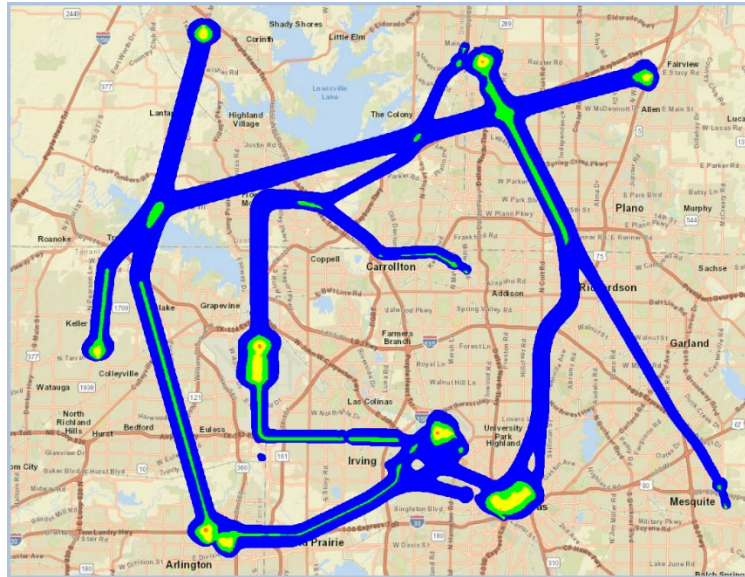


On the modeling of urban air mobility vehicle takeoff and landing operations in the FAA Aviation Environmental Design Tool

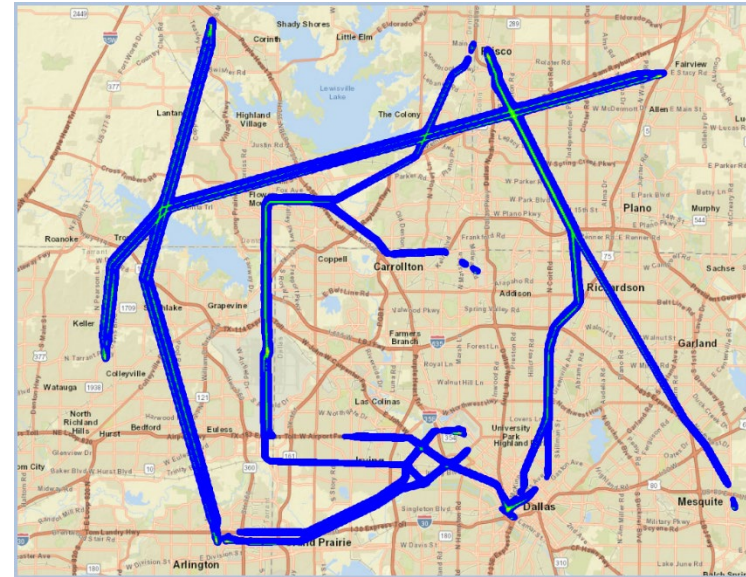
Stefan J. Letica and Stephen A. Rizzi, NASA Langley Research Center



