ACR Slate Recommendations Analyses and Request:

Population Data Sources
Elimination of 2-Mile Departure Restriction
Delay Initial Turn on South Flow Departures
Alternating Downwind Distances

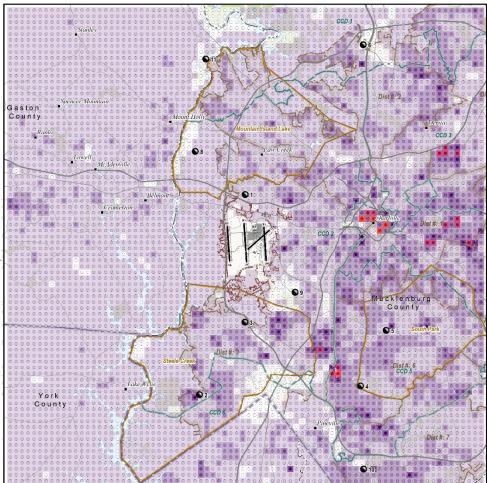
For ACR Review, Understanding, and Discussion

September 18, 2019



ACR Request: Population Data Sources

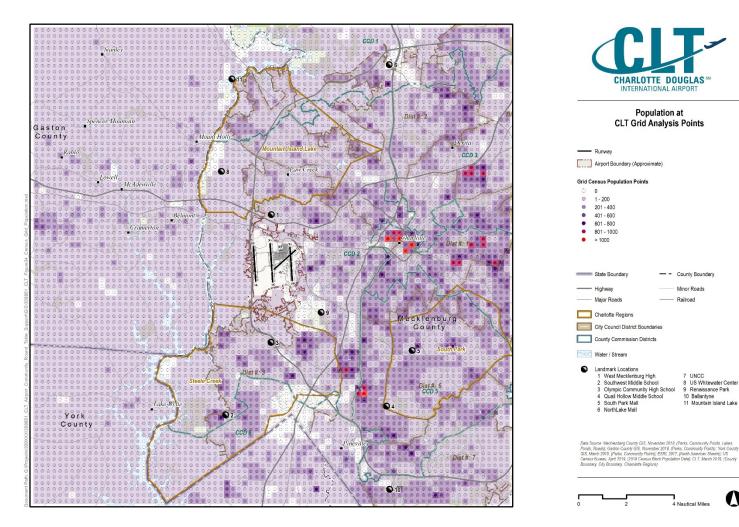
Request of the ACR at the August 2019 ACR meeting





2010 US Census Population Levels at Grid Analysis Points

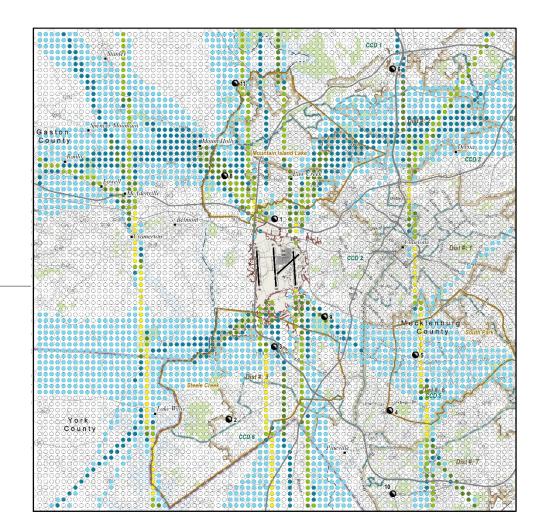
| Population Interval | Count of Grid Points |
|-----------------------|----------------------|
| 0 | 323 |
| 1-200 | 4,578 |
| 201-400 | 1,154 |
| 401-600 | 186 |
| 601-800 | 39 |
| 801-1000 | 16 |
| Greater than 1,000 | 5 |
| Total | 6,301 |
| Total Grid Population | 736,785 |



3

ACR Slate Recommendation Analysis: Elimination of 2-Mile Departure Restriction

Slate recommendation adopted by ACR at March 2019 meeting





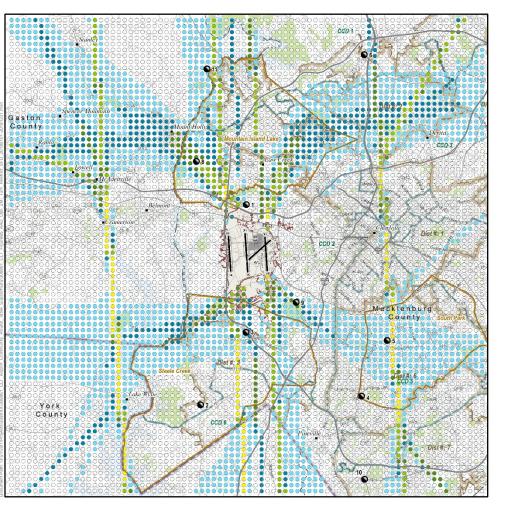
ACR Slate Recommendation – Elimination of 2-Mile Departure Restriction

- Modified calendar year 2018 aircraft South Flow departures so that aircraft would turn upon reaching the departure end of the Runway on current South Flow departure headings
- Aircraft would be expected to turn at or near the Runway departure end if the 2mile departure restriction was removed for South Flow departures absent other changes
- Modeled the full year of aircraft operations with the modified departure flight paths
- Compared the modeled results with the 2018 baseline results at each of the grid points (including population estimates at each grid point) in terms of:
 - Number of annual-average overflights
 - Number of average daily noise events above 70 dB (N70)



Annual Average Day Aircraft Overflights Analysis: Elimination of 2-Mile Departure Restriction

| Overflight Interval (Operations) | Count of Grid Points | Count of Population |
|--|-------------------------|------------------------|
| Less than 5 | 3,553 | 456,649 |
| 6-15 | 1,797 | 182,377 |
| 16-30 | 453 | 47,716 |
| 31-60 | 180 | 14,181 |
| 61-120 | 211 | 24,040 |
| 121-240 | 107 | 11,822 |
| 241-360 | 0 | 0 |
| Greater than 360 | 0 | 0 |
| Total | 6,301 | 736,785 |



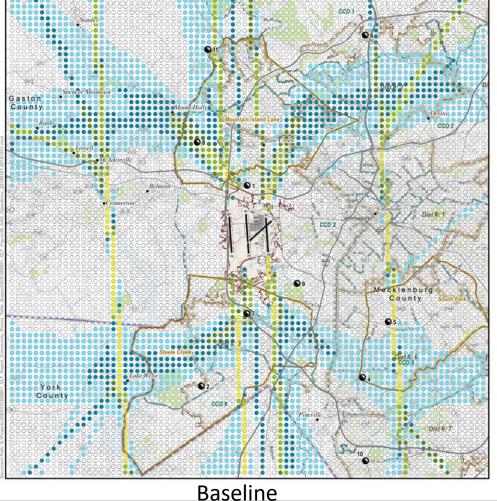


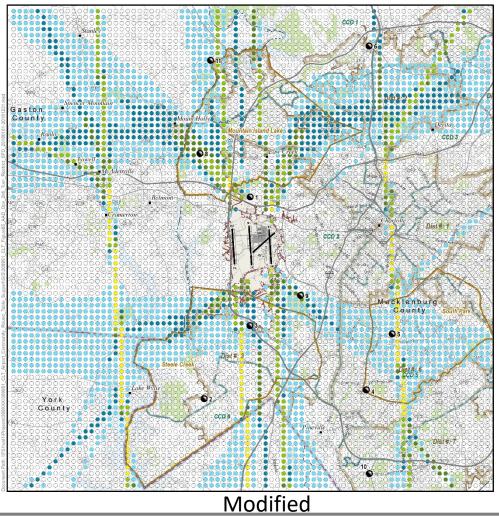
Average Annual Day Operations Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with Elimination of 2-Mile Turn Restriction for South Flow Departures

Runway

| Average Annual Day Operati | ons |
|--|--|
| 6 - 15 | |
| 16 - 30 | |
| 31 - 60 | |
| 61 - 120 | |
| 0 121 - 240 | |
| 241 - 360 | |
| >360 | |
| State Boundary | County Boundary |
| Highway | Minor Roads |
| Major Roads | Railroad |
| Charlotte Regions | |
| City Council District B | oundaries |
| County Commission E | Districts |
| Water / Stream | Open Space |
| Landmark Locations | |
| 1 West Mecklenbur | |
| Southwest Middle Olympic Commun | |
| 4 Quail Hollow Mide | |
| 5 South Park Mall | 11 Mountain Island Lake |
| 6 NorthLake Mall | |
| | |
| Data Source: Mechlenberg County G | IS, November 2018, (Perks, Community Points, Lekes, November 2018, (Perks, Community Points); York Coun |
| GIS. March 2019, (Parks, Community | Points); CLT, March 2019, (County Points); Yok County Points); CLT, March 2019, (County Boundary, City |
| Boundary, Cherolette Regions) | |
| | |

