

APPENDIX A
REDIM ANALYSIS

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MEMORANDUM:

Date: February 15, 2022

To: Brian Zinn
Environmental Scientist
Austin-Bergstrom International Airport

From: RS&H, Inc.

Subject: AUS EA Runway 17R-35L REDIM Data Inputs and Results

This memorandum provides the data inputs and results for the FAA's Runway Exit Interactive Model Version 3.0.1 (REDIM) evaluation for the Environmental Assessment (EA) for the Airport Expansion and Development Program (AEDP) at Austin-Bergstrom International Airport (AUS or Airport).

Today, the operational functionality of the west airfield limits the overall efficiency of the Airport. A measure of the efficiency of the operation of a runway is the runway occupancy time (ROT), which is the number of seconds an arriving aircraft is on a runway once the aircraft has crossed the arrival runway threshold. Analysis of the existing condition found the ROT for Runway 18R-36L to be approximately 53.9 seconds for aircraft arriving in a south flow and 55.7 seconds for aircraft arriving in a north flow. This is above the optimal ROT of 50 seconds or less¹. Above 50 seconds, surface efficiency will improve but arrival runway capacity does not increase. With an ROT below 50 seconds, a higher arrival rate is possible to the runway in addition to reductions in taxi time on the airport surface.

The higher than preferred ROT is due primarily to the configuration and location of the exit taxiways from Runway 18R-36L, which are right-angled (90 degree) exits. Acute angled exit taxiways proposed as part of the AEDP are anticipated to reduce ROT to about 48.2 seconds in both south and north flow. This would be an improvement of 5.7 seconds for aircraft arriving in south flow and of 7.5 seconds for aircraft arriving in north flow. Additionally, the REDIM analysis evaluated various taxi exit locations to optimize the location of the acute angled exit taxiways to achieve an optimum average ROT. The results for these model runs are provided below.

REDIM Model Settings Input

The following Airport specific data and inputs were used in the REDIM analysis to conduct the analysis.

REDIM Model

Model Version: 3.0.1 – Date: 4/9/2020

Aircraft Fleet Mix

The aircraft fleet mix percentages presented in Table 1 were based on existing fleet mix and day/night breakout developed in the Aviation Environmental Design Tool (AEDT) as part of the baseline noise

¹ FAA Order JO 7110.65Z Air Traffic Control, June 17, 2021; FAA Order JO 7210.3CC Facility Operation and Administration, June 17, 2021
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analysis. The air carrier / cargo aircraft were modeled to keep the analysis consistent with the Master Plan as a point of comparison.

Table 1
2019 AIRCRAFT FLEET MIX

Aircraft Type(s)	REDIM ID	Percent of Fleet (%)
Bombardier CRJ 700	CRJ7	1.0
Airbus A319	A319	11.0
Airbus A320	A320	18.7
Airbus A321	A321	7.0
Boeing 717-200	B712	0.9
Boeing 737-400	B734	0.1
Boeing 737-700	B737	27.6
Boeing 737-800	B738	21.7
Boeing 737-900	B739	0.1
Bombardier CRJ 900	CRJ9	0.1
Embraer 170	E170	2.3
Embraer 175	E175	3.7
Embraer 190	E190	1.4
McDonnell Douglas MD-83	MD83	0.1
Airbus A300-600	A306	0.9
Boeing 757-300	B753	0.4
Boeing 767-300	B763	0.1
McDonnell Douglas DC-10	DC10	0.4
McDonnell Douglas MD-11	MD11	0.3
Airbus A340-300	A343	0.3
Boeing 747-400	B744	0.3
Boeing 777-200	B772	0.1
Boeing 777-300ER	B77W	0.1
Boeing 787-9	B789	0.1
Total		100 %

Environmental Data

- Airport elevation: 541 feet
- Airport temperature:
 - Baseline runs, 97 degrees Fahrenheit (average day in hottest month used)
 - Sensitivity Analysis runs, 85 degrees Fahrenheit (average daytime summer temperature)
- Runway length: 12,250 feet
- Runway cluster data used to analyze exit locations:
 - Baseline runs, 8,500 feet
 - Sensitivity Analysis runs, 7,000, 7,500, 8,000, and 9,000 feet
- Runway width: 150 feet
- Wet conditions: 20 percent wet surface conditions

REDIM RUNS

The REDIM analysis was conducted in the following analysis groupings.

**Runway Occupancy Times for Runway 18R-36L
(Master Plan, Existing Conditions, and Conditions with the AEDP)**

Master Plan			Master Plan			Existing RWY 18R-36L			Existing RWY 18R-36L			AEDP RWY 18R-36L		
18R SF	Exit	Capture	36L NF	Exit	Capture	18R SF	Exit	Capture	36L NF	Exit	Capture	18R/36L	Exit	Capture
5,400	90	16.2%	5,098	90	6.8%	5,210	90	9.7%	4,902	90	3.3%	5,248	30	22.4%
7,200	90	78.1%	6,900	90	81.4%	7,001	90	81.0%	6,700	90	78.7%	6,888	30	72.2%
12,047	90	5.7%	12,047	90	11.8%	12,024	90	9.3%	12,024	90	18.1%	9,020	90	5.4%
												12,025	90	0%
ROT		100%	ROT		100%	ROT		100%	ROT		100%	ROT		100%
58.5		Seconds	61		Seconds	59.9		Seconds	63.7		Seconds	51.6		Seconds
Run: 03			Run: 01			Run: 05			Run: 06			Run: 07		

*Note: Some of the model runs were used to test sensitivity and as such not all runs are displayed.

*Note: Baseline Model ran on 8,500' Runway Cluster and at 97 degrees Fahrenheit

- Runs 01 and 03 were analyzed to attempt to correlate the REDIM 2.0 runs developed in the Master Plan and utilized the same runway exit locations.
- Runs 05 and 06 model existing Taxiway T and Taxiway G with the point of curvature for these runway exits consistent with a right angle runway exits measured from Google Earth.
- Run 07 reflects the results from the runway exit locations from the AEDP.

The ROT for the existing Runway 18R-36L is about 63.7 seconds for aircraft arriving in a south flow and about 59.9 seconds for aircraft arriving in a north flow. Implementation of the runway exits included in the AEDP would reduce the ROT to about 51.6 seconds in both the south and north flow, which would be an improvement by 12.1 seconds for aircraft arriving in south flow and by 8.3 seconds for aircraft arriving in north flow.