Motivation



Fixed-Wing



Helicopter

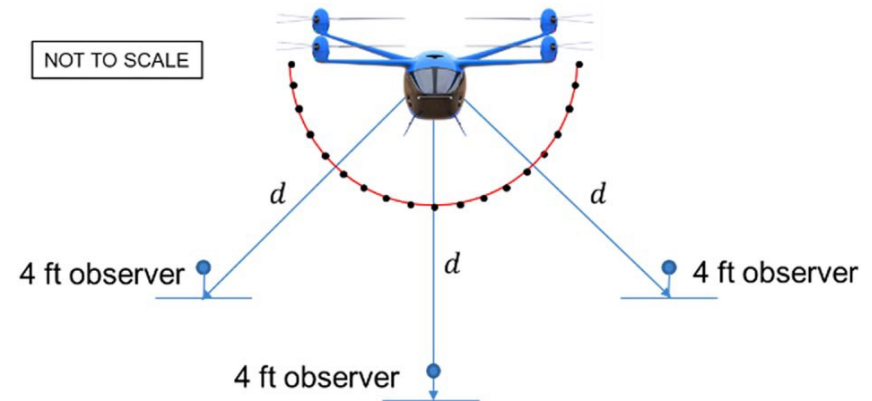
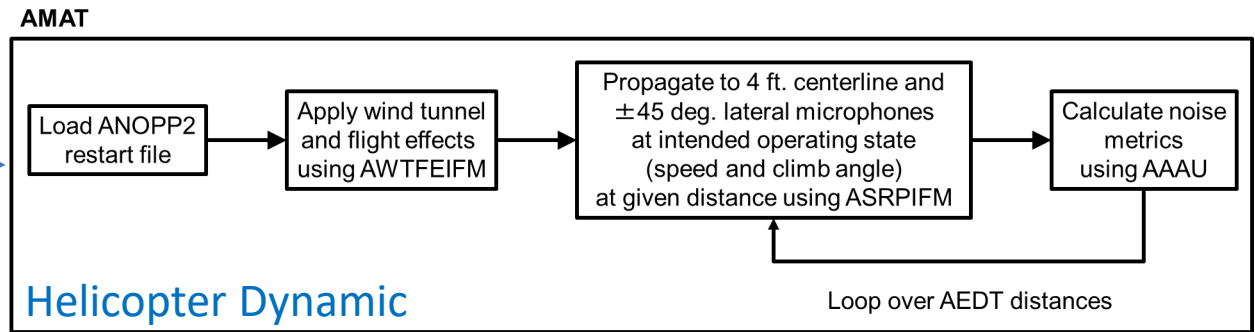
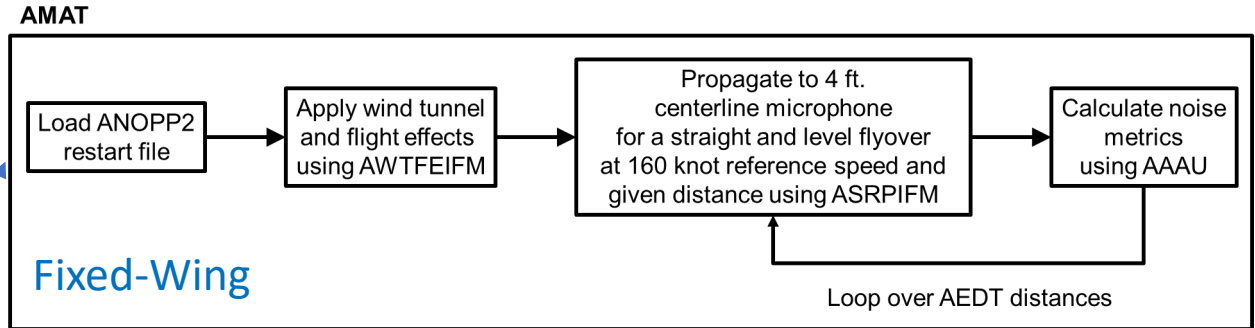
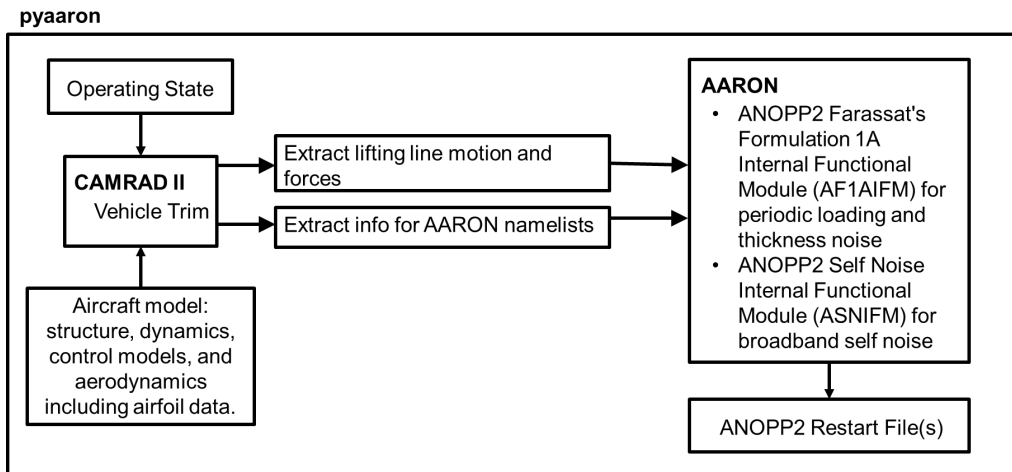