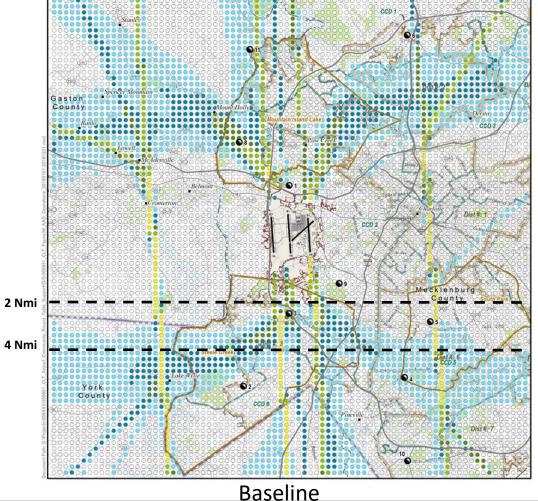
Annual Average Day Aircraft Overflights Analysis: 2018 Operations with Elimination of 2-Mile Departure Restriction Compared to Baseline

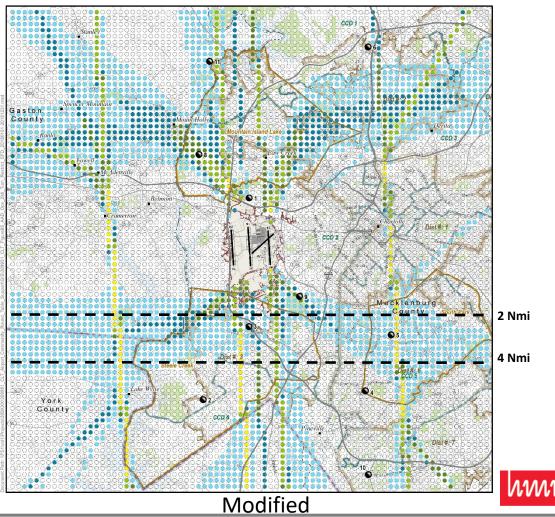






Annual Average Day Aircraft Overflights Analysis: 2018 Operations with Elimination of 2-Mile Departure Restriction Compared to Baseline

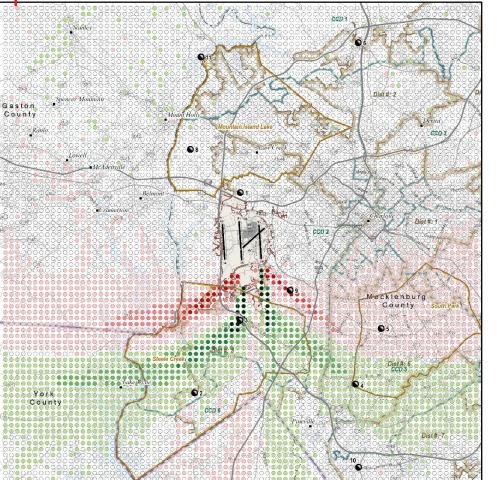




Annual Average Day Aircraft Overflights Analysis: Difference – 2018 Operations with Elimination of 2-Mile Departure Restriction Compared to Baseline

| Overflight Interval (Operations) | Count of Grid Points / % Change | Count of Population / % Change |
|--|---------------------------------------|--------------------------------------|
| Less than -30 | 24 / 0.4% | 2,037 / 0.3% |
| -30 to -20 | 29 / 0.5% | 5,654 / 0.8% |
| -20 to -10 | 118 / 1.9% | 18,630 / 2.5% |
| -10 to -1 | 698 / 11.1% | 80,445 / 10.9% |
| -1 to 1 | 4,147 / 65.8% | 468,575 / 63.6% |
| 1 to 10 | 1,138 / 18.1% | 154,222 / 20.9% |
| 10 to 20 | 106 / 1.7% | 4,027 / 0.5% |
| 20 to 30 | 21 / 0.3% | 2,291 / 0.3% |
| Greater Than 30 | 20 / 0.3% | 904 / 0.1% |
| Total | 6,301 / 100.0% | 736,785 / 100.0% |

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Average Annual Day Operations Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with Elimination of 2-Mile Turn Restriction for South Flow Departures Compared to **Baseline Operations** Runwa Airport Boundary (Approximate) Difference in Average Annual Day Operations • <-30 .20 - - 30 .10 ... 20 .1 - - 10 0 1 - 10 10 - 20 20 - 30 >30 State Bounda - - County Boundary

Charlotte Regions
City Council District Boundaries
County Commission Districts
Water / Stream
Landmark Locations

Major Roads

Minor Roads

Railroan

| 1 | West Mecklenburg High | 7 | UNCC |
|---|-------------------------------|----|----------------------|
| 2 | Southwest Middle School | 8 | US Whitewater Center |
| 3 | Olympic Community High School | 9 | Renaissance Park |
| 4 | Quail Hollow Middle School | 10 | Ballantyne |
| 5 | South Park Mall | 11 | Mountain Island Lake |
| 6 | NorthLake Mall | | |
| | | | |

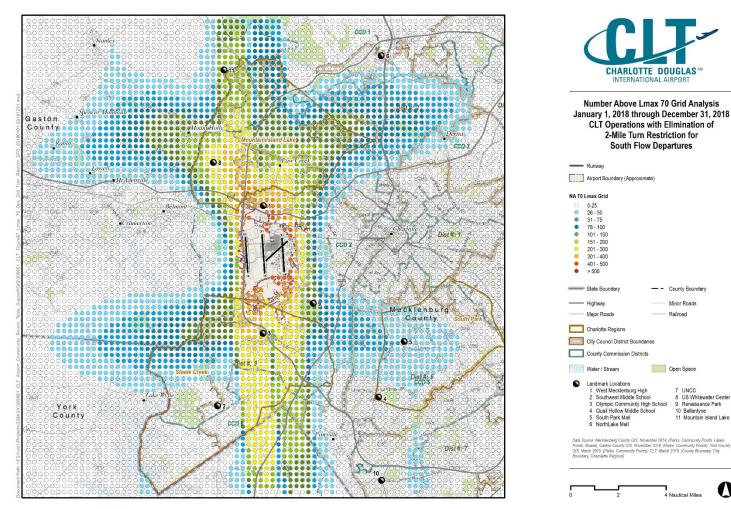
Data Source: Mechienberg County GIS, November 2018. (Perks, Community Points, Lekes, Ponds, Roads): Caston County GIS, November 2018. (Perks, Community Points): York County GIS, Merch 2019. (Perks, Community Points); CLT, Merch 2019. (County Boundery, City Boundery, Chevolette Rescional



- 869 Grid points (13.9%) / 106,776 people (14.5%) would experience reduced numbers of overflights with elimination of 2-mile restriction
- 1,285 Grid points (20.4%) / 161,444 people (21.8%) would experience increased numbers of overflights with elimination of 2-mile restriction

Number of Noise Events Above 70 dB (N70) Analysis: 2018 Operations with Elimination of 2-Mile Departure Restriction

| N70 Interval (Events) | Count of Grid Points | Count of Population |
|--------------------------|-------------------------|------------------------|
| 25 or Less | 3,433 | 439,493 |
| 26-50 | 1,007 | 120,409 |
| 51-75 | 471 | 48,317 |
| 76-100 | 335 | 28,696 |
| 101-150 | 346 | 37,438 |
| 151-200 | 285 | 25,140 |
| 201-300 | 258 | 27,901 |
| 301-400 | 103 | 6,823 |
| 401-500 | 46 | 2,266 |
| Greater than 500 | 17 | 302 |
| Total | 6,301 | 736,785 |



