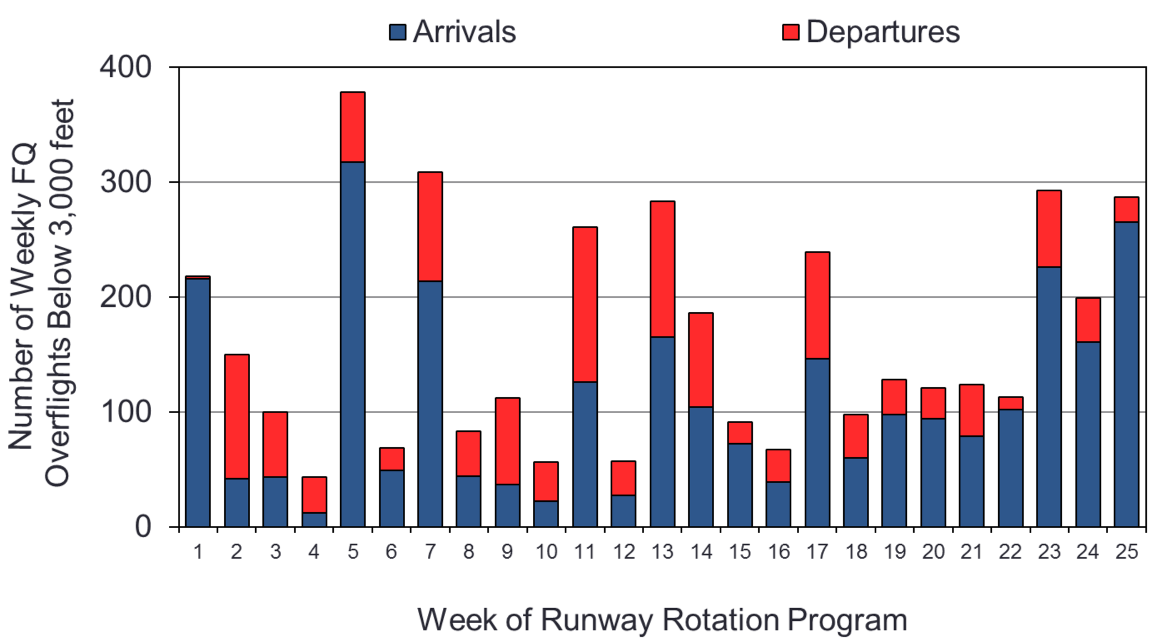


Figure 88: Schiller Park Arrival and Departure Overflights < 3,000' AGL Weeks 1-25