Methodology – AEDT

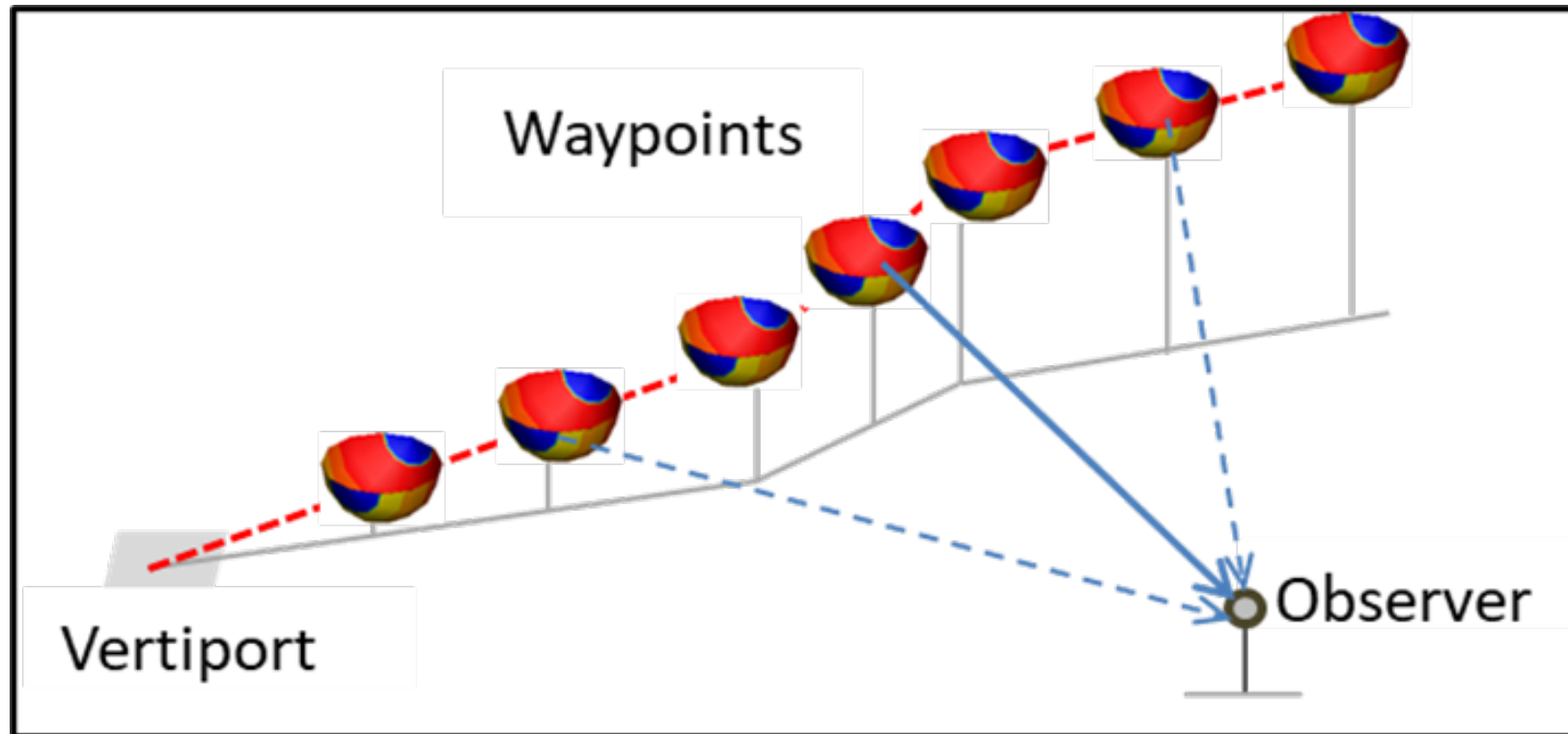
- Generate NPDs
- Provide to AEDT database
- Specify ground track and profile
- AEDT computes contribution from each finite segment with adjustments, including:
 - Noise fraction
 - Duration
 - Lateral directivity
- Report noise exposure and maximum level metrics at ground receptors