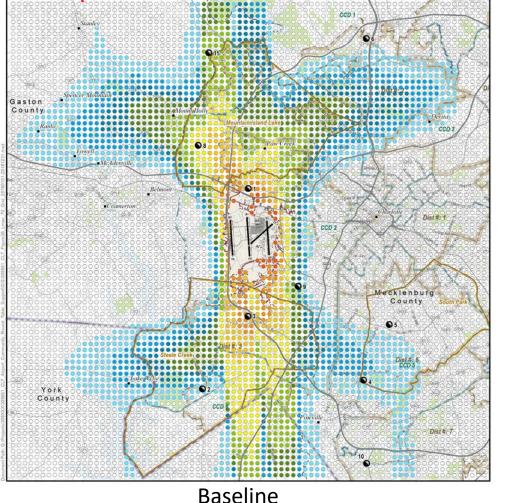
7 UNCC

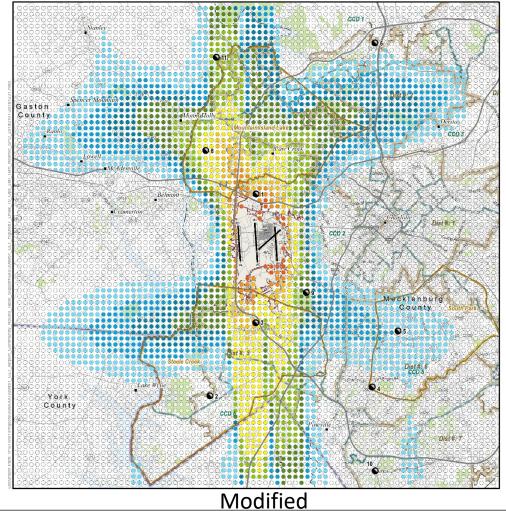
10 Ballantyne

8 US Whitewater Center

11 Mountain Island Lake

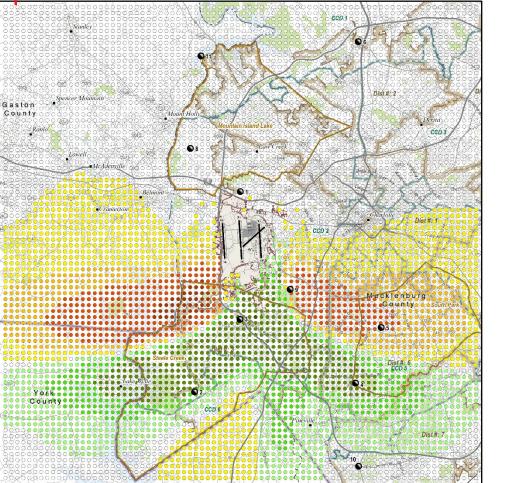
Number of Noise Events Above 70 dB (N70) Analysis: 2018 Operations with Elimination of 2-Mile Departure Restriction Compared to Baseline





Number of Noise Events Above 70 dB (N70) Analysis: Difference – 2018 Operations with Elimination of 2-Mile Departure Restriction Compared to Baseline

| N70 Difference Interval (Events) | Count of Grid Points / % Change | Count of Population / % Change |
|-------------------------------------|---------------------------------------|--------------------------------------|
| Less than -75 | 95 / 1.5% | 13,394 / 1.8% |
| -75 to -25 | 306 / 4.9% | 43,168 / 5.9% |
| -25 to -10 | 335 / 5.3% | 34,886 / 4.7% |
| -10 to -1 | 636 / 10.1% | 70,167 / 9.5% |
| -1 to 1 | 3,122 / 49.5% | 340161 / 46.2% |
| 1 to 10 | 988 / 15.7% | 147,803 / 20.1% |
| 10 to 25 | 431 / 6.8% | 56,251 / 7.6% |
| 25 to 75 | 347 / 5.5% | 28,538 / 3.9% |
| Greater than 75 | 41 / 0.7% | 2,417 / 0.3% |
| Total | 6301 / 100.0% | 736785 / 100.0% |





Number Above Lmax 70 Grid Analysis

January 1, 2018 through December 31, 2018 CLT Operations with Elimination of 2-Mile Turn Restriction for South Flow Departures Compared to **Baseline Operations** Runwa Airport Boundary (Approximate) Lmax Difference Grid • -75+ -25 to -75 -10 to -25 -1 to -10 -1 to 1 (No Color) 1 to 10 10 to 25 25 to 75 75+ - - County Boundar Minor Roads Major Roads ----- Railroad Charlotte Regions City Council District Boundaries County Commission Districts Water / Stream Onen Snace Landmark Locations West Mecklenburg High UNCC Southwest Middle School 8 US Whitewater Center Olympic Community High School 9 Renaissance Park 4 Quail Hollow Middle School 10 Ballantyne 5 South Park Mall 11 Mountain Island Lake 6 NorthLake Mall Data Source: Mechienberg County GIS, November 2018. (Perks, Community Points, Lake Ponds, Roads); Gaston County GIS, November 2018. (Perks, Community Points); York C GIS, March 2019. (Parks, Community Points); CLT, March 2019. (County Boundary, City

• 1,372 Grid points (21.8%) / 161,615 people (21.9%) would experience fewer events above 70 dB Lmax with elimination of 2-mile restriction

• 1,807 Grid points (28.7%) / 235,009 people (31.9%) would experience more events above 70 dB Lmax with elimination of 2-mile restriction

ACR Slate Recommendation Analysis: 2018 Operations with Elimination of 2-Mile Departure Restriction Observations

- Number of average daily overflight:
 - A greater number of grid points and more people experienced an increase than decrease
- Number of noise events greater than 70 dB (N70)
 - A greater number of grid points and more people experienced an increase than decrease
- Elimination of the 2-mile departure restriction provides the greatest benefits for areas further from the airport, and least benefit for areas close to the airport east and west of the South Flow Runways
- Potential noise reductions in the southern portions of the grid and noise increases in the central and northern portion of the grid for the community of South Park
- Potential noise reductions in the central portions of the grid and noise increases in the southern and northern portion of the grid for the community of Steele Creek
- Dispersion would remain roughly the same compared to baseline operations
- This may be seen as a shifting of noise from one area of a community to another and that communities protected for years by this restriction may likely notice this change and react negatively

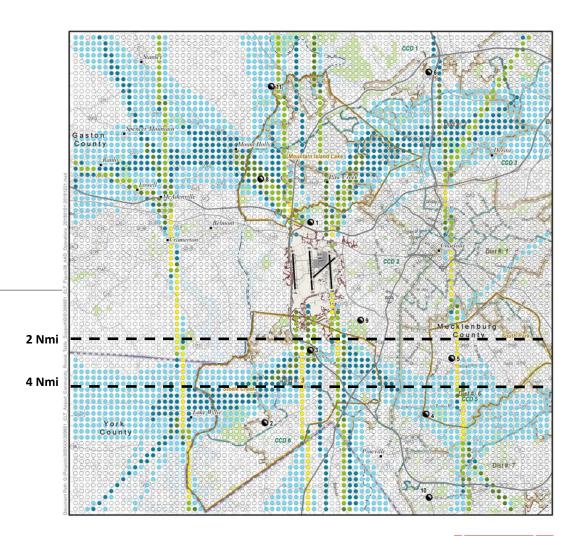
ACR Slate Recommendation Analysis: Elimination of 2-Mile Departure Restriction Overall Analysis Considerations for the ACR

- Do the reported changes from the 2018 baseline to elimination of the 2-mile departure restriction for South Flow departures meet the goals of the ACR?
- Does the ACR want to reserve a final decision to see if you want to recommend removal of the 2-mile restriction along with another measure, instead of by itself?
- Does the ACR want to recommend elimination of the 2-mile departure restriction for South Flow departures for consideration of the final slate?