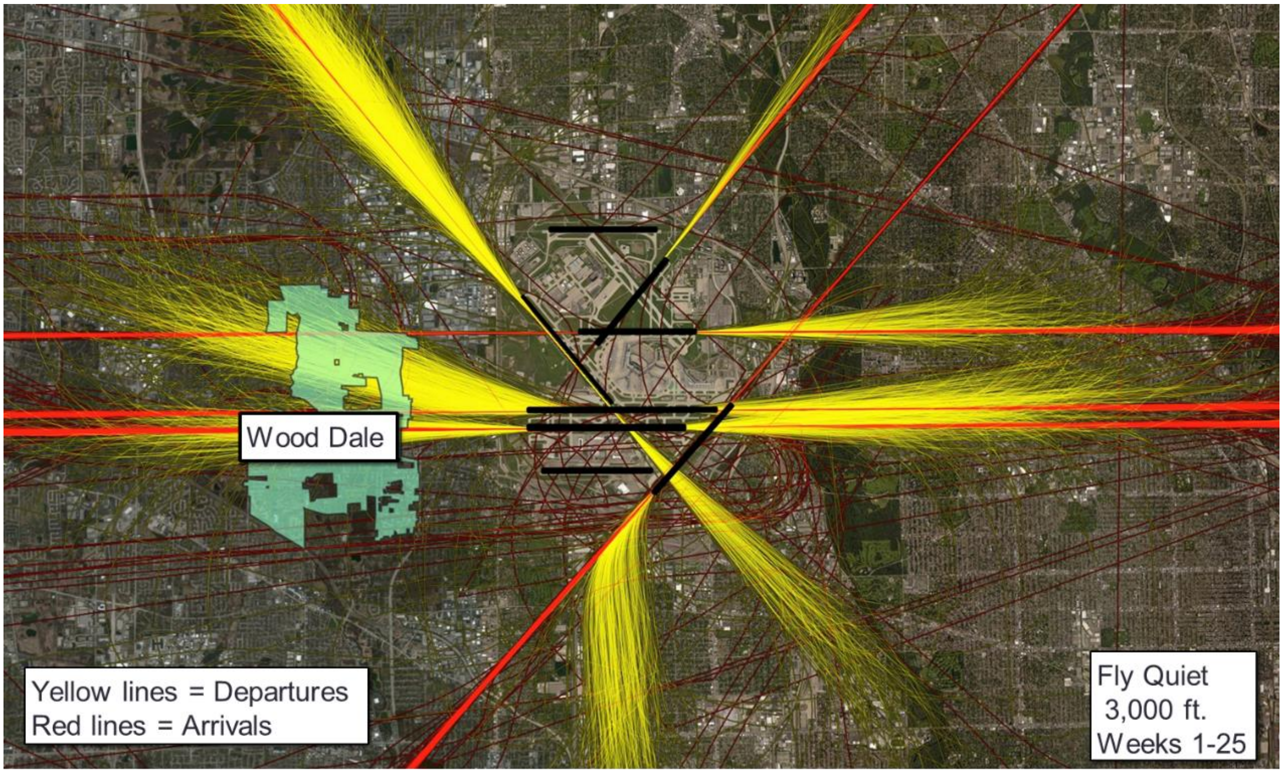


Figure 89: Wood Dale Flight Tracks Overflights 3,000' AGL Weeks 1-25

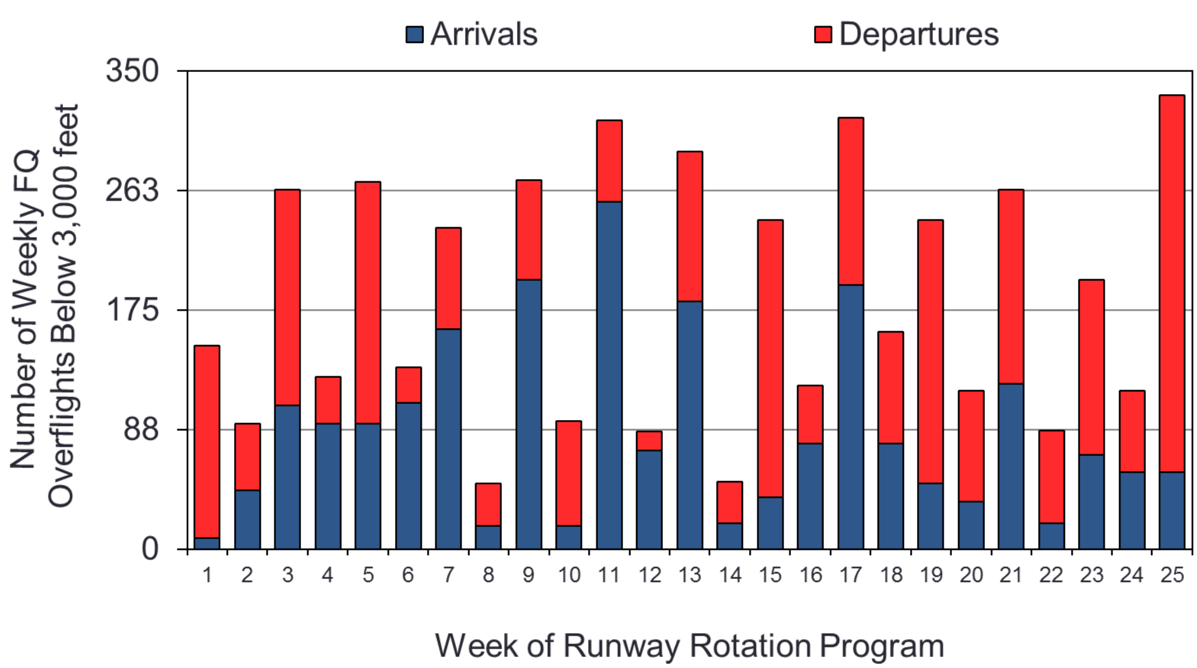


Figure 90: Wood Dale Arrival and Departure Overflights > 3,000" AGL Weeks 1-25

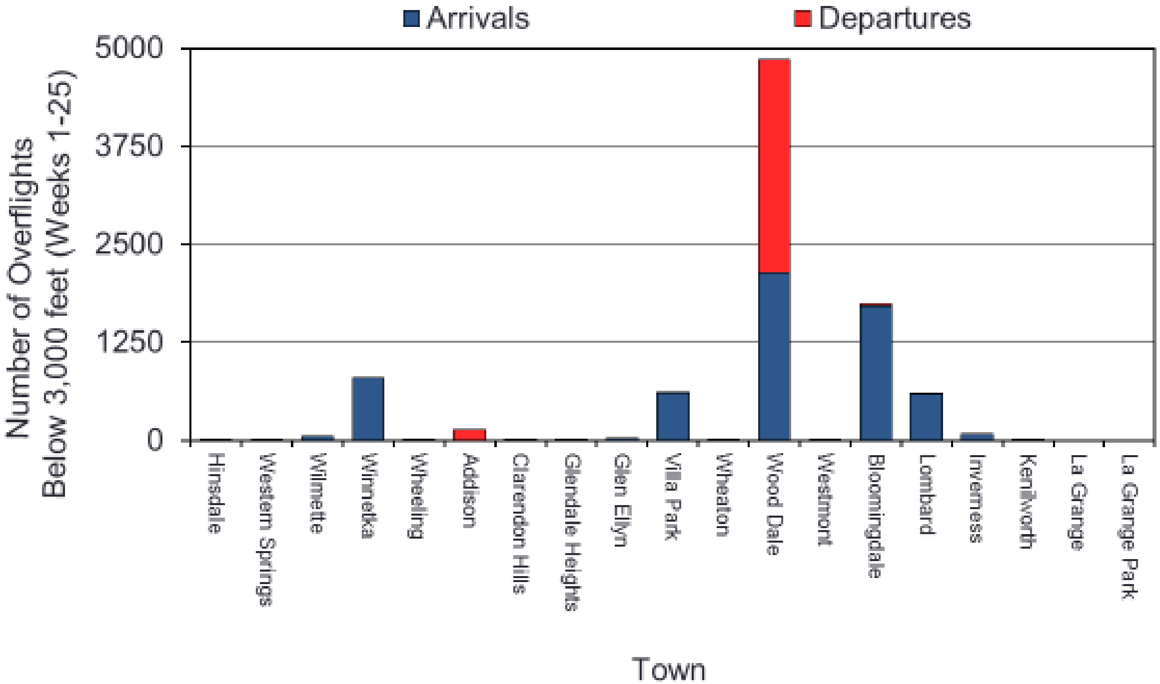


Figure 91: Weeks 1-25 Overflights < 3,000' AGL Other O'Hare Communities Chart 1

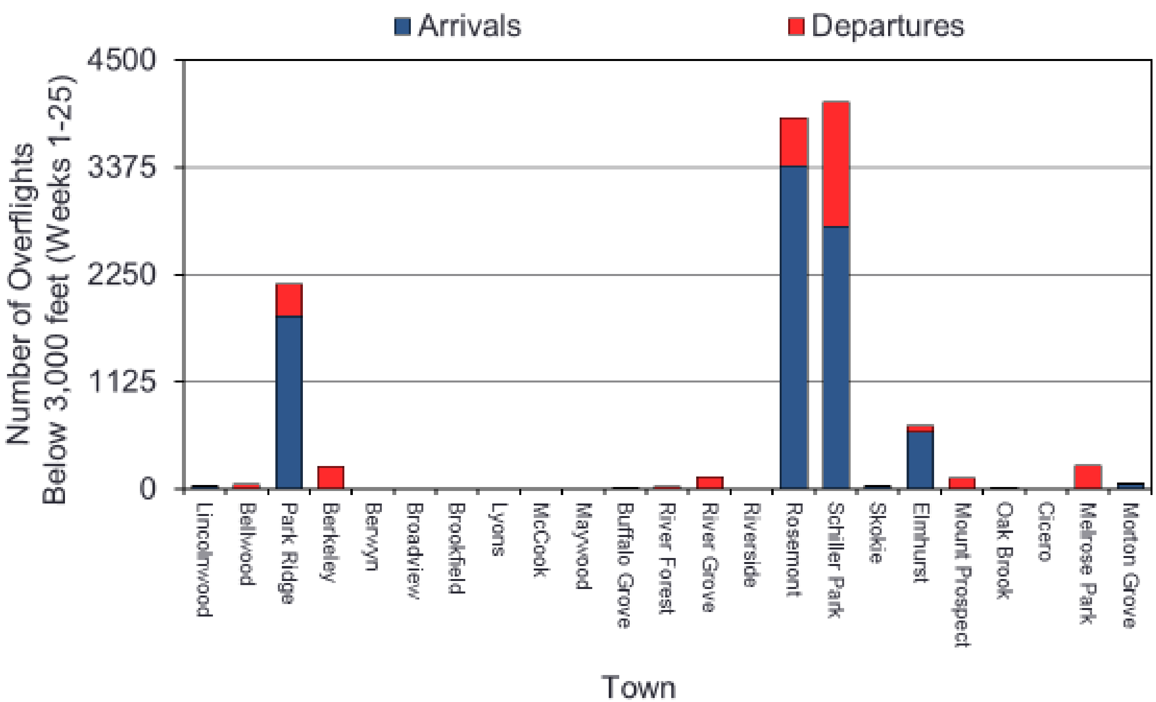


Figure 92: Weeks 1-25 Overflights < 3,000' AGL Other O'Hare Communities Chart 2

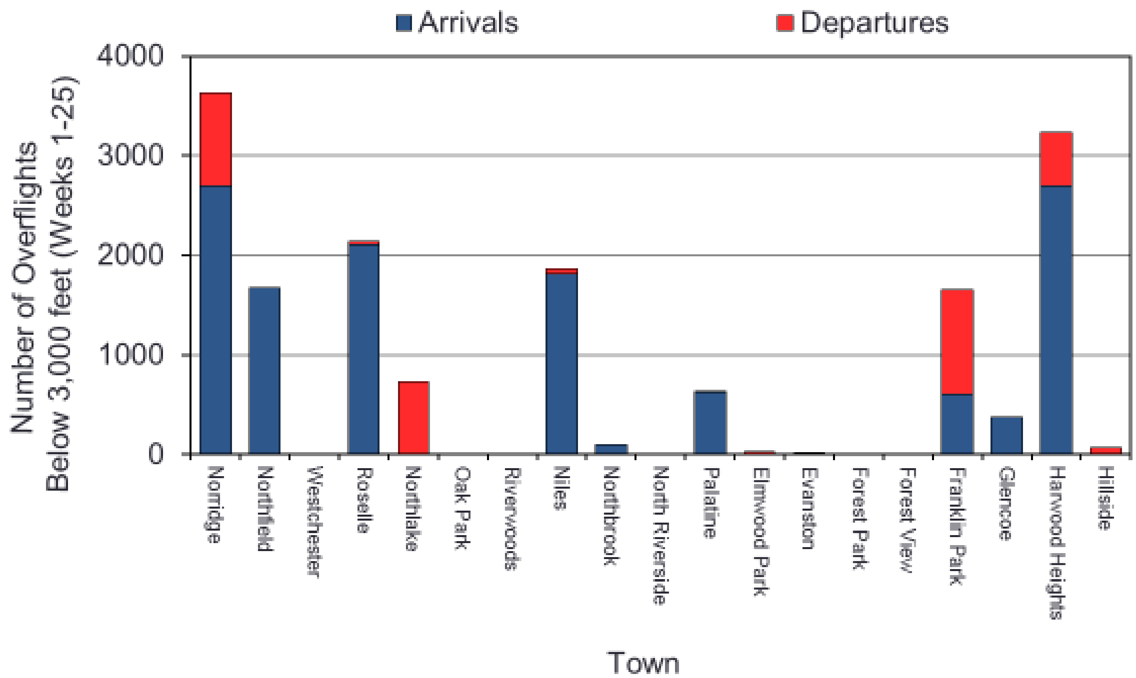