Methodology – AMAT

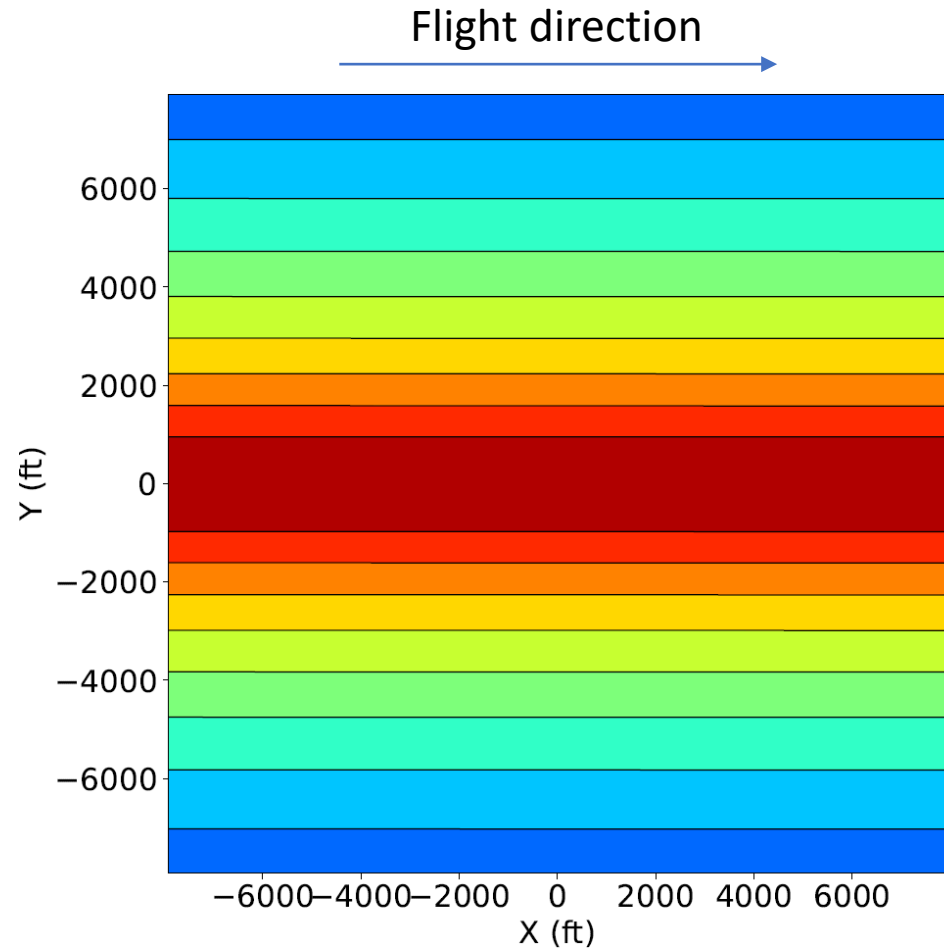


Rizzi, S.A., Letica, S.J., Boyd Jr., D.D., and Lopes, L.V., "Prediction of noise-power-distance data for urban air mobility vehicles," *AIAA Journal of Aircraft*, Vol. 61, No. 1, 2024, pp. 166-182, <https://doi.org/10.2514/1.C037435>.