ACR Slate Recommendation Analysis: Delay Initial Turn on South Flow Departures

Slate recommendation adopted by ACR at March 2019 meeting





ACR Request– Delay Initial Turn on South Flow Departures

- Purpose of recommendation to delay the initial turn on south flow departures was to allow aircraft to climb to higher altitudes before turning, which would result in lower noise levels to communities to the east and west of south extension of the CLT runways centerlines
- HMMH suggests the altitude-based turn analyses shown last month shows similar results to what could be achieved with a delay in the initial turns
- FAA waiver currently exists at approximately 4 nautical miles that allows the delay in getting required aircraft separation through divergent headings from the parallel runways
 - This waiver exists because the FAA was unable to meet the existing requirement (less than 4 nautical miles) for separation of aircraft departing parallel runways



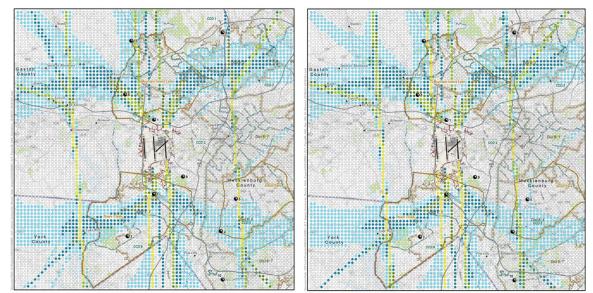
ACR Request– Delay Initial Turn on South Flow Departures

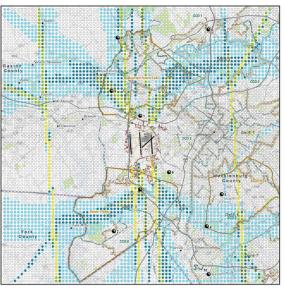
- HMMH recommends no further analysis at this time on delaying the initial turn for southbound departures
 - Altitude-based turns resulted in delaying the initial turn
 - The current separation requirements and FAA waiver to extend the separation requirements further suggests delaying the turns will be difficult to get the FAA to consider and implement such a measure
 - Depending on final recommended slate to submit to the FAA, delaying the initial turn may come back into play



ACR Slate Recommendation Analysis: Alternating Downwind Distances

Slate recommendation adopted by ACR at March 2019 meeting







ACR Slate Recommendation – Alternating Downwind Distances

- Determined reasonable distances from the airport based on consultation with FAA for annually alternating/rotating the downwind arrival legs
 - Annual downwind alternation/rotation schedule represented the best balance of meeting community requests to vary downwind flight path locations over time while also meeting FAA training and publication requirements
 - It would take 3 years to rotate through each of the downwind distances
 - Current downwinds are at a distance of 5 nautical miles
 - Reasonable distances for alternating the downwinds would be 4 or 6 nautical miles



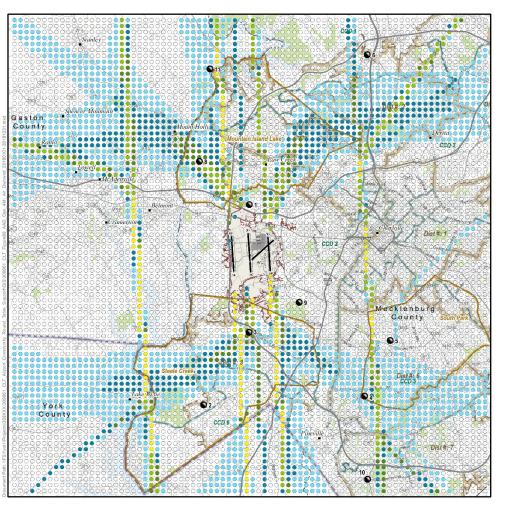
ACR Slate Recommendation – Alternating Downwind Distances

- Modified arrival flight tracks to shift downwinds to distance of 4 or 6 nautical miles from the airport
- Modeled the full year of aircraft operations with each of the modified downwind distances
- Compared the modeled results for each downwind distance with the 2018 baseline results at each of the grid points (including population estimates at each grid point) in terms of:
 - Number of annual-average overflights
 - Number of average daily noise events above 70 dB (N70)



Annual Average Day Aircraft Overflights Analysis: 2018 Operations with 4-Mile Alternating Downwind

| Overflight Interval (Operations) | Count of Grid Points | Count of Population |
|--|-------------------------|------------------------|
| Less than 5 | 3,698 | 446,483 |
| 6-15 | 1,571 | 169,205 |
| 16-30 | 505 | 61,488 |
| 31-60 | 177 | 20,704 |
| 61-120 | 210 | 24,543 |
| 121-240 | 140 | 14,362 |
| 241-360 | 0 | 0 |
| Greater than 360 | 0 | 0 |
| Total | 6,301 | 736,785 |

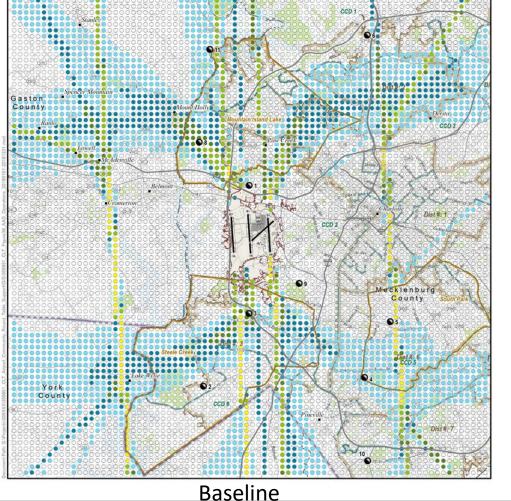


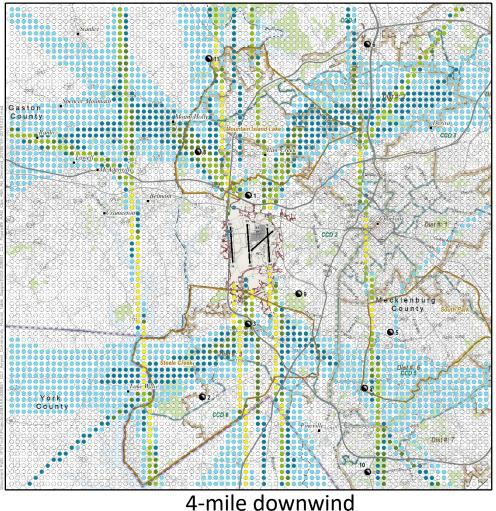


Average Annual Day Operations Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with 4-Mile Alternating Downwind

| Runway | | |
|--|--|---|
| Airport Boundary (Approximat | e) | |
| e Annual Day Operations | | |
| <= 5 | | |
| 6 - 15 | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| - 300 | | |
| State Boundary | | County Boundary |
| Highway | | Minor Roads |
| Major Roads | | Railroad |
| Charlotte Regions | | |
| City Council District Boundarie | es | |
| County Commission Districts | | |
| Water / Stream | | Open Space |
| 3 Olympic Community High | School | 7 UNCC 8 US Whitewater Center 9 Renaissance Park 10 Ballantyne 11 Mountain Island Lake |
| Ready; Gaston County (DS, Novembe anh 2019, (Parka, Community Points); r ry, Chevolette Regions) | r 2018, (Pr CLT, Marc | arks, Community Points); York County |
| | Airport Boundary (Approximal e Annual Day Operations = 5 6 - 15 16 - 30 31 - 60 61 - 120 121 - 240 241 - 380 State Boundary Highway Major Roads Charlotte Regions Charlotte | Airport Boundary (Approximate) e Annual Day Operations = 5 6 - 15 16 - 30 31 - 60 61 - 120 241 - 380 - 380 State Boundary Highway Major Roads Charlotte Regions City Council District Boundaries County Commission Districts Water / Stream Landmark Locations 1 West Mediterburg High 2 Southmest Middle School 3 South Park Mail 6 NorthLake Mail |

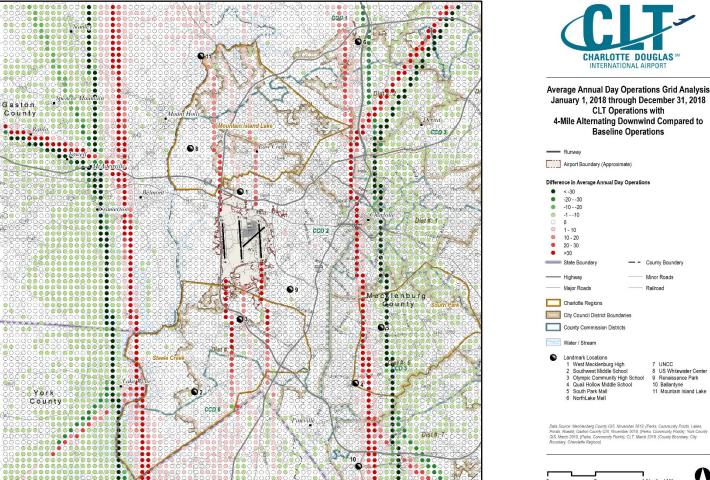
Annual Average Day Aircraft Overflights Analysis: 2018 Operations with 4-Mile Alternating Downwind Compared to Baseline