The following model runs analyzed varying acute angled exit taxiway locations to optimize and reduce the ROT to be under 50 seconds.

**Runway Occupancy Times for Runway 18R-36L
Optimizing First Acute Exit Location**

Option 1			Option 2			Option 3			Option 4			Option 5			Option 6			Option 7		
18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture
5,000	30	12.0%	5,400	30	30.2%	5,500	30	35.7%	5,600	30	41.6%	5,750	30	50.7%	5,600	30	41.6%	5,600	30	41.6%
6,640	30	77.9%	7,040	30	66.3%	7,140	30	61.6%	7,240	30	56.4%	7,390	30	48.1%	7,000	30	54.0%	6,900	30	53.1%
9,020	90	10.0%	9,020	90	3.6%	9,020	90	2.7%	9,020	90	2.0%	9,020	90	1.2%	9,020	90	4.0%	9,020	90	5.2%
12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%
ROT		100%	ROT		100%	ROT		100%	ROT		100%	ROT		100%	ROT		100%	ROT		100%
52.2		Seconds	51.3		Seconds	51.1		Seconds	51		Seconds	50.9		Seconds	50.1		Seconds	49.8		Seconds
Run: 08			Run: 09			Run: 10			Run: 11			Run: 14			Run: 15			Run: 16		

*Note: Some of the model runs were used to test sensitivity and as such not all runs are displayed.

*Note: Baseline Model ran on 8,500' Runway Cluster and at 97 degrees Fahrenheit

- Runs 08, 09, 10, 11, 14, 15, and 16 analyzed varying distances for the first acute angled exit taxiway location. The second exit taxiway was kept within a range of 1,300 feet to 1,640 feet from the first exit taxiway.

- The aim for these runs was to achieve a minimum capture rate of 40 percent for the first acute angle exit to be consistent with the REDIM 2.0 runs from the Master Plan.
- Run 16 with runway exit distances of 5,600 feet and 6,900 feet resulted in the lowest ROT of 49.8 seconds. However, the geometry of the first runway exits crossing each other from north and south flow would cause a wide expanse of pavement with the throats of these runway exits overlapping. Subsequent runs evaluated a first acute angled exit taxiway location to minimize a wide expanse airfield geometry issue.

Runway Occupancy Times for Runway 18R-36L

First Acute Angled Exit Taxiway Location at 5,375 feet

Option 8			Option 9			Option 10			Option 11		
<u>18R/36L</u>	<u>Exit</u>	<u>Capture</u>	<u>18R/36L</u>	<u>Exit</u>	<u>Capture</u>	<u>18R/36L</u>	<u>Exit</u>	<u>Capture</u>	<u>18R/36L</u>	<u>Exit</u>	<u>Capture</u>
5,375	30	28.7%	5,375	30	28.7%	5,375	30	28.7%	5,375	30	28.7%
7,015	30	67.4%	6,775	30	64.0%	6,675	30	62.1%	6,900	30	66.0%
9,020	90	3.8%	9,020	90	7.2%	9,020	90	9.2%	9,020	90	5.2%
12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%
ROT		100%	ROT		100%	ROT		100%	ROT		100%
51.4		Seconds	50.6		Seconds	50.5		Seconds	50.9		Seconds
Run: 17			Run: 18			Run: 19			Run: 20		

*Note: Baseline Model ran on 8,500' Runway Cluster and at 97 degrees Fahrenheit

- Runs 17 through 20 evaluated varying second acute angled exit taxiway locations with the first exit fixed at 5,375 feet. This distance sets the throats of the entry points to the first acute angled exit taxiways in both north and south flow closer together up to the point before they start to overlap at the edge of the runway.
- The capture rate for the first runway exit is less than 30 percent and the runway exits do not perform as well as options with the first angled exit located at 5,600 feet from the arrival runway threshold.

Runway Occupancy Times for Runway 18R-36L

First Acute Angled Exit Taxiway Location at 5,750 or 5,800 feet

Option 12			Option 13			Option 14		
<u>18R/36L</u>	<u>Exit</u>	<u>Capture</u>	<u>18R/36L</u>	<u>Exit</u>	<u>Capture</u>	<u>18R/36L</u>	<u>Exit</u>	<u>Capture</u>
5,800	30	53.6%	5,750	30	50.7%	5,750	30	50.7%
6,900	30	41.2%	6,900	30	44.1%	7,000	30	45.4%
9,020	90	5.2%	9,020	90	5.2%	9,020	90	4.0%
12,025	90	0%	12,025	90	0%	12,025	90	0%
ROT		100%	ROT		100%	ROT		100%
49.4		Seconds	49.4		Seconds	49.6		Seconds
Run: 21			Run: 22			Run: 23		

*Note: Baseline Model ran on 8,500' Runway Cluster and at 97 degrees Fahrenheit

- Runs 21 through 23 evaluated the first angled exit taxiway at 5,750 feet and at 5,800 feet from the arrival runway threshold with a second angled exit located at 6,900 feet and 7,000 feet from the arrival runway threshold respectively. The distance for the first acute angled exit taxiway sets the

throat of the exits past each other to a point where a wide expanse of pavement issue is minimized.

- The capture rate for the first exit taxiway is greater than 50 percent for all the runs.
- Run 21 provides the first acute angled runway exit taxiway at 5,800 feet from the arrival runway threshold with a second acute angled exit taxiway location at 6,900 feet from the arrival runway threshold and provides the lowest overall ROT time of 49.4 seconds.