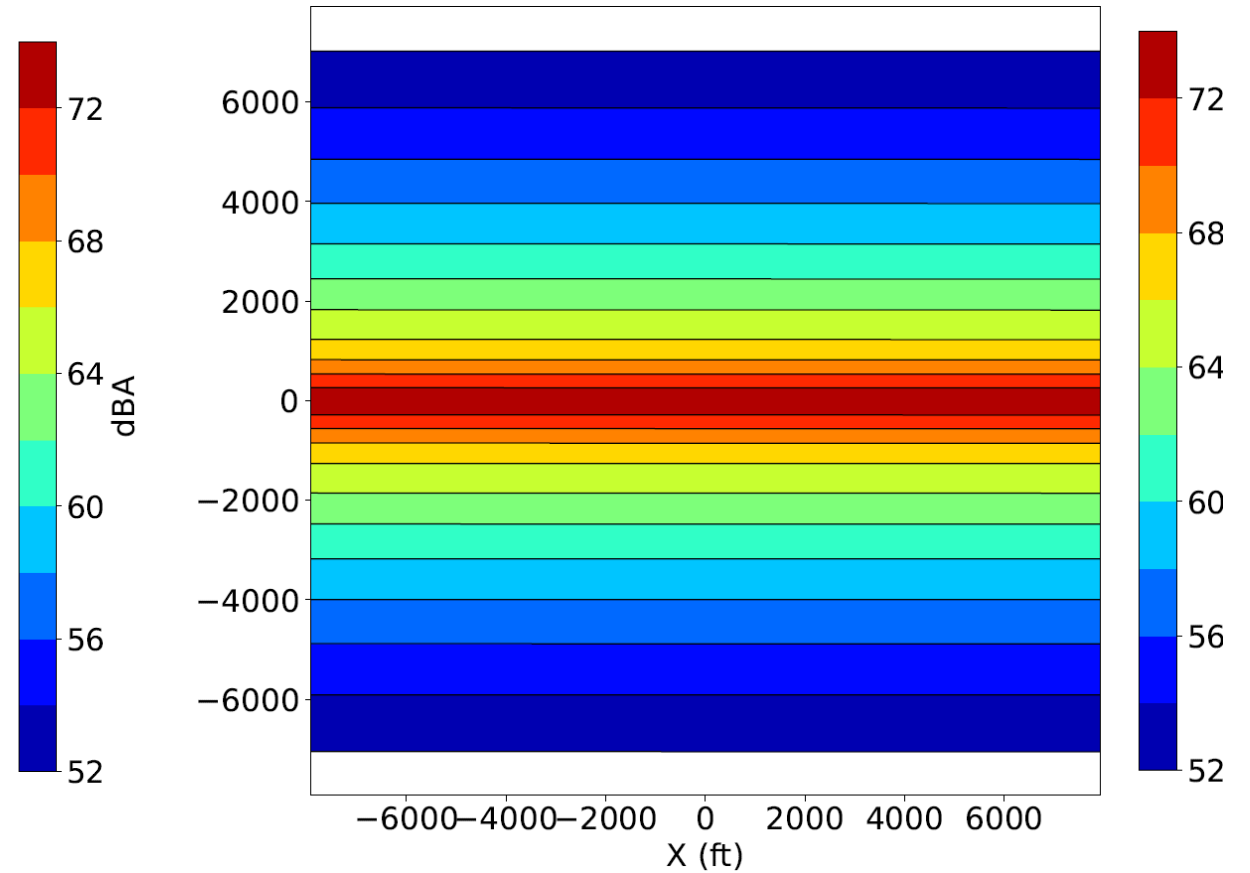
Methodology – AMAT



AEDT Results – Overflight