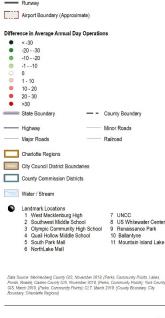




Annual Average Day Aircraft Overflights Analysis: Difference – 2018 Operations with 4-Mile Alternating Downwind Compared to Baseline

| Overflight Interval (Operations) | Count of Grid Points / % Change | Count of Population / % Change |
|--|---------------------------------------|--------------------------------------|
| Less than -30 | 196 / 3.1% | 25,756 / 3.5% |
| -30 to -20 | 61 / 1.0% | 5,306 / 0.7% |
| -20 to -10 | 59 / 0.9% | 4,926 / 0.7% |
| -10 to -1 | 361 / 5.7% | 29,749 / 4.0% |
| -1 to 1 | 4,672 / 74.1% | 561,816 / 76.3% |
| 1 to 10 | 520 / 8.3% | 54,956 / 7.5% |
| 10 to 20 | 107 / 1.7% | 10,613 / 1.4% |
| 20 to 30 | 80 / 1.3% | 10,431 / 1.4% |
| Greater Than 30 | 245 / 3.9% | 33,232 / 4.5% |
| Total | 6,301 / 100.0% | 736,785 / 100.0% |





4 Nautical Miles

CHARLOTTE DOUGLAS INTERNATIONAL AIRPORT

CLT Operations with

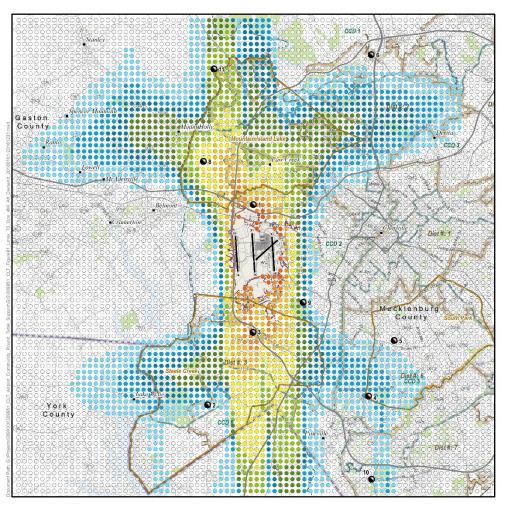
Baseline Operations

677 Grid points (10.7%) / 65,737 people (8.9%) would experience reduced numbers of overflights with a 4-mile alternating downwind ۰ 23

952 Grid points (15.2%) / 109,232 people (14.8%) would experience increased numbers of overflights with a 4-mile alternating downwind

Number of Noise Events Above 70 dB (N70) Analysis: 2018 Operations with 4-Mile Alternating Downwind

| N70 Interval (Events) | Count of Grid Points | Count of Population |
|--------------------------|-------------------------|------------------------|
| 25 or Less | 3,536 | 437,022 |
| 26-50 | 901 | 104,982 |
| 51-75 | 456 | 59,632 |
| 76-100 | 329 | 31,704 |
| 101-150 | 348 | 38,780 |
| 151-200 | 272 | 23,817 |
| 201-300 | 223 | 22,466 |
| 301-400 | 147 | 13,770 |
| 401-500 | 72 | 4,310 |
| Greater than 500 | 17 | 302 |
| Total | 6,301 | 736,785 |

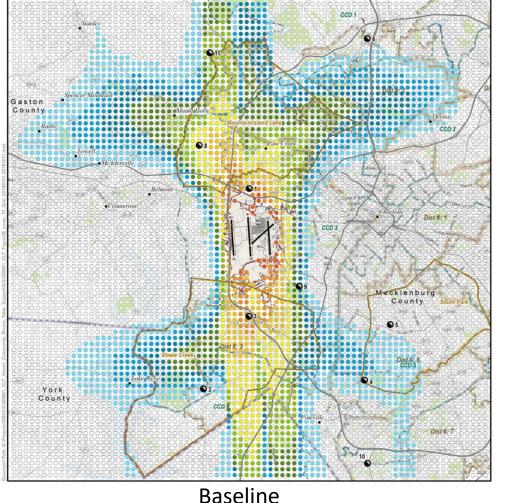


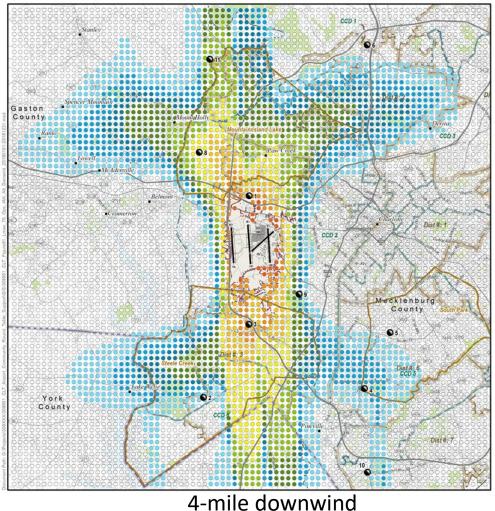


Number Above Lmax 70 Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with 4-Mile Alternating Downwind

| _ | Runway | | |
|---------------------|---|----------|---|
| | Airport Boundary (Approxima | te) | |
| NA 70 | Lmax Grid | | |
| | 0-25 26 - 50 51 - 75 76 - 100 101 - 150 151 - 200 201 - 300 301 - 400 401 - 500 > 500 | | |
| _ | State Boundary | | County Boundary |
| | Highway | | Minor Roads |
| | Major Roads | | Railroad |
| | Charlotte Regions | | |
| - | City Council District Boundar | ies | |
| | County Commission Districts | | |
| \sim | Water / Stream | | Open Space |
| ٩ | Landmark Locations 1 West Mecklenburg High 2 Southwest Middle Schoc 3 Olympic Community Higi 4 Quail Hollow Middle Sch 5 South Park Mall 6 NorthLake Mall | h School | 7 UNCC 8 US Whitewater Cent 9 Renaissance Park 10 Ballantyne 11 Mountain Island Lak |
| Ponds, F G/S, Ma | urce: Mechlenberg County GIS, Noven Reads): Gastor County GIS, Novenbe ch 2019, (Parks, Community Points); (y, Cheralette Regiona) | 2018 (Pe | rks, Community Points); York Coun |
| 0 | 2 | 4 | Nautical Miles |

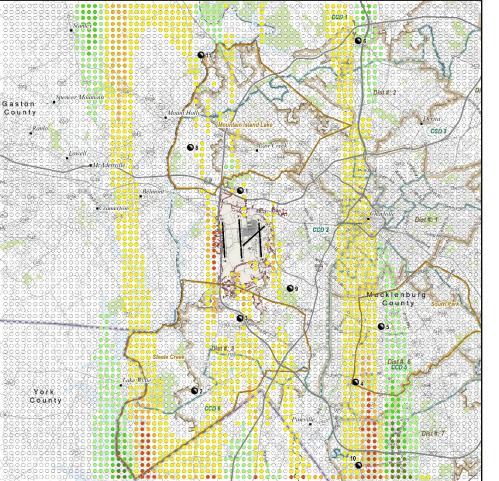
Number of Noise Events Above 70 dB (N70) Analysis: 2018 Operations with 4-Mile Alternating Downwind Compared to Baseline





Number of Noise Events Above 70 dB (N70) Analysis: Difference – 2018 Operations with 4-Mile Alternating Downwind Compared to Baseline

| N70 Difference Interval (Events) | Count of Grid Points / % Change | Count of Population / % Change |
|-------------------------------------|---------------------------------------|--------------------------------------|
| Less than -75 | 0 / 0.0% | 0 / 0.0% |
| -75 to -25 | 32 / 0.5% | 5,740 / 0.8% |
| -25 to -10 | 78 / 1.2% | 5,467 / 0.7% |
| -10 to -1 | 400 / 6.3% | 35,959 / 4.9% |
| -1 to 1 | 4,464 / 70.8% | 533,667 / 72.4% |
| 1 to 10 | 1,106 / 17.6% | 134,039 / 18.2% |
| 10 to 25 | 161 / 2.6% | 13,701 / 1.9% |
| 25 to 75 | 60 / 1.0% | 8,212 / 1.1% |
| Greater than 75 | 0 / 0.0% | 0 / 0.0% |
| Total | 6,301 / 100.0% | 736,785 / 100.0% |





Number Above Lmax 70 Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with Altitude Based Turns with 4-Mile Alternating Downwind Compared to Baseline Operations