Runway Occupancy Times for Runway 18R-36L

Sensitivity Analysis: Conditions with the AEDP Utilizing Different Cluster Data

Sensitivity Analysis - REDIM runs to evaluate different runway clusters for AEDP - from Run 07

AEDP RWY 18R-36L			AEDP RWY 18R-36L			AEDP RWY 18R-36L			AEDP RWY 18R-36L			AEDP RWY 18R-36L		
18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture
5,248	30	22.4%	5,248	30	62.1%	5,248	30	28.3%	5,248	30	47.0%	5,248	30	17.7%
6,888	30	72.2%	6,888	30	37.4%	6,888	30	67.4%	6,888	30	51.7%	6,888	30	72.1%
9,020	90	5.4%	9,020	90	0.5%	9,020	90	4.4%	9,020	90	1.3%	9,020	90	10.2%
12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%
ROT		100%	ROT		100%	ROT		100%	ROT		100%	ROT		100%
51.6		Seconds	47.2		Seconds	50.9		Seconds	48.6		Seconds	52.5		Seconds
Run: 07			Run: 25			Run: 26			Run: 27			Run: 28		
* 8,500' Runway Cluster			* 7,000' Runway Cluster			* 7,500' Runway Cluster			* 8,000' Runway Cluster			* 9,000' Runway Cluster		

*Note: Model ran on noted Runway Cluster data and at 97 degrees Fahrenheit

- Runs 25 through 28 evaluated conditions with the AEDP using various Runway Cluster data. Run 07 from the baseline runs is shown for comparison purposes.
- Input from the tower provided after the baseline runs indicated that existing right angle Taxiway G captures 29% of the total aircraft arrival fleet in south flow at 5,210 feet from threshold and 99% of the total aircraft arrival fleet in north flow at 6,700 feet from the threshold. Therefore, a minimum of 30% capture rate was used as the minimum expected capture rate for the first acute angled exit located exit at a similar distance of 5,248 under the AEDP. Runway clusters 7,000 and 8,000 feet both captured greater than 30% for the first exit and were carried forward to the next step.

Runway Occupancy Times for Runway 18R-36L

Sensitivity Analysis: Option 12 - First Acute Angled Exit Taxiway Location at 5,800 Utilizing Different Cluster Data

18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture
5,800	30	53.6%	5,800	30	86.3%	5,800	30	59.6%	5,800	30	77.5%	5,800	30	43.3%
6,900	30	41.2%	6,900	30	13.2%	6,900	30	36.2%	6,900	30	21.3%	6,900	30	46.8%
9,020	90	5.2%	9,020	90	0.5%	9,020	90	4.2%	9,020	90	1.3%	9,020	90	9.9%
12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%
ROT		100%	ROT		100%	ROT		100%	ROT		100%	ROT		100%
49.4		Seconds	48.1		Seconds	49		Seconds	47.9		Seconds	50.6		Seconds
Run: 21			Run: 29			Run: 30			Run: 31			Run: 32		
* 8,500' Runway Cluster			* 7,000' Runway Cluster			* 7,500' Runway Cluster			* 8,000' Runway Cluster			* 9,000' Runway Cluster		

*Note: Model ran on noted Runway Cluster data and at 97 degrees Fahrenheit

- Runs 29 through 32 evaluated Option 12 which placed the first acute angled exit at 5,800 feet using various Runway Cluster data. Run 21 from the baseline runs is shown for comparison purposes.

- From the baseline runs, 5,800 feet became the furthest first acute exit location from threshold considered.
- The cluster data runs for 7,500, 8,500, and 9,000 were carried forward for comparison purposes only. The 7,000 and 8,000 cluster data runs were carried forward from the previous step as viable options. Both achieved an ROT under 50 seconds at 48.1 seconds and 47.9 seconds respectively. However, the capture rate over 75% on the first exit suggests that the first exit may optimize between 5,248 and 5,800 feet as the exits would be more balanced. The 8,000-foot cluster data was carried forward to the next step.

Runway Occupancy Times for Runway 18R-36L

Sensitivity Analysis: Existing Conditions, Conditions with the AEDP, Option 7, Option 10, and Option 12 - Utilizing the 8,000 Cluster at 85 degrees Fahrenheit

Existing RWY 18R-36L			Existing RWY 18R-36L			AEDP RWY 18R-36L			Option 7			Option 10			Option 12		
18R SF	Exit	Capture	36L NF	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture	18R/36L	Exit	Capture
5,210	90	31.8%	4,902	90	15.2%	5,248	30	52.1%	5,600	30	72.3%	5,375	30	59.8%	5,800	30	81.2%
7,001	90	66.4%	6,700	90	80.5%	6,888	30	47.0%	6,900	30	26.8%	6,675	30	38.4%	6,900	30	17.9%
12,024	90	1.8%	12,024	90	4.4%	9,020	90	0.9%	9,020	90	0.9%	9,020	90	1.8%	9,020	90	0.9%
						12,025	90	0%	12,025	90	0%	12,025	90	0%	12,025	90	0%
ROT	100%		ROT	100%		ROT	100%		ROT	100%		ROT	100%		ROT	100%	
53.9	Seconds		55.7	Seconds		48.2	Seconds		47.5	Seconds		47.1	Seconds		48	Seconds	
Run: 36 - 05 Adjusted			Run: 37 - 06 Adjusted			Run: 38 - 07 / 27 Adjusted			Run: 44 - 16 Adjusted			Run: 46 - 19 Adjusted			Run: 39 - 21 Adjusted		

*Note: Baseline Model ran on 8,000' Runway Cluster and at 85 degrees Fahrenheit

*Note: Some of the model runs were used to test sensitivity and as such not all runs are displayed.

- Runs 36, 37, 38, 39, 44 and 46 ran an additional sensitivity analysis on the Existing Conditions, Conditions with the AEDP, Option 7, Option 10, and Option 12 on the 8,000-foot runway cluster and at 85 degrees Fahrenheit. The baseline runs for each of these runs is noted in the table above. 85 degrees Fahrenheit represents the average daily temperature for the months of July and August.
- Model runs for Conditions with the AEDP, Option 7, Option 10, and Option 12 all resulted in ROT under 50 seconds.
- The ROT between these 3 options ranged from 47.1 seconds (Option 10) to 48.2 seconds (Conditions with the AEDP). The first acute angle exit capture rate ranged from 52.1 to 81.2 percent.
- Option 10 with the first acute angled taxiway located at 5,375 feet from threshold performed the best with an ROT of 47.1 seconds and had a more balanced use of the acute angled exits with a capture split at approximately 60 / 38 for the first two exits. Under these parameters, the airfield appears to optimize with a first acute exit between 5,375 and 5,600 feet. However, as stated above, the geometry of the first runway exits crossing each other from north and south flow may cause a wide expanse of pavement with the throats of these runway exits overlapping at 5,600 feet and would need to be studied further in design.