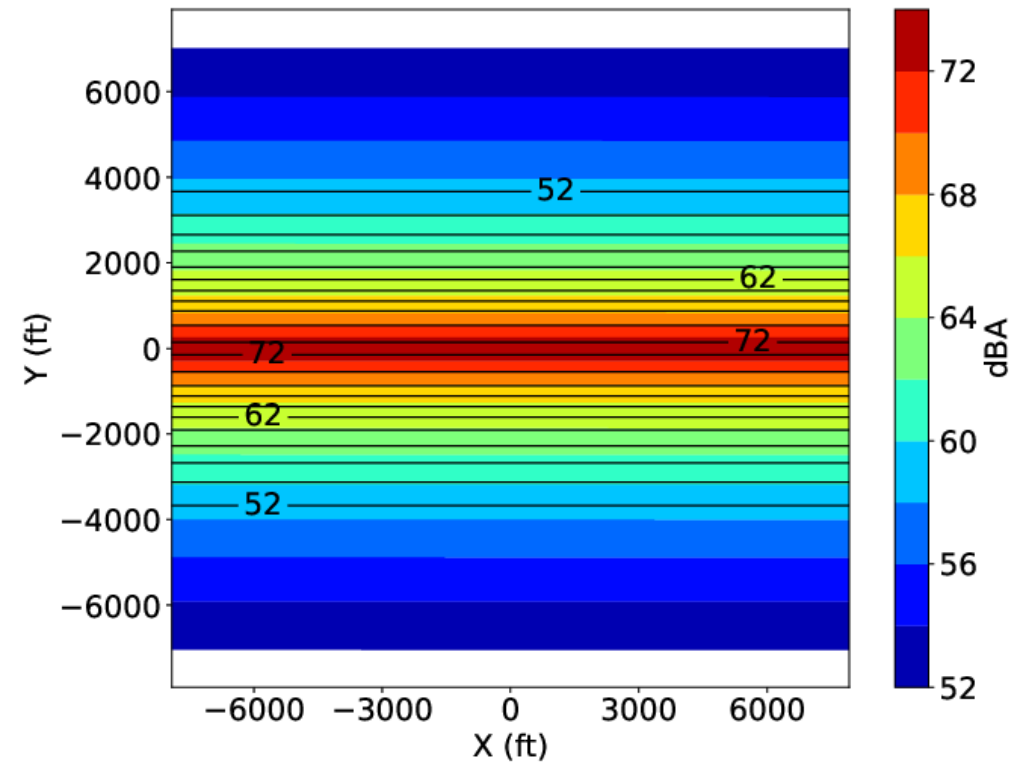
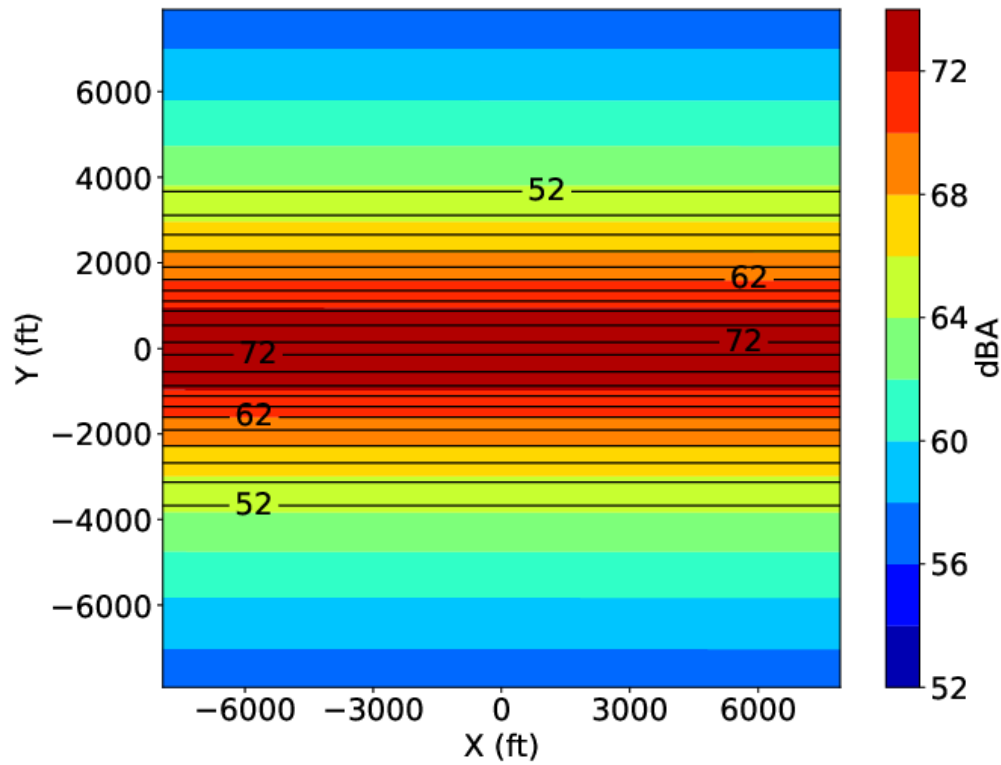
Fixed-Wing