Figure 93: Weeks 1-25 Overflights < 3,000' AGL Other O'Hare Communities Chart 3

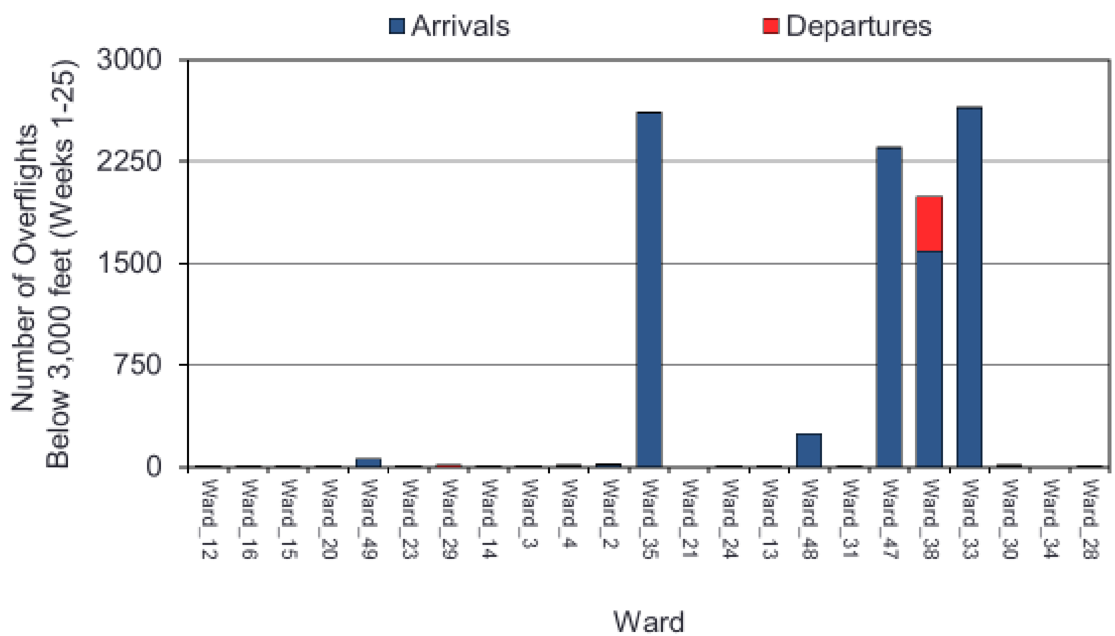


Figure 94: Weeks 1-25 Overflights < 3,000' AGL Other O'Hare Communities Chart 4

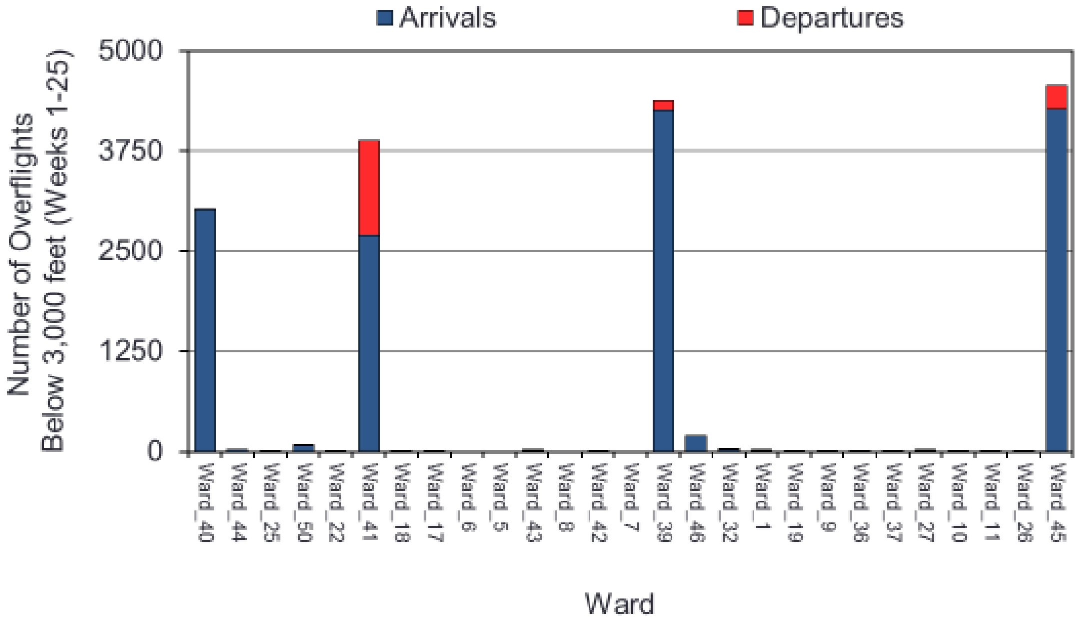


Figure 95: Weeks 1-25 Overflights < 3,000' AGL Other O'Hare Communities Chart 5

Note: Ward 41 includes Chicago O'Hare International Airport operations below 3,000' AGL within the airport boundary have been eliminated because the operations are compatible with the airport environment.