Conclusion:

- Given the parameters analyzed, achieving an ROT under 50 seconds is possible under the Conditions with the AEDP and will be carried forward in the Environmental Assessment.
- The ROT can be further reduced by shifting the first acute angled exit taxiway approximately 125 – 350 feet further from the arrival runway arrival threshold. The second acute angled exit taxiway is located at 6,675-6,900 feet from the arrival runway threshold in a similar location to that included in the AEDP.

- During design, the geometry of the exit taxiway locations will require further study. It is also recommended that field observations be completed to collect taxiway exit capture rate data on the both Runway 18L-36R and Runway 18R-36L to evaluate taxiway exit capture rates to further calibrate these results against different cluster analysis results from the model.

The following pages depict the REDIM summary output from the existing runway, the runway under the AEDP, and optimized ROT runs.

Existing Runway 18R South Flow – Run #36 -05 Adjusted

Runway Exit Locations

(36-05_EX_SF_20W_MP_AC-8000C-adjusted-85Degrees)

Exit	Exit Status	Exit Type	Point Of Curvature Location (ft)
1	Open	90°	5,210
2	Open	90°	7,001
3	Open	90°	12,024

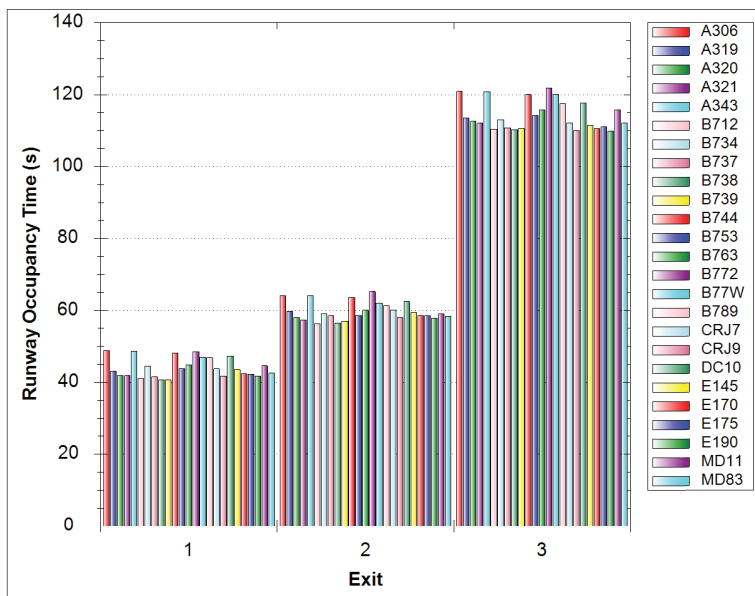
Runway Occupancy Times (53.9 s - Std Dev: 11.7 s)

(36-05_EX_SF_20W_MP_AC-8000C-adjusted-85Degrees)

Aircraft Name	1	2	3
A306	48.8s	64.2s	120.9s
A319	43.2s	59.8s	113.5s
A320	41.9s	58.1s	112.6s
A321	41.8s	57.4s	112.0s
A343	48.7s	64.1s	120.8s
B712	41.1s	56.3s	110.4s
B734	44.5s	59.1s	113.1s
B737	41.6s	58.5s	110.7s
B738	40.7s	56.5s	110.2s
B739	40.7s	57.0s	110.6s
B744	48.2s	63.7s	120.0s
B753	43.9s	58.5s	114.3s
B763	44.9s	60.0s	115.7s
B772	48.5s	65.2s	121.9s
B77W	46.9s	62.0s	120.1s
B789	46.9s	61.4s	117.5s
CRJ7	43.7s	60.1s	112.1s
CRJ9	41.8s	58.0s	110.0s
DC10	47.4s	62.5s	117.6s
E145	43.6s	59.4s	111.4s
E170	42.4s	58.6s	110.6s
E175	42.3s	58.5s	111.0s
E190	41.8s	57.8s	109.8s
MD11	44.6s	59.1s	115.8s
MD83	42.6s	58.4s	112.1s

Runway Occupancy Times (53.9 s - Std Dev: 11.7 s)

(36-05_EX_SF_20W_MP_AC-8000C-adjusted-85Degrees)



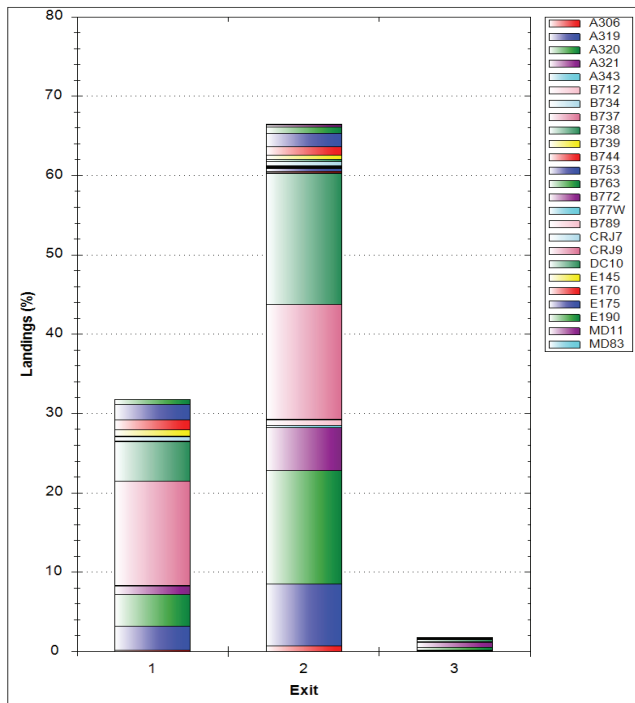
Runway Exit Aircraft Assignment

(36-05_EX_SF_20W_MP_AC-8000C-adjusted-85Degrees)

