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MEMORANDUM

To:	CLT Airport Community Roundtable
From:	Gene Reindel, Technical Consultant
Date:	December 3, 2019
Subject:	Cumulative Noise Analyses
Reference:	HMMH Project Number 309951.002

The purpose of this memorandum is to provide additional information to the CLT ACR as the members determine the cumulative analyses to request of HMMH. The purpose of the cumulative analyses is to provide ACR members additional information to evaluate whether or not to proceed with certain measures in the slate of recommendations to the FAA. Below is the list of the nine current measures the ACR is considering for the slate of recommendations:

1. Noise abatement departure profile (NADP) procedures
2. Continuous descent approach (CDA) procedures
3. Alternating downwind arrival rails
4. Altitude-based turns for south departures
5. Divergent departure headings
6. Delay initial aircraft turns for south departures
7. Change headings of initial aircraft turns for south departures
8. Remove the two-mile restriction for south departures
9. Maintain a minimum aircraft altitude of 6,000 feet on the downwind arrival legs

As HMMH presented at the November 2019 ACR meeting, there are a total of 20 combinations for the cumulative analyses. This memorandum is intended to reduce the actual number of cumulative analyses to a more manageable number.

Of most importance is that some of the individual measures cannot be combined with other measures. The following is a list of measures that cannot be run together:

1. Change initial departure turn heading with divergent departure headings:
   On divergent departure headings, not all aircraft will fly the same initial headings as multiple departure headings would be assigned based on aircraft destination. This makes both alternatives exclusive and not compatible with being run together.
2. Delay initial turns on departure with removing the two-mile restriction:
   Delaying turns while at the same time removing the two-mile restriction on south departures contradict one another and are mutually exclusive.

HMMH recommends not including NADP nor CDA procedures with the cumulative analyses because such procedures will provide benefit on departure and arrival, respectively, and will not interact differently with other recommended measures. The results of these two procedures will be a noise reduction regardless of what other procedures get implemented and will reduce the noise on top of the reductions realized by the other measures.

HMMH also recommends not combining the alternating downwind rails measure with the cumulative analyses because this results in three independent runs, the likelihood of the FAA to implement such a rotating process is slight at best, and the cumulative results would mostly move to under the alternating downwind rail in effect for each implementation year.

Lastly HMMH recommends not combining delaying the initial turn on south departures with the cumulative analyses as altitude-based turns have the ability to delay turns based on the altitude, so it would be better to

model the altitude-based turns for the cumulative analyses rather than simply delaying the initial turn on departure.

Considering the information as presented above, we propose the following four recommendations for ACR consideration for cumulative analyses:

1. Altitude-based turns with divergent departure headings and maintain a minimum aircraft altitude of 6,000 feet on the downwind arrival legs
2. Altitude-based turns with a change to the initial departure turn heading and maintain a minimum aircraft altitude of 6,000 feet on the downwind arrival legs
3. Remove the two-mile restriction with divergent departure headings and maintain a minimum aircraft altitude of 6,000 feet on the downwind arrival legs
4. Remove the two-mile restriction with a change to the initial departure turn heading and maintain a minimum aircraft altitude of 6,000 feet on the downwind arrival legs

Unfortunately, all four of these recommended cumulative analyses requires additional model preparation and analysis rather than simply combining previously run measures. Therefore, we estimate that we can likely only complete one cumulative analysis per month beginning in January, which results in the fourth cumulative analysis results being provided in April or May 2020, assuming all four of these proposed cumulative analyses are requested from the ACR members.