Runway

| | Airport Boundary (Approximat | e) | |
|---------|---|-------------|--|
| Lmax [| Difference Grid | | |
| ٠ | -75+ | | |
| • | -25 to -75 | | |
| • | -10 to -25 | | |
| | -1 to -10 | | |
| 0 | -1 to 1 (No Color) | | |
| 0 | 1 to 10 | | |
| | 10 to 25 | | |
| • | 25 to 75 | | |
| • | 75+ | | |
| _ | State Boundary | | County Boundary |
| | Highway | | Minor Roads |
| | Major Roads | | Railroad |
| | Charlotte Regions | | |
| - | City Council District Boundarie | es | |
| | County Commission Districts | | |
| ~~ | Water / Stream | | Open Space |
| • | Landmark Locations | | |
| | 1 West Mecklenburg High | | 7 UNCC |
| | 2 Southwest Middle School | | 8 US Whitewater Center 9 Renaissance Park |
| | 3 Olympic Community High 4 Quail Hollow Middle Scho | | 10 Ballantyne |
| | 5 South Park Mall | /01 | 11 Mountain Island Lake |
| | 6 NorthLake Mall | | |
| Data Sc | surce: Mechlenberg County GIS, Noven Roads); Gaston County GIS, Novembei | c 2018, (PI | (Perks, Community Points, Lekes, erks, Community Points); York County h 2019, (County Boundery, City |

• 510 Grid points (8.0%) / 47,166 people (6.4%) would experience fewer events above 70 dB Lmax with 4-mile alternating downwind

• 1,327 Grid points (21.2%) / 155,952 people (21.2%) would experience more events above 70 dB Lmax with 4-mile alternating downwind

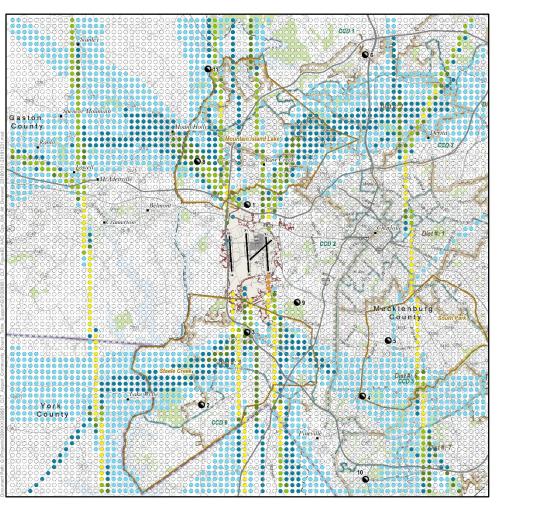
ACR Slate Recommendation Analysis: 2018 Operations with 4-Mile Alternating Downwind Observations

- Number of average daily overflight:
 - A greater number of grid points and more people experienced an increase than decrease
- Number of noise events greater than 70 dB (N70)
 - A greater number of grid points and more people experienced an increase than decrease
- Use of a 4 nautical mile alternating downwind provides the greatest benefits for areas under the current downwind at 5 nautical miles, and least benefit for areas inside (closer to the airport) of the current 5 nautical mile downwind
- Potential noise reductions in the central portions of the grid and noise increases in the western
 portion of the grid for the community of South Park
- Potential noise reductions in the western portions of the grid and noise increases in the central and eastern portions of the grid for the community of Steele Creek
- Potential noise reductions and increases occur at varying grid areas of the community of Mountain Island Lake
- Dispersion would remain roughly the same compared to baseline operations



Annual Average Day Aircraft Overflights Analysis: 2018 Operations with 6-Mile Alternating Downwind

| Overflight Interval (Operations) | Count of Grid Points | Count of Population |
|--|-------------------------|------------------------|
| Less than 5 | 3,589 | 437,835 |
| 6-15 | 1,715 | 183,321 |
| 16-30 | 498 | 59,377 |
| 31-60 | 160 | 20,033 |
| 61-120 | 177 | 18,229 |
| 121-240 | 159 | 17,984 |
| 241-360 | 3 | 6 |
| Greater than 360 | 0 | 0 |
| Total | 6,301 | 736,785 |

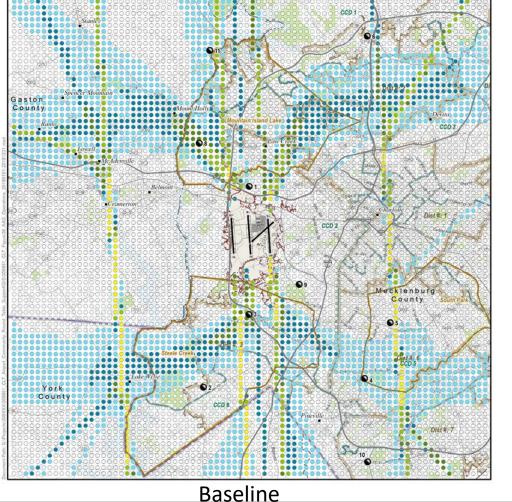


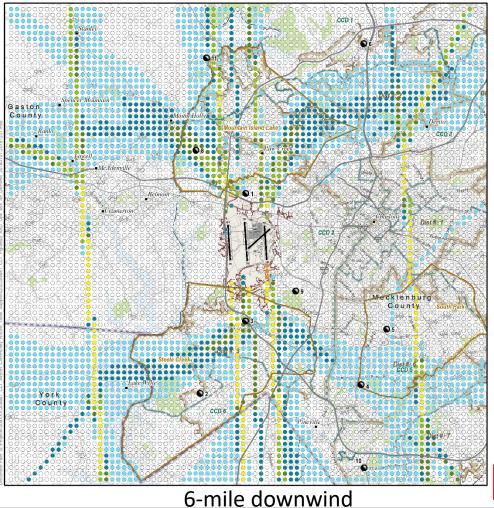


Average Annual Day Operations Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with 6-Mile Alternating Downwind

| _ | Runway |
|----------------|--|
| | Airport Boundary (Approximate) |
| - | · |
| erag | e Annual Day Operations |
| | <= 5 |
| | 6 - 15 |
| | 16 - 30 |
| | 31 - 60 |
| | 61 - 120 |
| | 121 - 240 241 - 360 |
| | >360 |
| | -300 |
| _ | State Boundary County Boundary |
| _ | Highway Minor Roads |
| _ | Major Roads Railroad |
| | Charlotte Regions |
| | City Council District Boundaries |
| | County Commission Districts |
| ×. | Water / Stream Open Space |
| • | Lendmark Locations 7 UNCC 2 West Mecklenburg High 7 UNCC 2 Southvest Middle School 8 US Whitewater Center 3 Olympic Community High School 9 Renaissance Park 4 Qual Holow Middle School 10 Balentyne 5 South Park Mall 11 Mourtain Island Lake 6 NorthLake Mell 11 |
| nals, S, Mi | zurze Mechederg Carrly US, November 2015 (Priets Connusty Points Leien, News) Castro Carrly US, November 2018 (Priets Connusty Points), Yok Caudy etc. 2018, (Priets, Connusty Points); CLT, Mach 2019. (Caudy Boundery, Cly yr, Chrubelle Regions) 2 4 Nautical Miles |

Annual Average Day Aircraft Overflights Analysis: 2018 Operations with 6-Mile Alternating Downwind Compared to Baseline

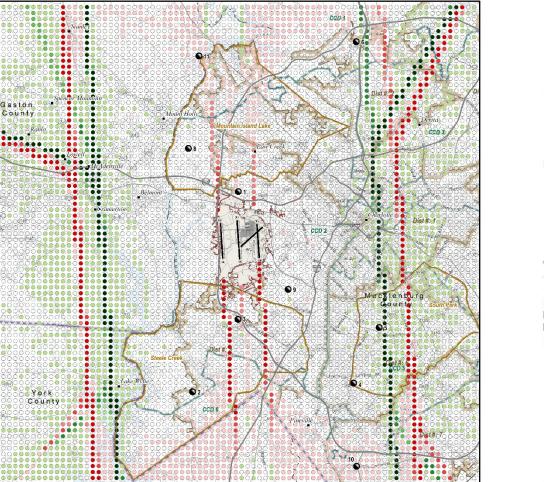




NWV

Annual Average Day Aircraft Overflights Analysis: Difference – 2018 Operations with 6-Mile Alternating Downwind Compared to Baseline

| Overflight Interval (Operations) | Count of Grid Points / % Change | Count of Population / % Change |
|--|---------------------------------------|--------------------------------------|
| Less than -30 | 201 / 3.2% | 26,222 / 3.6% |
| -30 to -20 | 51 / 0.8% | 4,167 / 0.6% |
| -20 to -10 | 50 / 0.8% | 3,780 / 0.5% |
| -10 to -1 | 252 / 4.0% | 19,548 / 2.7% |
| -1 to 1 | 4,529 / 71.9% | 557,193 / 75.6% |
| 1 to 10 | 824 / 13.1% | 77,360 / 10.5% |
| 10 to 20 | 83 / 1.3% | 9,393 / 1.3% |
| 20 to 30 | 66 / 1.0% | 7,924 / 1.1% |
| Greater Than 30 | 245 / 3.9% | 31,198 / 4.2% |
| Total | 6,301 / 100.0% | 736,785 / 100.0% |