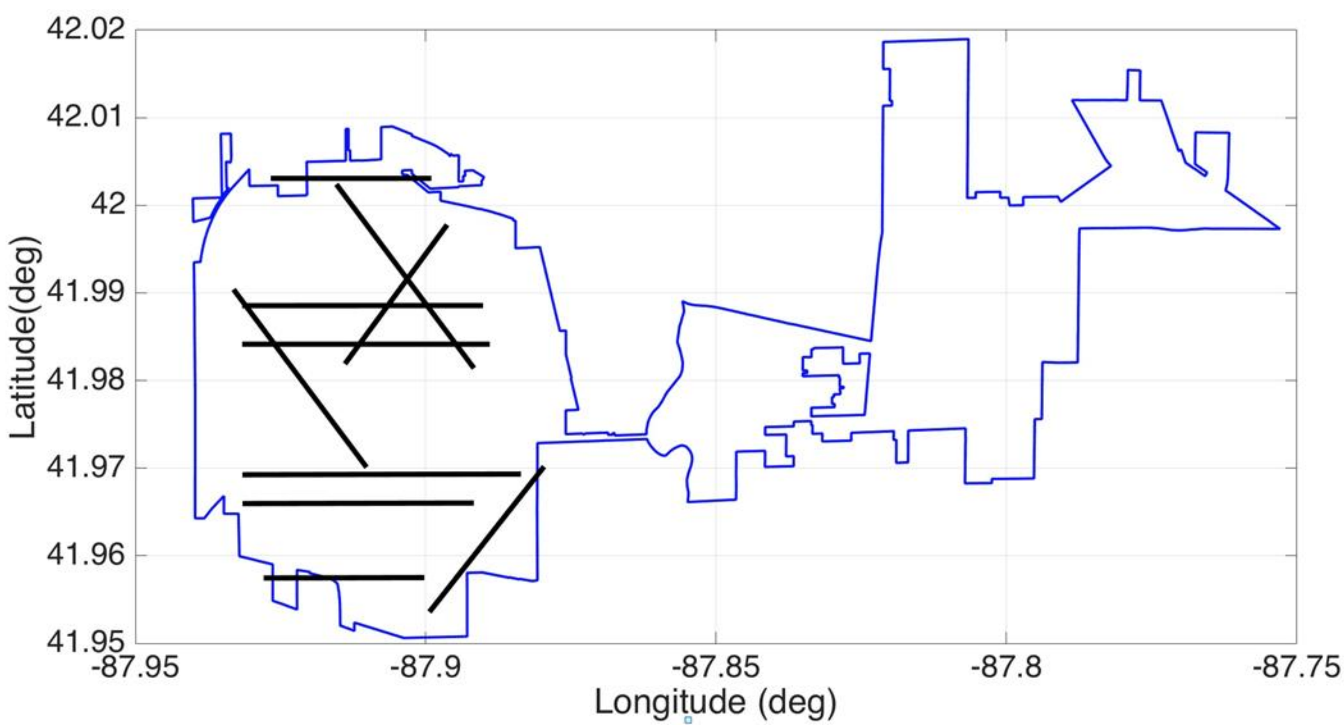


Figure 96: Ward 41 Boundaries

Appendix 4: SOC Noise Monitor Noise Events SOC Noise Monitors

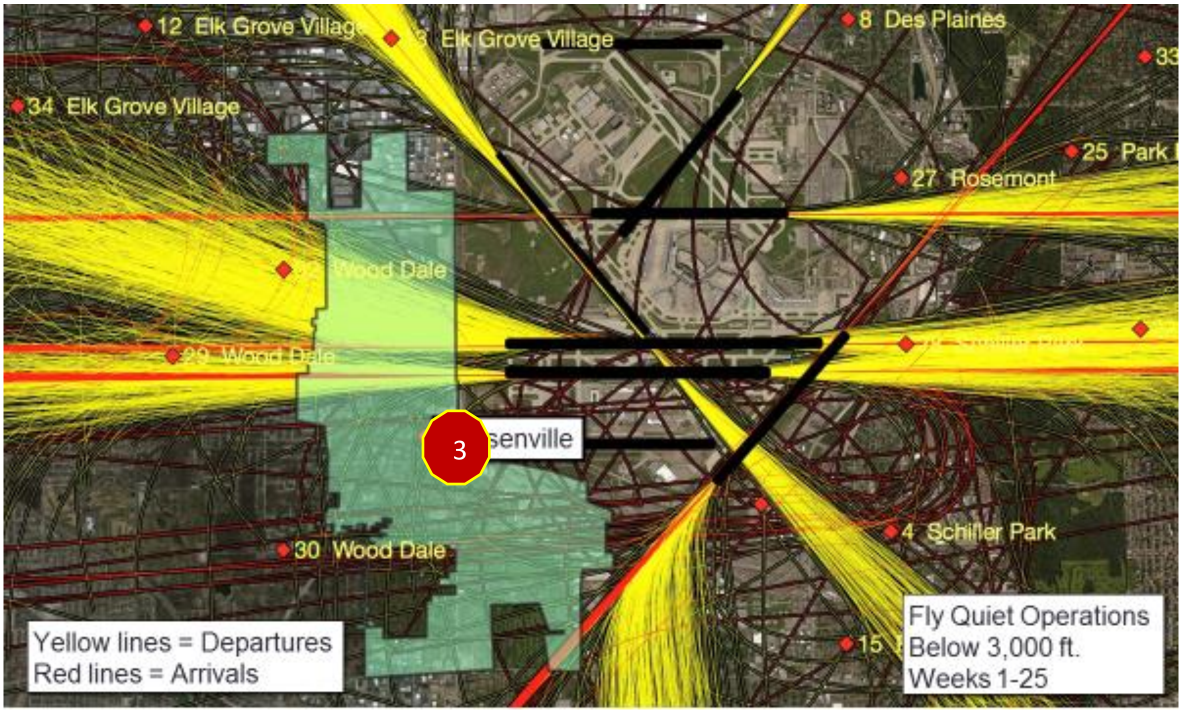


Figure 97: Noise Monitor 3 96 N. Mason Street Bensenville

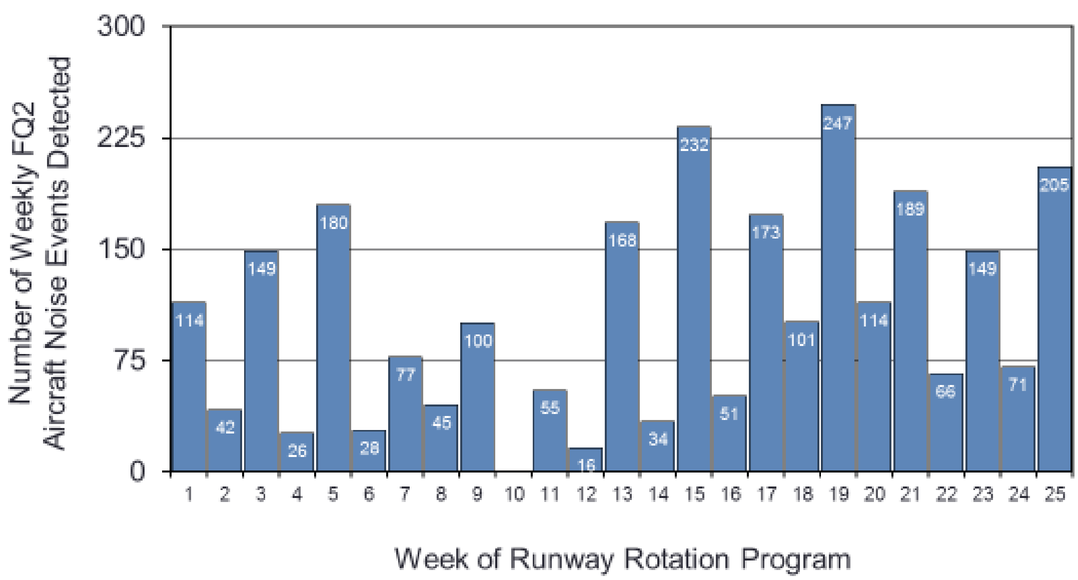


Figure 98: Bensenville Noise Monitor 3 Weekly FQ II Noise Events Weeks 1-25

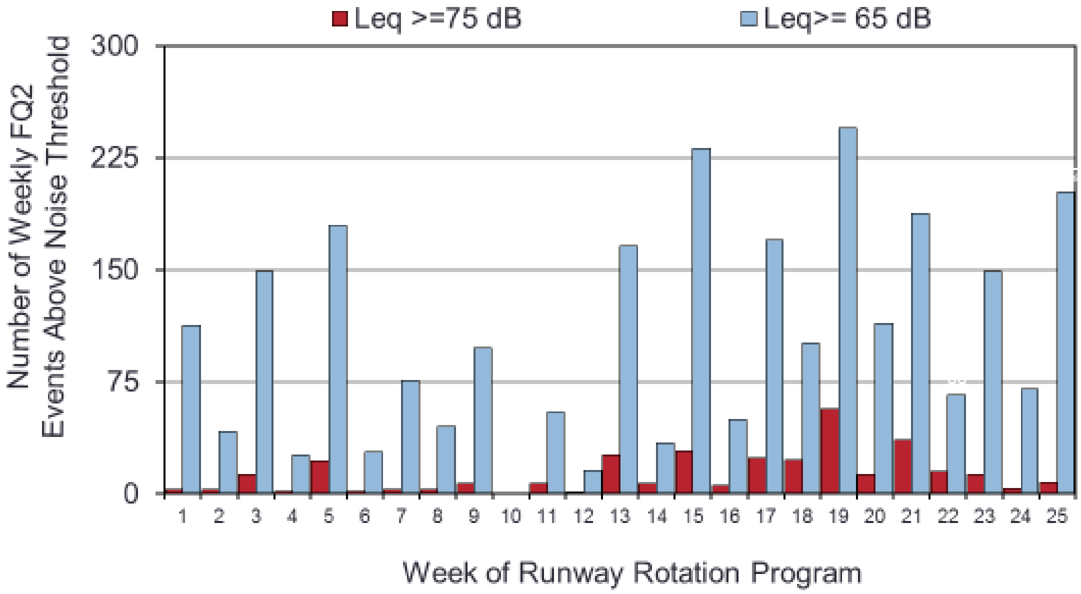


Figure 99: Bensenville Noise Monitor 3 FQ II Noise Events > 65 dB and >75 dB

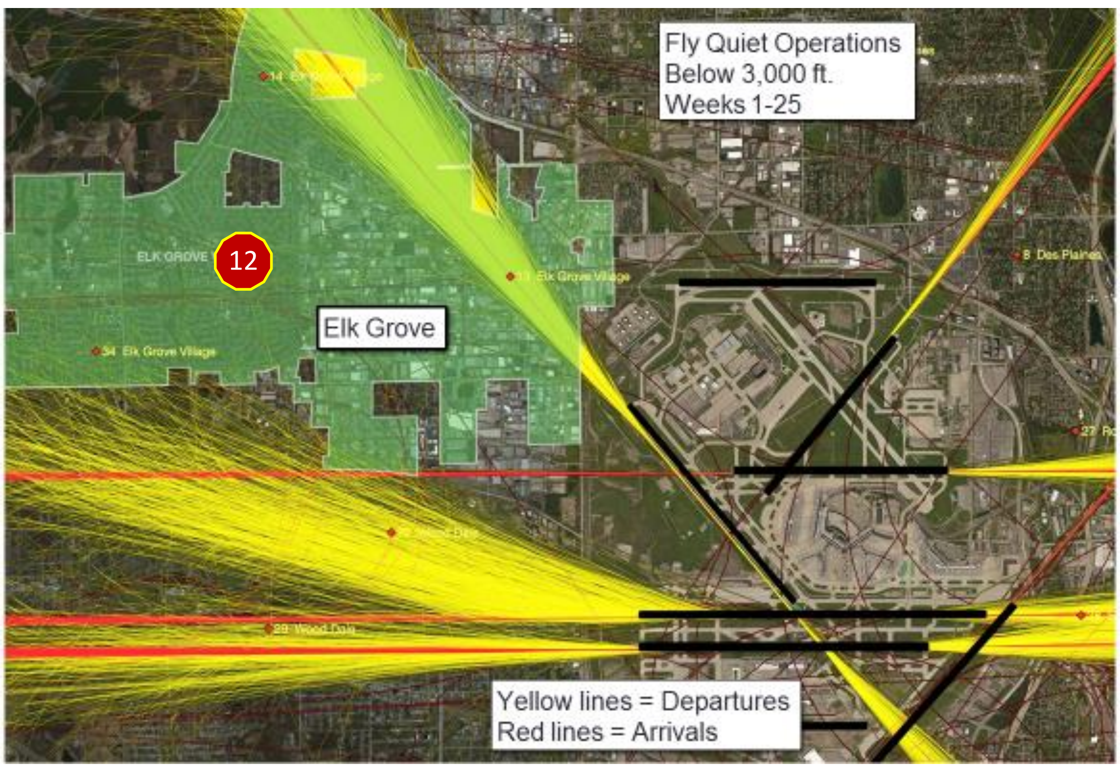


Figure 100: Noise Monitor 12 343 E Elk Grove Boulevard Elk Grove Village