Aircraft Name	1	2	3	Aircraft Mix
A306	16.1%	73.6%	10.3%	0.9%
A319	27.9%	71.6%	0.6%	10.9%
A320	21.4%	76.4%	2.2%	18.7%
A321	14.8%	77.3%	7.9%	7.1%
A343	14.8%	74.3%	10.9%	0.3%
B712	9.0%	86.3%	4.7%	0.9%
B734	21.0%	73.2%	5.8%	0.1%
B737	47.5%	52.3%	0.1%	27.6%
B738	22.7%	76.0%	1.3%	21.7%
B739	24.1%	74.7%	1.1%	0.1%
B744	10.5%	80.2%	9.3%	0.3%
B753	10.2%	80.9%	8.9%	0.4%
B763	8.4%	85.3%	6.3%	0.1%
B772	20.6%	78.4%	1.0%	0.1%
B77W	5.2%	87.4%	7.4%	0.1%
B789	7.6%	76.9%	15.5%	0.1%
CRJ7	48.7%	51.0%	0.3%	0.9%
CRJ9	30.2%	67.5%	2.3%	0.1%
DC10	23.2%	61.6%	15.2%	0.4%
E145	62.5%	37.3%	0.1%	1.3%
E170	53.5%	46.2%	0.3%	2.3%
E175	53.7%	46.0%	0.3%	3.7%
E190	40.1%	59.1%	0.8%	1.4%
MD11	9.3%	82.0%	8.8%	0.3%
MD83	18.4%	78.4%	3.1%	0.1%
Exit Mix	31.8%	66.4%	1.8%	

Runway Exit Aircraft Assignment

(36-05_EX_SF_20W_MP_AC-8000C-adjusted-85Degrees)



Existing Runway 36L North Flow – Run #37 - #06 Adjusted

Runway Exit Locations

(37-06_EX_NF35L_20W_MP_AC-8000C_85Deg)

Exit	Exit Status	Exit Type	Point Of Curvature Location (ft)
1	Open	90°	4,902
2	Open	90°	6,699
3	Open	90°	12,024

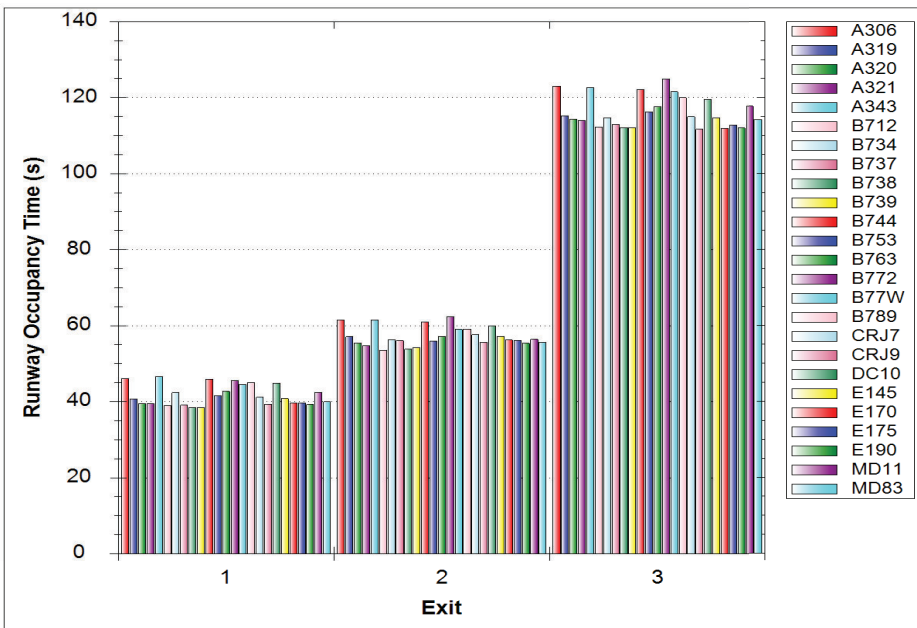
Runway Occupancy Times (55.7 s - Std Dev: 14.5 s)

(37-06_EX_NF35L_20W_MP_AC-8000C_85Deg)

Aircraft Name	1	2	3
A306	46.1s	61.5s	123.1s
A319	40.7s	57.1s	115.3s
A320	39.5s	55.4s	114.3s
A321	39.5s	54.8s	114.0s
A343	46.7s	61.6s	122.6s
B712	39.0s	53.5s	112.3s
B734	42.4s	56.4s	114.7s
B737	39.1s	56.1s	113.0s
B738	38.5s	53.8s	112.2s
B739	38.5s	54.3s	112.1s
B744	45.8s	60.9s	122.2s
B753	41.6s	55.9s	116.2s
B763	42.7s	57.1s	117.6s
B772	45.6s	62.4s	124.8s
B77W	44.6s	59.0s	121.5s
B789	45.1s	59.1s	120.0s
CRJ7	41.2s	57.7s	115.0s
CRJ9	39.4s	55.6s	111.7s
DC10	44.8s	59.9s	119.5s
E145	40.8s	57.2s	114.8s
E170	39.7s	56.2s	112.0s
E175	39.7s	56.1s	112.8s
E190	39.3s	55.4s	112.0s
MD11	42.5s	56.4s	117.8s
MD83	39.9s	55.6s	114.2s

Runway Occupancy Times (55.7 s - Std Dev: 14.5 s)

(37-06_EX_NF35L_20W_MP_AC-8000C_85Deg)