Average Annual Day Operations Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with 6-Mile Alternating Downwind Compared to Baseline Operations

Airport Boundary (Approximate)

Runwa

| • | < -30 |
|------------------|--|
| • | -2030 |
| | -1020 |
| | -110 |
| 0 | 0 |
| \odot | 1 - 10 |
| ٠ | 10 - 20 |
| • | 20 - 30 |
| • | >30 |
| _ | State Boundary County Boundary |
| | Highway Minor Roads |
| | Major Roads Railroad |
| | Charlotte Regions |
| | City Council District Boundaries |
| | County Commission Districts |
| ~~ | Water / Stream |
| ۲ | Landmark Locations 7 UNCC 1 West Mecklenburg High 7 UNCC 2 Southrest Middle School 8 US Whitewater Center 3 Olympic Community High School 9 Renaissance Park 4 Quail Hollow Middle School 10 Ballantyne 5 South Park Hall 11 Mountain Island Lake 6 NorthLake Mall |
| Ponds, G/S, M | sures-Mechinology Courty U.S., November 2018, (Parts, Community Paints, Laies, Nasali, Castro Courty CIS, November 2018, (Parts, Community Paints), Yoa Courts and 2018, (Parts, Community Points), C.T. March 2019, (Courty Bounday, Ciry ry, Chanadrin Regiona) |

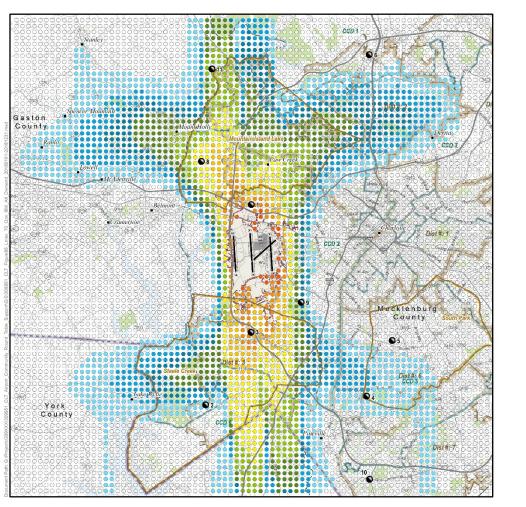
4 Nautical Miles

• 554 Grid points (8.8%) / 53,717 people (7.4%) would experience reduced numbers of overflights with 6-mile alternating downwind

1,218 Grid points (19.3%) / 125,875 people 17.1%) would experience increased numbers of overflights with 6-mile alternating downwind

Number of Noise Events Above 70 dB (N70) Analysis: 2018 Operations with 6-Mile Alternating Downwind

| N70 Interval (Events) | Count of Grid Points | Count of Population |
|--------------------------|-------------------------|------------------------|
| 25 or Less | 3,500 | 434,463 |
| 26-50 | 956 | 112,071 |
| 51-75 | 467 | 56,955 |
| 76-100 | 314 | 30,847 |
| 101-150 | 341 | 38,672 |
| 151-200 | 271 | 23,240 |
| 201-300 | 216 | 22,155 |
| 301-400 | 146 | 13,709 |
| 401-500 | 73 | 4,371 |
| Greater than 500 | 17 | 302 |
| Total | 6,301 | 736,785 |

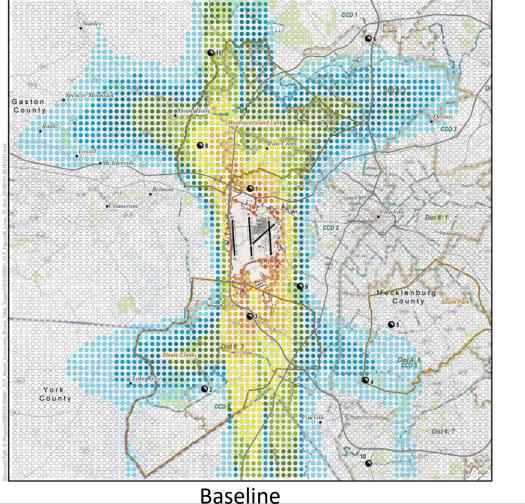


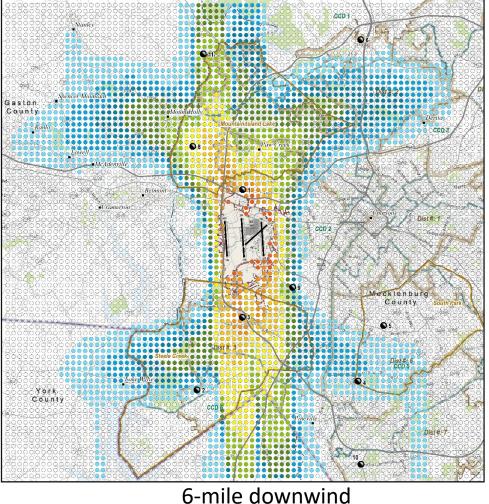


Number Above Lmax 70 Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with 6-Mile Alternating Downwind

| | Runway | | |
|---|--|----------|--|
| []] | Airport Boundary (Approximal | te) | |
| NA 70 I | Lmax Grid | | |
| 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0-25 26-50 51-75 76-100 101-150 151-200 201-300 301-400 401-500 > 500 | | |
| _ | State Boundary | | County Boundary |
| | Highway | | Minor Roads |
| | Major Roads | | Railroad |
| | Charlotte Regions | | |
| | City Council District Boundari | es | |
| | County Commission Districts | | |
| ~~ | Water / Stream | | Open Space |
| ۲ | Landmark Locations 1 West Mecklenburg High 2 Southwest Middle Schoo 3 Olympic Community Higt 4 Quait Hollow Middle Scho 5 South Park Mall 6 NorthLake Mall | School | 7 UNCC 8 US Whitewater Cen 9 Renaissance Park 10 Ballantyne 11 Mountain Island Lai |
| Ponds, R G/S, Mar | urce: Mechlenberg County GIS, Novem Reads): Geston County GIS, November rch 2019, (Perks, Community Points): C y, Chevalette Regions) | 2018 (Pe | rks, Community Points); York Court |
| 0 | 2 | 4 | Nautical Miles |

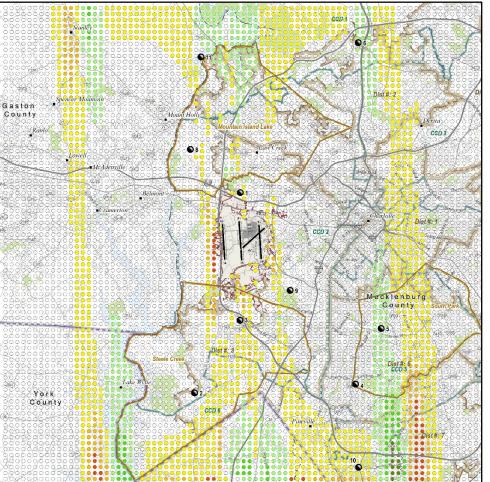
Number of Noise Events Above 70 dB (N70) Analysis: 2018 Operations with 6-Mile Alternating Downwind Compared to Baseline