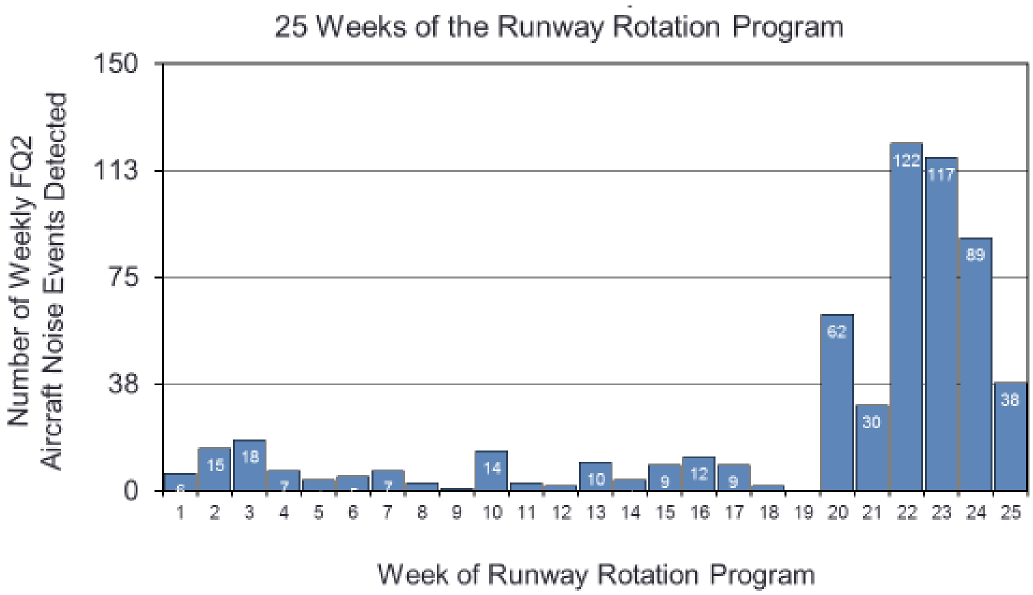


Figure 101: Noise Monitor 12 FQ II Noise events Weeks 1-25

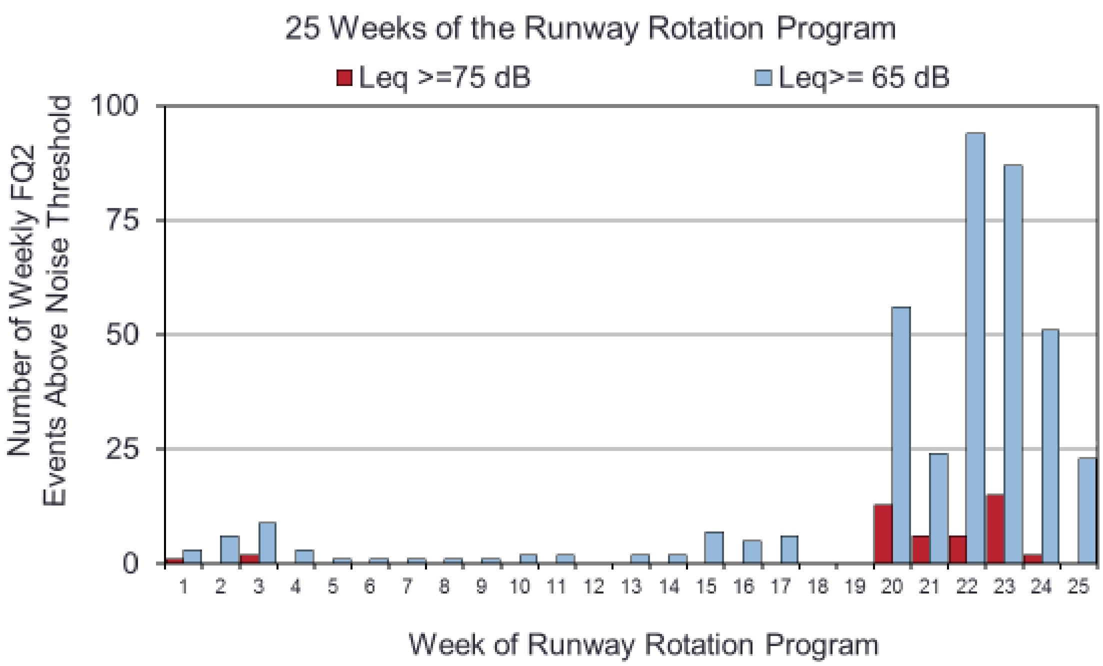


Figure 102: Elk Grove Noise Monitor 12 FQ II Noise Events > 65 dB and >75 dB

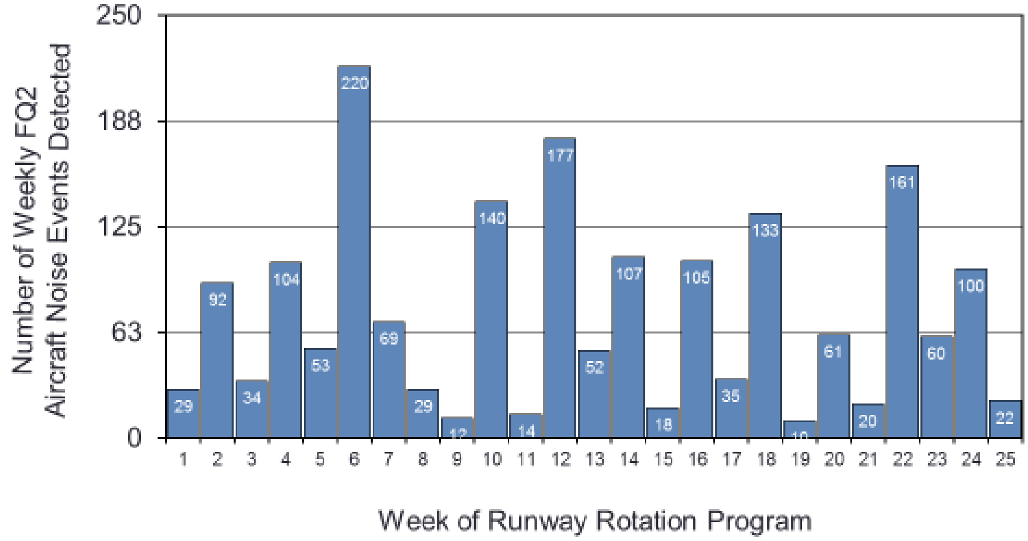


Figure 103: Noise Monitor 14 351 Briarwood Lane Elk Grove Village FQ II Noise events Weeks 1-25

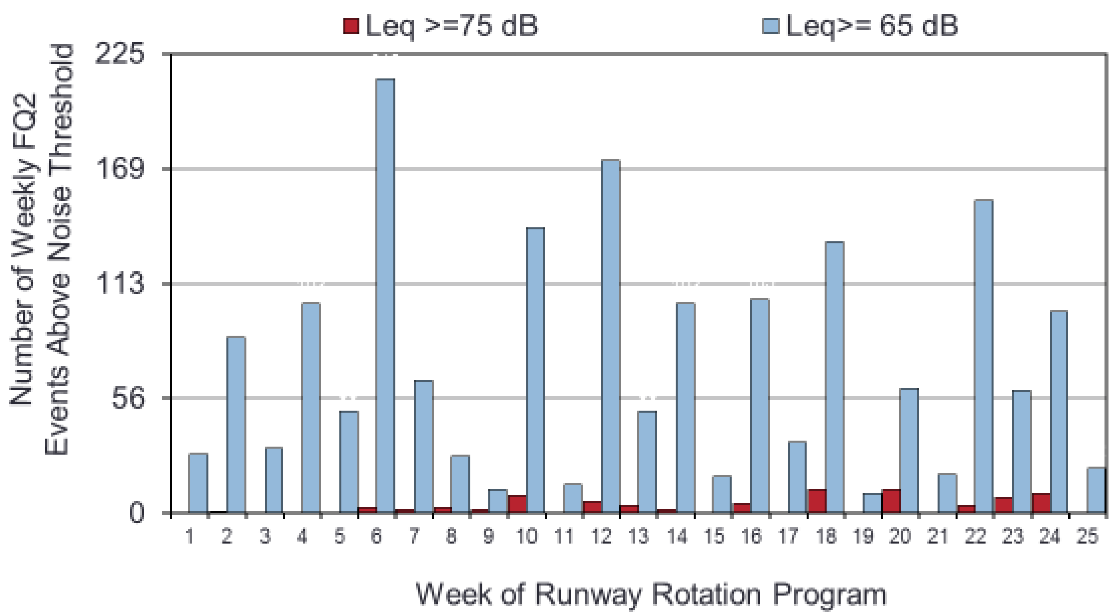


Figure 104: Elk Grove Noise Monitor 14 FQ II Noise Events > 65 dB and >75 dB

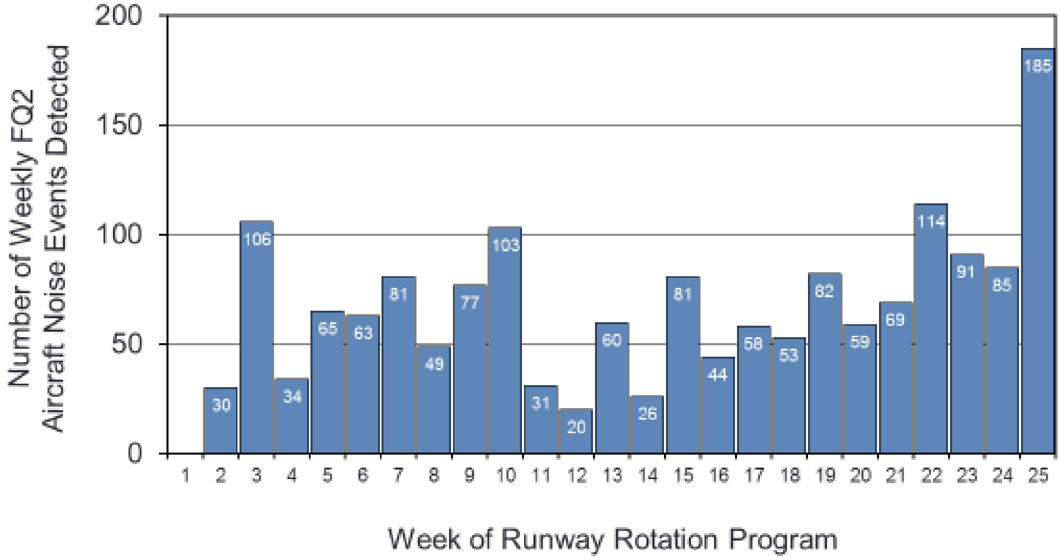


Figure 105: Noise Monitor 34 1240 Somerset Lane Elk Grove Village FQ II Noise events Weeks 1-25