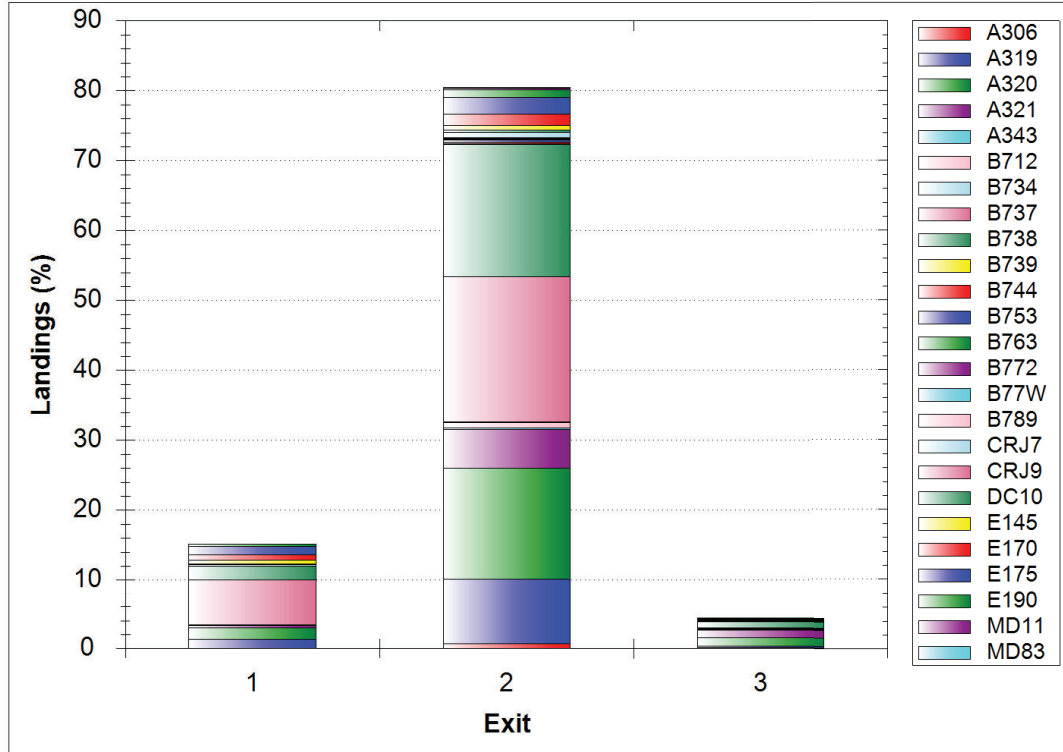
Runway Exit Aircraft Assignment

(37-06_EX_NF35L_20W_MP_AC-8000C_85Deg)

Aircraft Name	1	2	3	Aircraft Mix
A306	7.4%	74.9%	17.7%	0.9%
A319	11.4%	86.4%	2.2%	10.9%
A320	8.8%	85.0%	6.2%	18.7%
A321	5.6%	79.0%	15.4%	7.1%
A343	6.3%	74.8%	18.9%	0.3%
B712	2.2%	85.6%	12.2%	0.9%
B734	11.0%	78.3%	10.7%	0.1%
B737	24.1%	75.3%	0.5%	27.6%
B738	8.7%	87.1%	4.2%	21.7%
B739	9.3%	87.5%	3.2%	0.1%
B744	3.0%	79.9%	17.1%	0.3%
B753	3.5%	79.1%	17.4%	0.4%
B763	2.0%	85.2%	12.8%	0.1%
B772	7.5%	88.6%	3.9%	0.1%
B77W	1.3%	83.2%	15.5%	0.1%
B789	2.0%	70.9%	27.1%	0.1%
CRJ7	28.2%	70.8%	1.0%	0.9%
CRJ9	12.9%	81.5%	5.6%	0.1%
DC10	13.9%	64.4%	21.7%	0.4%
E145	43.0%	56.3%	0.7%	1.3%
E170	32.5%	66.6%	1.0%	2.3%
E175	32.6%	66.4%	0.9%	3.7%
E190	21.4%	76.2%	2.4%	1.4%
MD11	3.5%	79.1%	17.4%	0.3%
MD83	6.7%	86.1%	7.2%	0.1%
Exit Mix	15.2%	80.5%	4.4%	

Runway Exit Aircraft Assignment

(37-06_EX_NF35L_20W_MP_AC-8000C_85Deg)



Conditions with AEDP – Run #38 - #07 Adjusted

Runway Exit Locations

(38-27_07A_ALP_SYM_20W_MP_8000CL_9020Exit85Deg)

Exit	Exit Status	Exit Type	Point Of Curvature Location (ft)
1	Open	30° (with 1,400 ft spiral)	5,249
2	Open	30° (with 1,400 ft spiral)	6,886
3	Open	90°	9,019

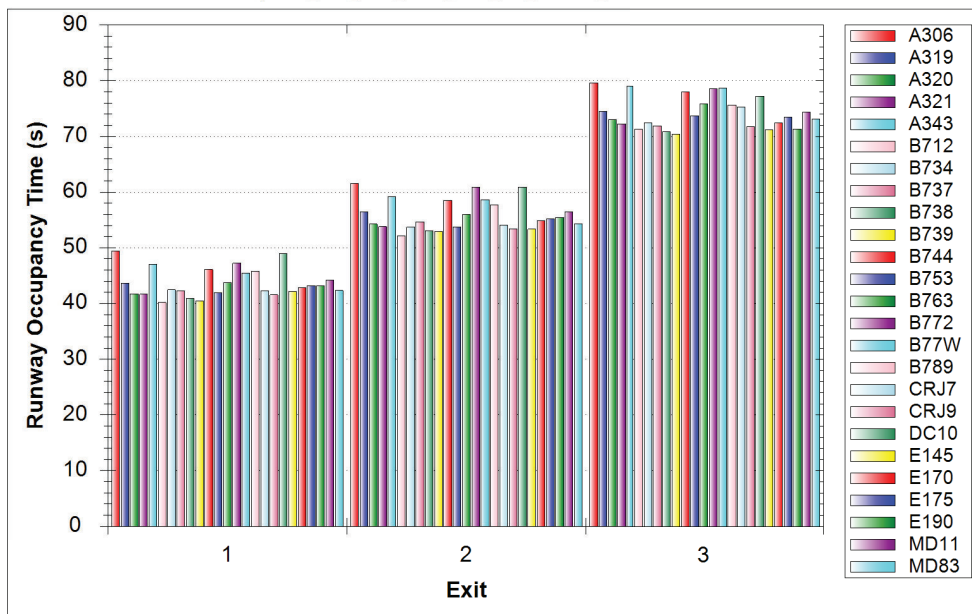
Runway Occupancy Times (48.2 s - Std Dev: 7.6 s)

(38-27_07A_ALP_SYM_20W_MP_8000CL_9020Exit85Deg)

Aircraft Name	1	2	3
A306	49.4s	61.5s	79.6s
A319	43.7s	56.4s	74.5s
A320	41.7s	54.3s	73.0s
A321	41.7s	53.8s	72.2s
A343	47.1s	59.1s	79.1s
B712	40.2s	52.1s	71.3s
B734	42.4s	53.7s	72.4s
B737	42.3s	54.7s	71.9s
B738	41.0s	53.1s	70.9s
B739	40.5s	52.9s	70.4s
B744	46.1s	58.5s	78.0s
B753	41.9s	53.7s	73.7s
B763	43.7s	56.0s	75.9s
B772	47.2s	60.9s	78.5s
B77W	45.5s	58.6s	78.7s
B789	45.8s	57.7s	75.7s
CRJ7	42.3s	54.0s	75.3s
CRJ9	41.5s	53.4s	71.8s
DC10	49.0s	60.9s	77.2s
E145	42.2s	53.3s	71.2s
E170	42.9s	54.9s	72.4s
E175	43.2s	55.2s	73.5s
E190	43.2s	55.5s	71.4s
MD11	44.2s	56.4s	74.4s
MD83	42.3s	54.3s	73.1s