Number of Noise Events Above 70 dB (N70) Analysis: Difference – 2018 Operations with 6-Mile Alternating Downwind Compared to Baseline

| N70 Difference Interval (Events) | Count of Grid Points / % Change | Count of Population / % Change |
|-------------------------------------|---------------------------------------|--------------------------------------|
| Less than -75 | 0 / 0.0% | 0 / 0.0% |
| -75 to -25 | 11 / 0.2% | 2,485 / 0.3% |
| -25 to -10 | 66 / 1.0% | 6,452 / 0.9% |
| -10 to -1 | 507 / 8.0% | 47,934 / 6.5% |
| -1 to 1 | 4,157 / 66.0% | 515,044 / 69.9% |
| 1 to 10 | 1,364 / 21.6% | 142,419 / 19.3% |
| 10 to 25 | 153 / 2.4% | 16,573 / 2.2% |
| 25 to 75 | 43 / 0.7% | 5,878 / 0.8% |
| Greater than 75 | 0 / 0.0% | 0 / 0.0% |
| Total | 6,301 / 100.0% | 736,785 / 100.0% |





Number Above Lmax 70 Grid Analysis January 1, 2018 through December 31, 2018 CLT Operations with Altitude Based Turns with 6-Mile Alternating Downwind Compared to Baseline Operations

Runwa

| max | Difference Grid | | |
|------------------|---|-------------|--|
| ٠ | -75+ | | |
| • | -25 to -75 | | |
| ٠ | -10 to -25 | | |
| ۲ | -1 to -10 | | |
| 0 | -1 to 1 (No Color) | | |
| 0 | 1 to 10 | | |
| ٠ | 10 to 25 | | |
| | 25 to 75 | | |
| ٠ | 75+ | | |
| _ | State Boundary | | County Boundary |
| | Highway | | Minor Roads |
| | Major Roads | | Railroad |
| | Charlotte Regions | | |
| - | City Council District Boundari | es | |
| | County Commission Districts | | |
| <u>~~</u> | Water / Stream | | Open Space |
| ۲ | Landmark Locations | | |
| | 1 West Mecklenburg High | | 7 UNCC |
| | Southwest Middle Schoo Olympic Community High | | 8 US Whitewater Center 9 Renaissance Park |
| | 4 Quail Hollow Middle Scho | | 10 Ballantyne |
| | 5 South Park Mall | | 11 Mountain Island Lake |
| | 6 NorthLake Mall | | |
| Ponds, G/S, M | ource: Mechlenberg County GIS, Nover Roads); Gaston County GIS, Novembe arch 2019, (Parks, Community Points); ary, Chendlette Regions) | er 2018 (P) | erks: Community Points): York County |

• 584 Grid points (9.2%) / 56,871 people (7.7%) would experience fewer events above 70 dB Lmax with 6-mile alternating downwind

• 1,560 Grid points (24.7%) / 164,870 people (22.3%) would experience more events above 70 dB Lmax with 6-mile alternating downwind

ACR Slate Recommendation Analysis: 2018 Operations with 4-Mile Alternating Downwind Observations

- Number of average daily overflight:
 - A greater number of grid points and more people experienced increases in overflights than decreases
- Number of noise events greater than 70 dB (N70)
 - A greater number of grid points and more people experienced an increase than decrease
- Use of a 6 nautical mile alternating downwind provides the greatest benefits for areas under the current downwind at 5 nautical miles, and least benefit for areas inside and outside (closer and further from the airport) of the current 5 nautical mile downwind
- Potential noise reductions and increases in the central portions of the grid for the community of South Park
- Potential noise reductions in the western portions of the grid and noise increases in the central and eastern portions of the grid for the community of Steele Creek
- Potential noise reductions and increases occur at varying grid areas of the community of Mountain Island Lake
- Dispersion would remain roughly the same compared to baseline operations



Annual Average Day Aircraft Overflights Analysis: 2018 Operations with Alternating Downwind Distances Compared to Baseline

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Mecglenburg

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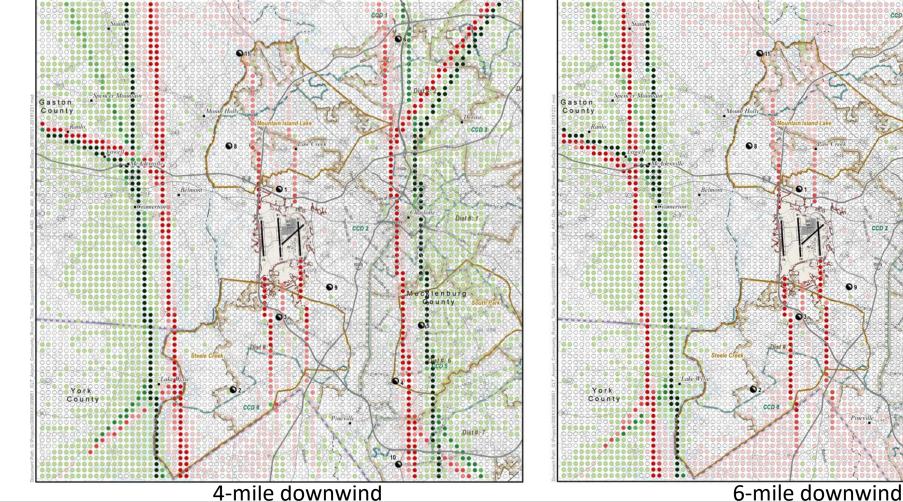
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NWN

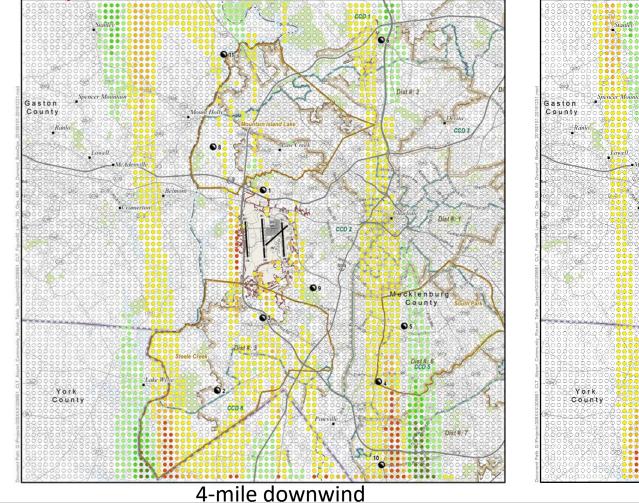
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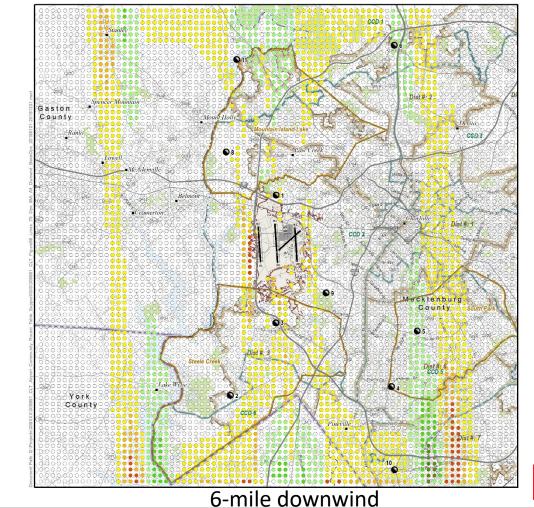
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Number of Noise Events Above 70 dB (N70) Analysis: 2018 Operations with Alternating Downwind Distances Compared to Baseline





ACR Slate Recommendation Analysis: 2018 Operations with Altitude Alternating Downwind Distances Overall Observations

- Alternating downwind distances may result in increases in noise levels to a greater number of grid points and population than would experience decreases compared to baseline operations based on the current grid point analysis size and a 3-year rotation period
- As the distance of the downwind changes the potential number of grid points and population increases that would potentially be exposed to increased noise levels
 - During the year where a 4 nautical mile downwind was used, areas closer to the airport would experience the least benefit
 - During the year where a 6 nautical mile downwind was used, areas further to the airport would experience the least benefit
- Areas under the current location of the downwind would experience the greatest benefit as they would experience reduced noise levels during the years where the 4 and 6 nautical mile downwind are used
- Rotating the location of the downwind legs for CLT arrivals would result in exposing new areas to aircraft noise and would likely result in community reaction to these changes

37

ACR Slate Recommendation Analysis: Alternating Downwind Distances Overall Analysis Considerations for the ACR

- Do the reported changes from the 2018 baseline to the implementation of alternating the downwind distance meet the goals of the ACR?
- How does the potential negative effect of alternating the downwind distance on air traffic controller training, FAA publication cycles, environmental concerns, and associated impacts on Industry factor in to the ACR recommendations for alternating the downwinds?
- Does the ACR want to recommend implementation of alternating downwind distances for consideration of the final slate?



Discussion