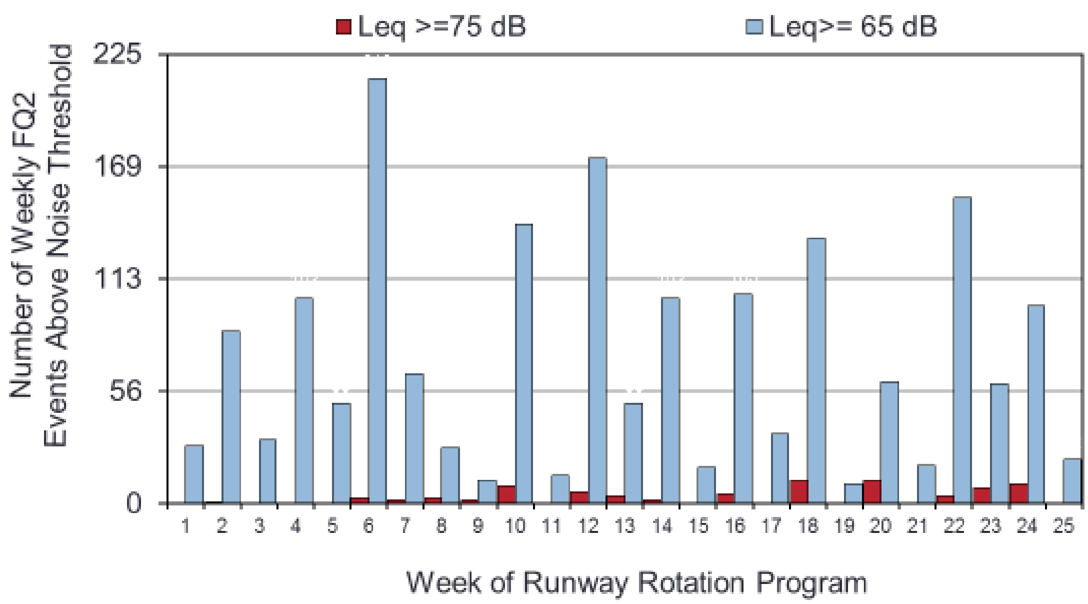


Figure 106: Elk Grove Noise Monitor 34 FQ II Noise Events > 65 dB and >75 dB

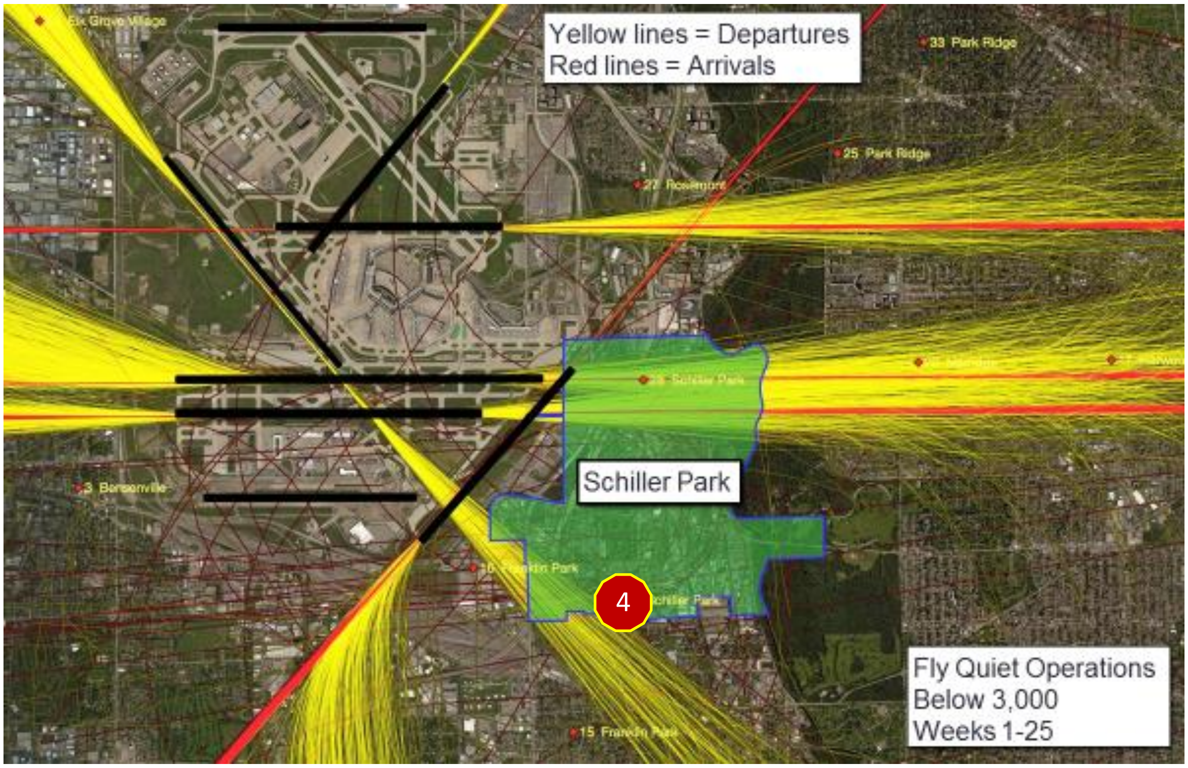


Figure 107: Noise Monitor #4 9879 Ivanhoe Avenue Schiller Park

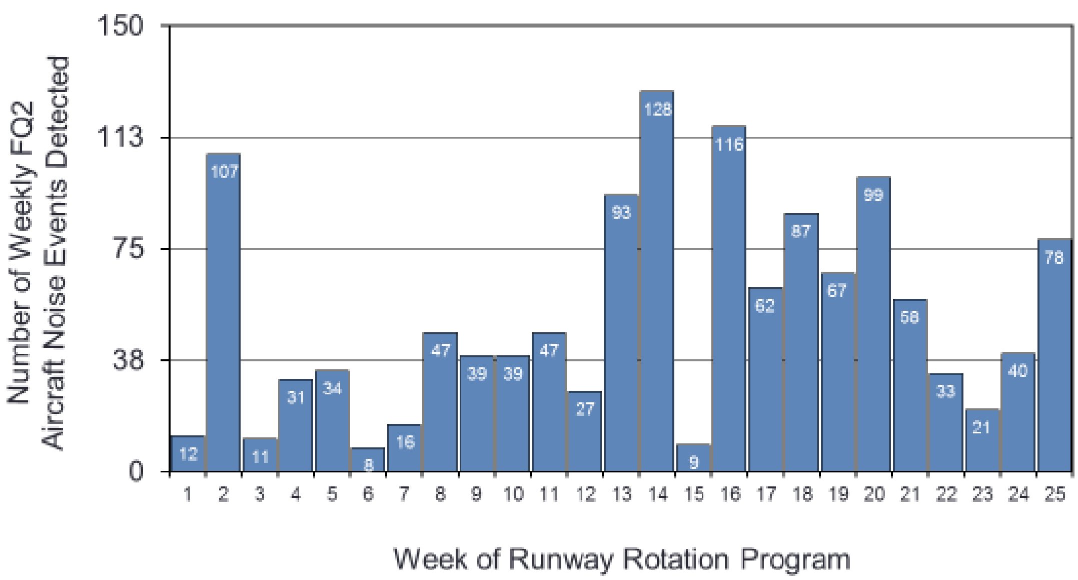


Figure 108: Noise Monitor 4 FQ II Noise events Weeks 1-25

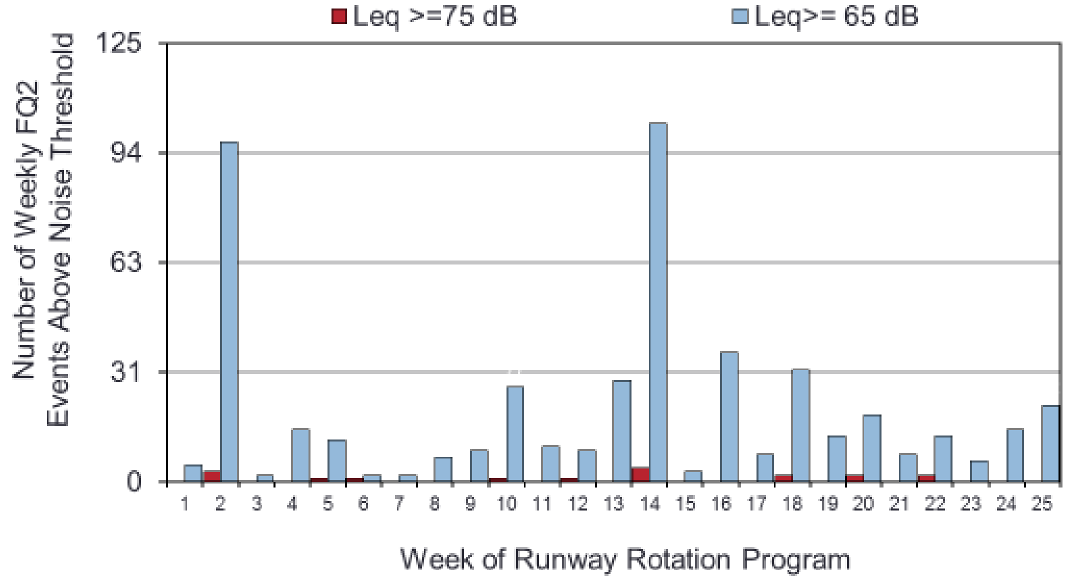


Figure 109: Schiller Park Noise Monitor 4 FQ II Noise Events > 65 dB and >75 dB

Appendix 5: Cumulative Density Leq Plots SOC Noise Monitors

Wood Dale and Bensenville Monitors

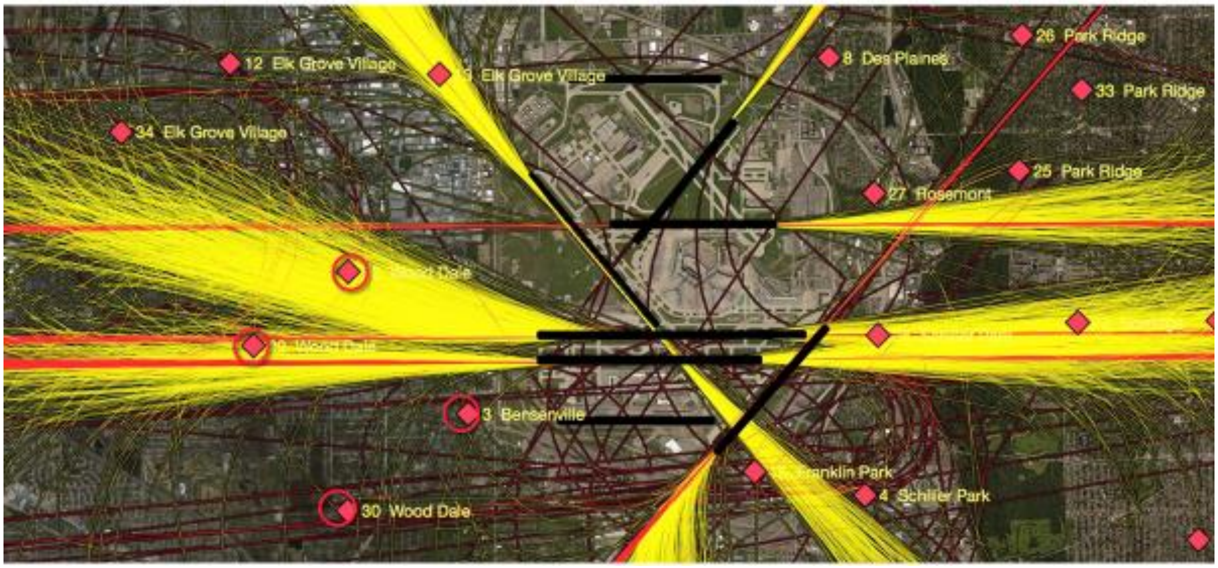


Figure 110: Wood Dale and Bensenville Noise Monitors 29, 30, 32 and 3

Wood Dale and Bensenville Leq CDF Curves