Runway Occupancy Times (48.2 s - Std Dev: 7.6 s)

(38-27_07A_ALP_SYM_20W_MP_8000CL_9020Exit85Deg)



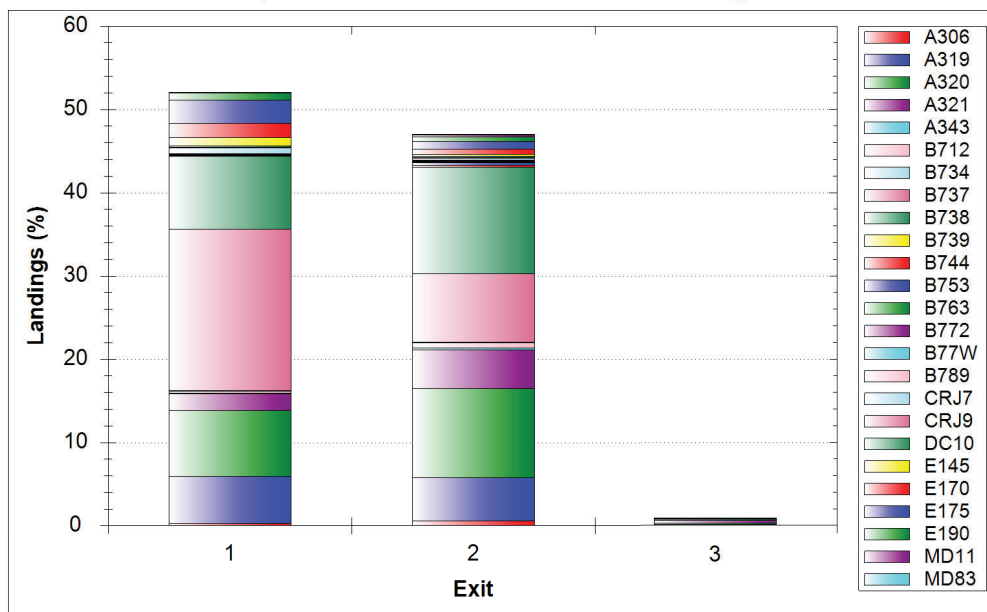
Runway Exit Aircraft Assignment

(38-27_07A_ALP_SYM_20W_MP_8000CL_9020Exit85Deg)

Aircraft Name	1	2	3	Aircraft Mix
A306	27.4%	65.1%	7.5%	0.9%
A319	52.2%	47.6%	0.2%	10.9%
A320	42.2%	57.0%	0.8%	18.7%
A321	28.6%	66.7%	4.7%	7.1%
A343	28.2%	66.0%	5.8%	0.3%
B712	26.5%	71.6%	1.9%	0.9%
B734	37.8%	59.0%	3.2%	0.1%
B737	70.1%	29.8%	0.0%	27.6%
B738	40.5%	58.7%	0.7%	21.7%
B739	44.3%	55.1%	0.6%	0.1%
B744	23.9%	70.3%	5.8%	0.3%
B753	22.9%	71.9%	5.1%	0.4%
B763	22.7%	73.8%	3.5%	0.1%
B772	40.8%	58.9%	0.3%	0.1%
B77W	14.4%	81.2%	4.4%	0.1%
B789	15.8%	73.1%	11.1%	0.1%
CRJ7	75.3%	24.6%	0.1%	0.9%
CRJ9	53.4%	45.8%	0.8%	0.1%
DC10	32.2%	55.5%	12.3%	0.4%
E145	81.9%	18.1%	0.0%	1.3%
E170	74.5%	25.4%	0.1%	2.3%
E175	74.5%	25.4%	0.1%	3.7%
E190	59.9%	39.8%	0.4%	1.4%
MD11	19.4%	74.1%	6.6%	0.3%
MD83	40.2%	58.8%	1.0%	0.1%
Exit Mix	52.1%	47.0%	0.9%	

Runway Exit Aircraft Assignment

(38-27_07A_ALP_SYM_20W_MP_8000CL_9020Exit85Deg)



Optimized Exits Runway 18R-36L – Option 10, Run #46 - 19 Adjusted

Runway Exit Locations

20Exit-A6

(46-19_ALP_SYM_20W_MP_8000CL_9020Exit-A10-85Deg)

Exit	Exit Status	Exit Type	Point Of Curvature Location (ft)
1	Open	30° (with 1,400 ft spiral)	5,374
2	Open	30° (with 1,400 ft spiral)	6,677
3	Open	90°	9,019

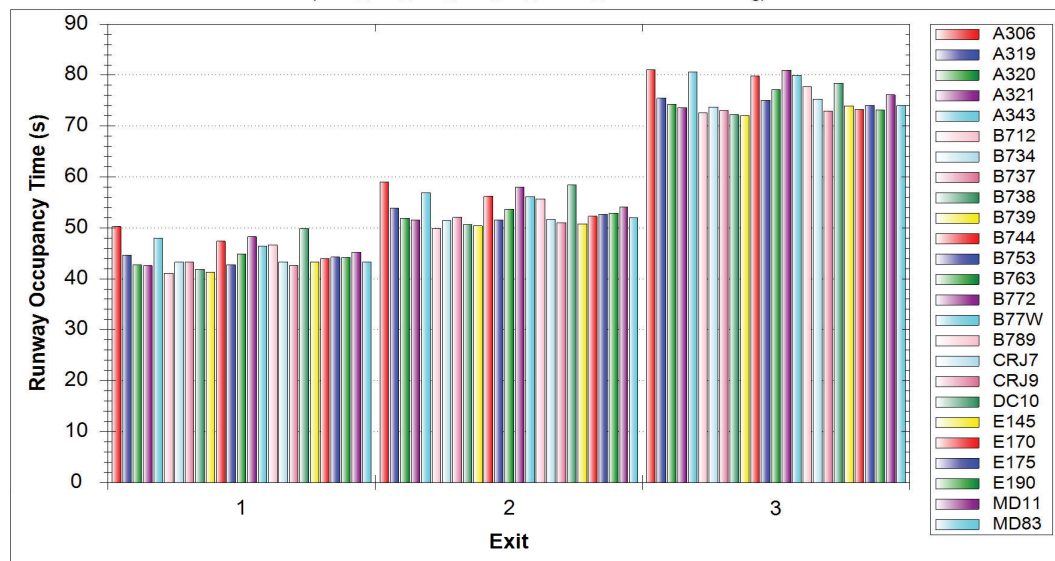
Runway Occupancy Times (47.1 s - Std Dev: 6.8 s)