- Significant differences between monitors in Wood Dale
- Noise monitor #29 has the highest Leq readings because its located aligned with the flight path of runways 28R and 28C

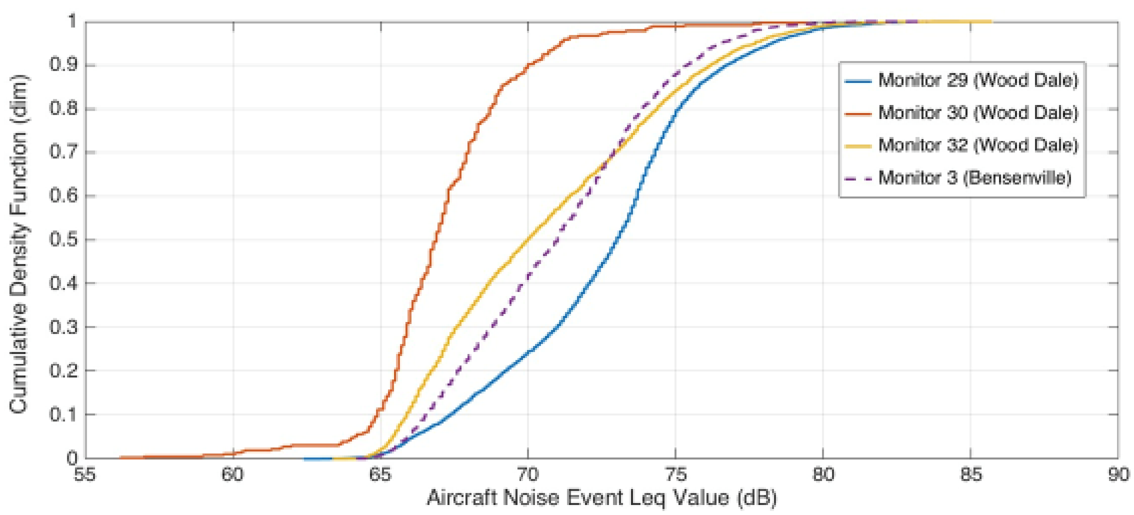


Figure 111: Wood Dale and Bensenville Cumulative Density Function Leq Curves

Schiller Park and Rosemont Monitors

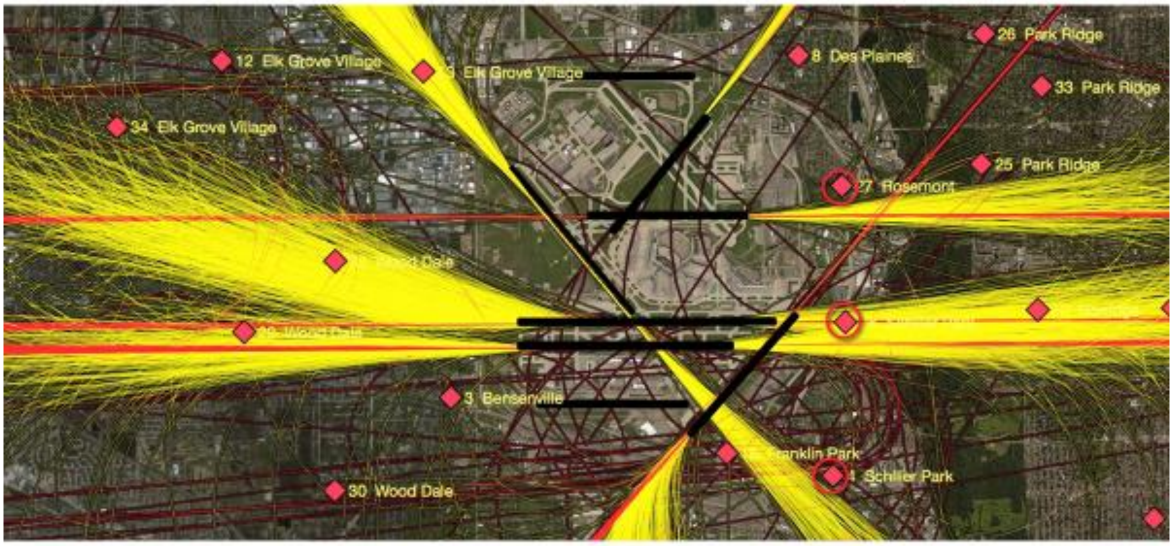


Figure 112: Schiller Park and Rosemont Noise Monitors 4, 28 and 27

Schiller Park and Rosemont Leq CDF Curves

- Significant differences between monitors in Schiller Park
- Noise monitor #28 has the highest Leq readings around ORD because is affected by arrivals on runway 28C and departures from 10C