(46-19_ALP_SYM_20W_MP_8000CL_9020Exit-A10-85Deg)

Aircraft Name	1	2	3
A306	50.3s	59.0s	81.0s
A319	44.7s	53.9s	75.5s
A320	42.7s	51.9s	74.3s
A321	42.6s	51.5s	73.6s
A343	48.0s	56.9s	80.6s
B712	41.1s	49.8s	72.6s
B734	43.3s	51.5s	73.7s
B737	43.3s	52.1s	73.0s
B738	41.9s	50.6s	72.2s
B739	41.3s	50.4s	72.0s
B744	47.4s	56.2s	79.8s
B753	42.8s	51.5s	75.0s
B763	44.9s	53.6s	77.2s
B772	48.3s	58.0s	80.9s
B77W	46.4s	56.1s	80.0s
B789	46.6s	55.7s	77.7s
CRJ7	43.3s	51.6s	75.3s
CRJ9	42.6s	51.0s	72.9s
DC10	49.9s	58.5s	78.4s
E145	43.3s	50.8s	74.0s
E170	44.0s	52.3s	73.3s
E175	44.3s	52.7s	74.1s
E190	44.2s	52.9s	73.2s
MD11	45.2s	54.1s	76.1s
MD83	43.3s	52.0s	74.0s

Runway Occupancy Times (47.1 s - Std Dev: 6.8 s)

(46-19_ALP_SYM_20W_MP_8000CL_9020Exit-A10-85Deg)



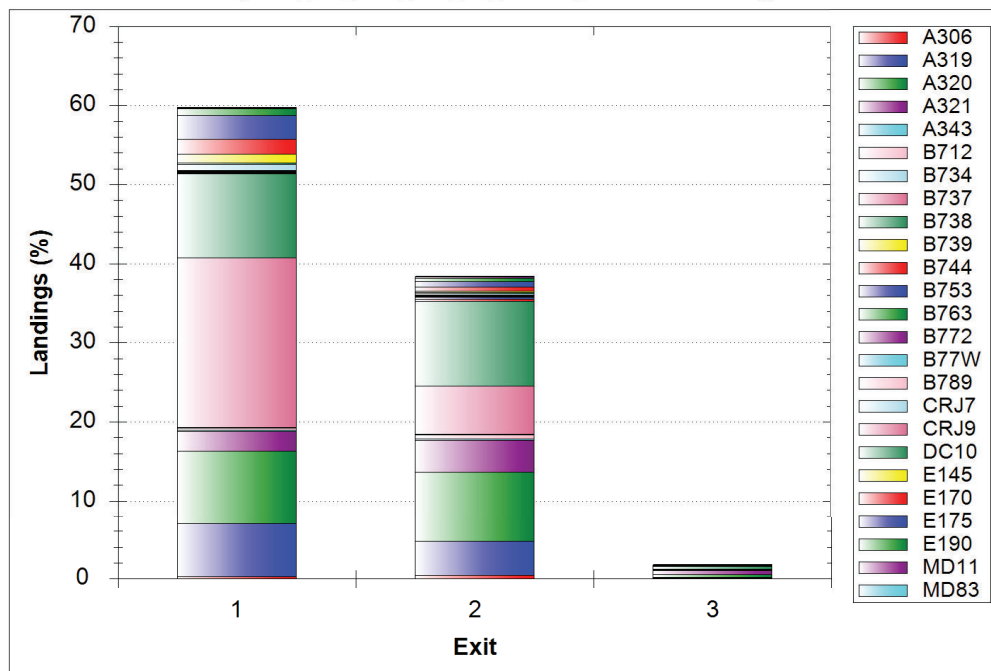
Runway Exit Aircraft Assignment

(46-19_ALP_SYM_20W_MP_8000CL_9020Exit-A10-85Deg)

Aircraft Name	1	2	3	Aircraft Mix
A306	33.6%	55.2%	11.3%	0.9%
A319	60.9%	38.5%	0.6%	10.9%
A320	50.1%	47.9%	2.0%	18.7%
A321	35.3%	56.7%	8.0%	7.1%
A343	34.3%	56.0%	9.7%	0.3%
B712	34.2%	62.0%	3.9%	0.9%
B734	44.2%	50.7%	5.1%	0.1%
B737	77.6%	22.2%	0.1%	27.6%
B738	49.1%	49.2%	1.7%	21.7%
B739	53.1%	45.4%	1.4%	0.1%
B744	30.8%	58.9%	10.3%	0.3%
B753	29.5%	61.9%	8.6%	0.4%
B763	29.7%	64.4%	5.8%	0.1%
B772	49.6%	49.2%	1.1%	0.1%
B77W	20.9%	70.8%	8.3%	0.1%
B789	20.4%	62.2%	17.4%	0.1%
CRJ7	81.0%	18.8%	0.2%	0.9%
CRJ9	59.2%	39.1%	1.7%	0.1%
DC10	38.2%	45.7%	16.1%	0.4%
E145	86.4%	13.5%	0.1%	1.3%
E170	80.5%	19.3%	0.2%	2.3%
E175	80.4%	19.4%	0.2%	3.7%
E190	67.4%	31.7%	0.8%	1.4%
MD11	24.8%	64.2%	11.1%	0.3%
MD83	47.6%	49.6%	2.7%	0.1%
Exit Mix	59.8%	38.4%	1.8%	

Runway Exit Aircraft Assignment

(46-19_ALP_SYM_20W_MP_8000CL_9020Exit-A10-85Deg)



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