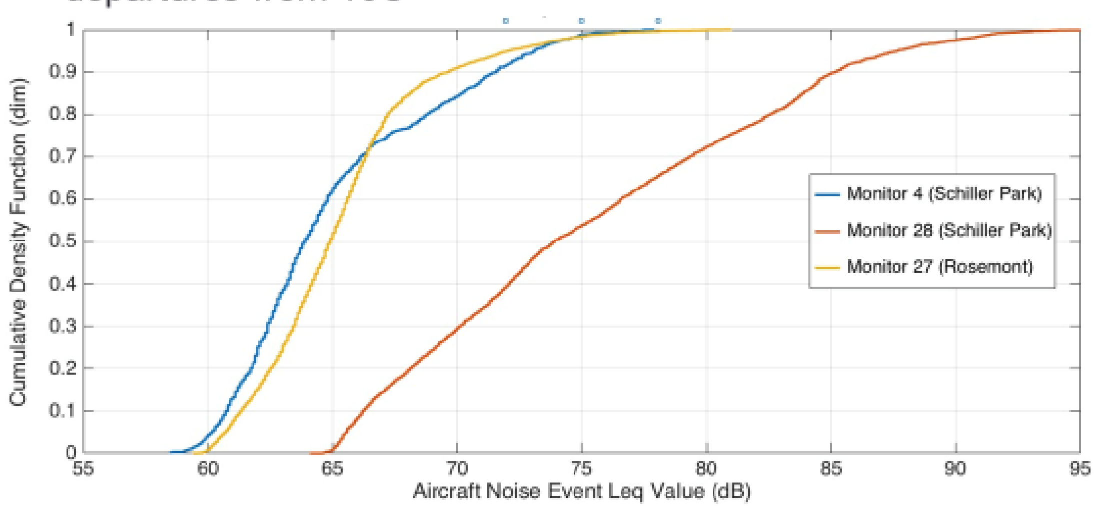


Figure 113: Schiller Park and Rosemont Cumulative Density Function Leq Curves

Norridge and Park Ridge Monitors

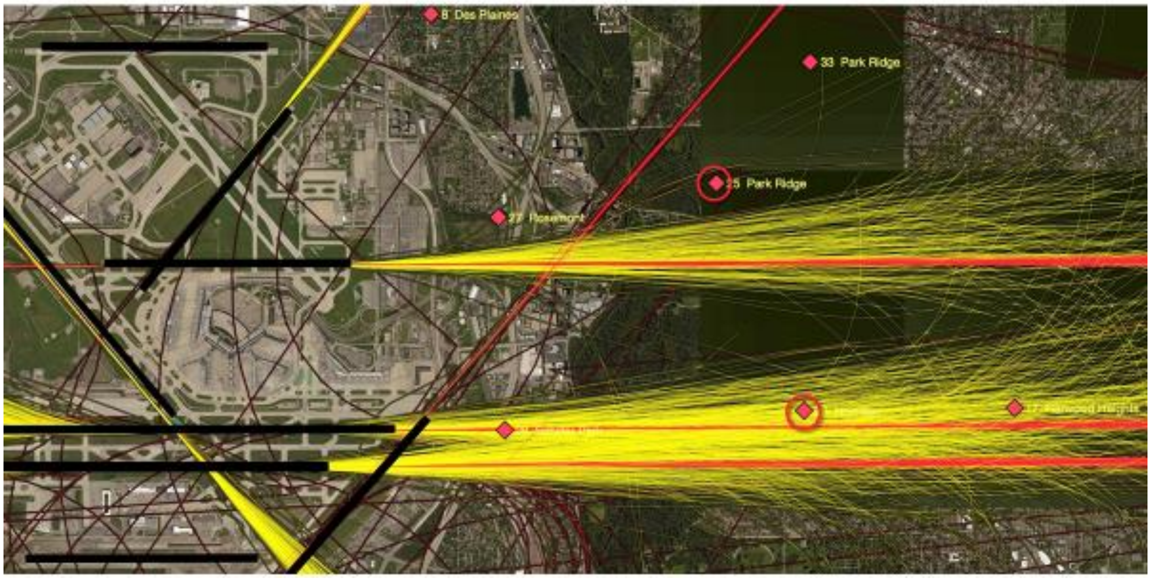


Figure 114: Norridge and Park Ridge Monitors 22 and 25

Norridge and Park Ridge Leq CDF Curves

- Significant differences between monitors located in Norridge and Park Ridge
- Noise monitor #22 is affected by runways 28C and 10C/10L

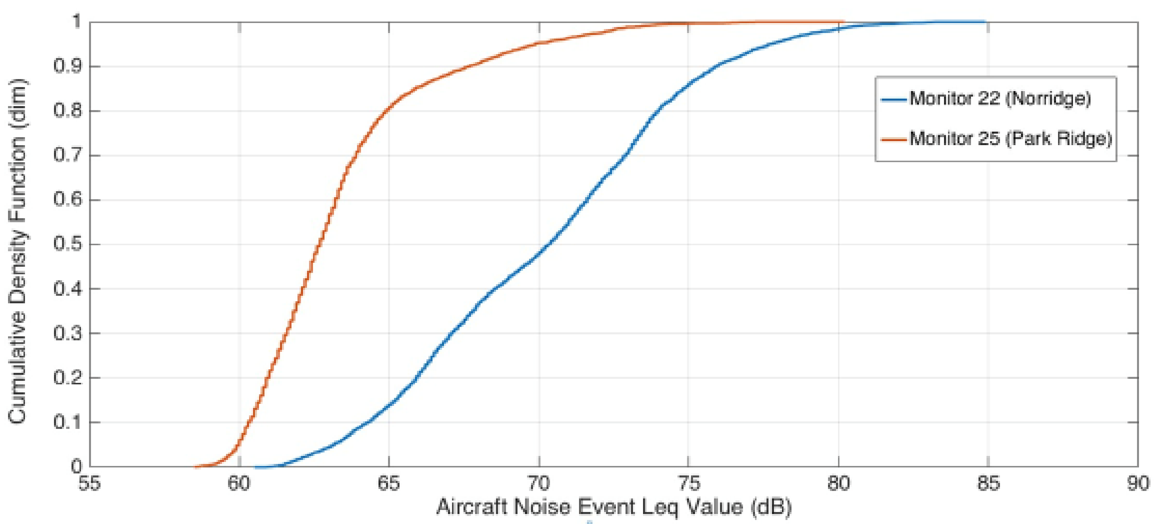


Figure 115: Norridge and Park Ridge Cumulative Density Function Leq Curves

Appendix 6: THE JDA TEAM

Author:

Dr. Antonio A. Trani, is a JDA associated consultant and Professor with the Department of Civil and Environmental Engineering at Virginia Tech University and is Co-Director of the National Center of Excellence for Aviation Operations Research (NEXTOR). He has been the Principal or Co-Principal Investigator on 68 research projects sponsored by the National Science Foundation, Federal Aviation Administration, National Aeronautics and Space Administration, National Consortium for Aviation Mobility, Federal Highway Administration, and the Center for Naval Analyses. Dr. Trani has provided noise, capacity and safety consulting services to the Norman Manley International Airport, Punta Cana International, National Institute for Aerospace (NIA), Xcelar, Quanta Technologies, Los Angeles World Airport, Charles Rivers Associates, Boeing Phantom Works, Civil Aviation Administration of China (CAAC), British Airports Authority (BAA), SEATAC Airport Authority, Louisville International Airport, Delta Airport Consultants, Celanese, and the MITRE Corporation.

Contributing:

Jim Krieger Senior Air Traffic Subject Matter Expert, has over 33 years of experience with the FAA, mostly in the Chicago area, working primarily at O'Hare Tower (ORD) as an air traffic controller, Area Supervisor, Area Manager, Staff Manager, Support Manager for Quality Assurance and finally, as the Air Traffic Manager. He was named Assistant Air Traffic Manager at Chicago Terminal Radar Approach Control (TRACON) in 2003 until 2008. Jim has FAA Headquarters experience too. In 2010, he was named the Chairman of the Airport Construction Advisory Council (ACAC), a panel of safety experts that was tasked with ensuring safety during airport construction projects. Jim served as the FAA's Group Manager for Runway Safety as well and used that experience as a tremendous opportunity to influence positive change nationwide and to move Runway Safety to the next level. Jim pioneered the conceptual procedure of the arrival-departure window tool to assist controllers with converging runway operations. He analyzed major airport construction projects across the National Airspace System to document and identify best practices during construction for air traffic managers and airport operators. Served as subject matter expert on many airport surface safety forums including "Navigating the Risks on the Airport Surface" for the Airline Pilots Association (ALPA) 59th Safety Forum. Mr. Krieger retired from the FAA in July 2015 as the Air Traffic Manager of O'Hare Tower.

Craig Burzych is an Air Traffic Operations Specialist, a JDA associated consultant and former career FAA Air Traffic Control Specialist. He spent 24 years working at the O'Hare Control Tower and 4 years working in the Chicago Midway Tower. He was detailed annually to lead the FAA Air Traffic Control support for the annual EAA Oshkosh "fly In" the single largest aviation show and exhibit held in the U.S. Craig served as President of the National Air Traffic Control Association (NATCA) (Chicago ORD) 9 years and also was a NATCA Aviation Safety Inspector and a member of the FAA Runway Safety Action team for the Great Lakes Region.

Joe Del Balzo, JDA Founder and President, served as the highest-ranking career professional (Acting Administrator) in the Federal Aviation Administration (FAA). Both in his long career with FAA (where he also served as FAA's Executive Director of System Operations, Executive Director for System Development, Director of the Eastern Region and Director of the FAA Technical Center) and in his subsequent private role as an aviation consultant, he has earned wide respect for his expertise in a wide range of aviation issues.

Cynthia Schultz PE, AAE, JDA Vice President of Airports, manages the JDA airport line of business including airport safety, noise assessments, sustainability, security, expert witness and training services. She has 12 years of commercial airport management experience combined with 26 years of public and private sector aviation project management. She has managed over thirty airport planning, engineering and infrastructure projects totaling more than $100 M including administering noise projects both as a manager of a commercial airport (12 years) and aviation consultant (6 years). She has applied for, administered and closed over $75M in federal airport improvement program grants. Prior to working in the airport industry, Cynthia was a Senior Engineer for the Boeing Company where she was a project manager for the horizontal and vertical stabilizer composite tooling package for the 777 new airplane program.