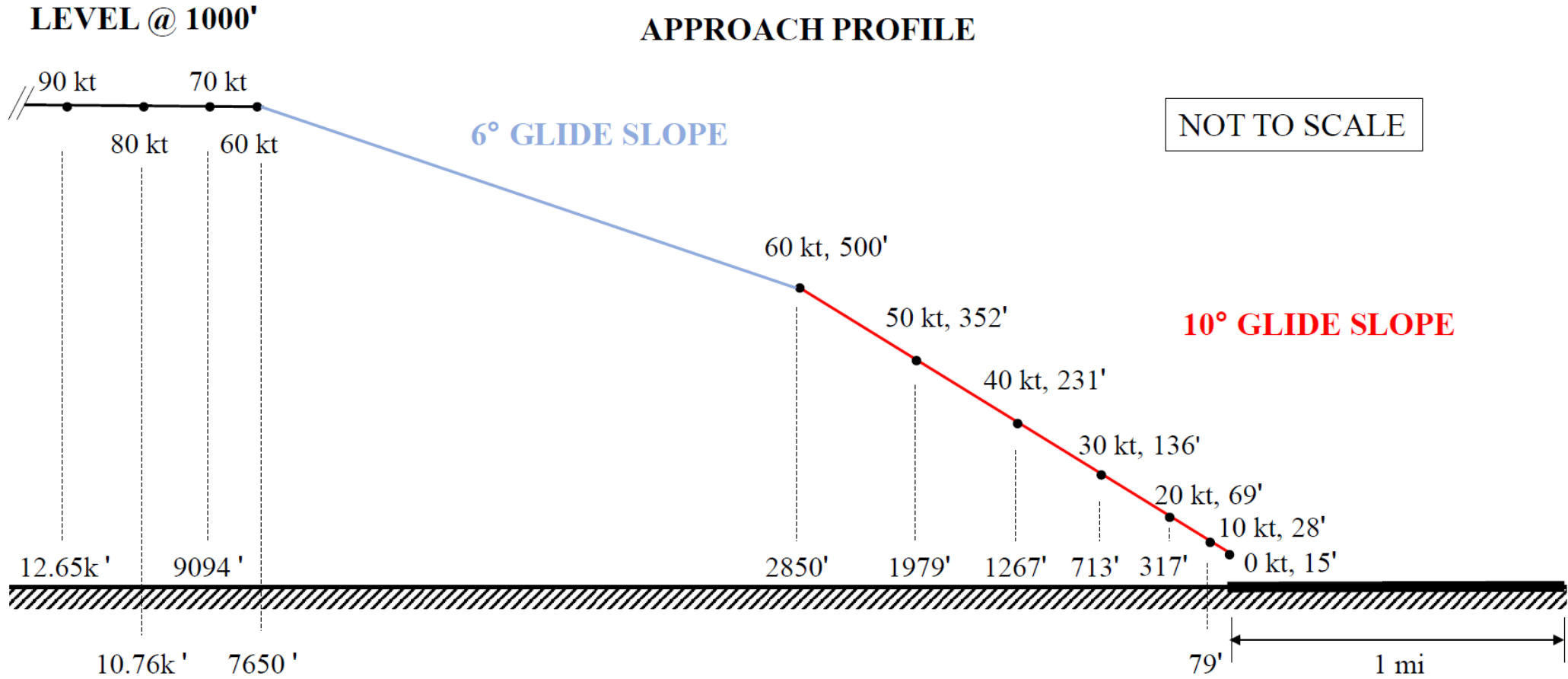
SEL_A

Helicopter

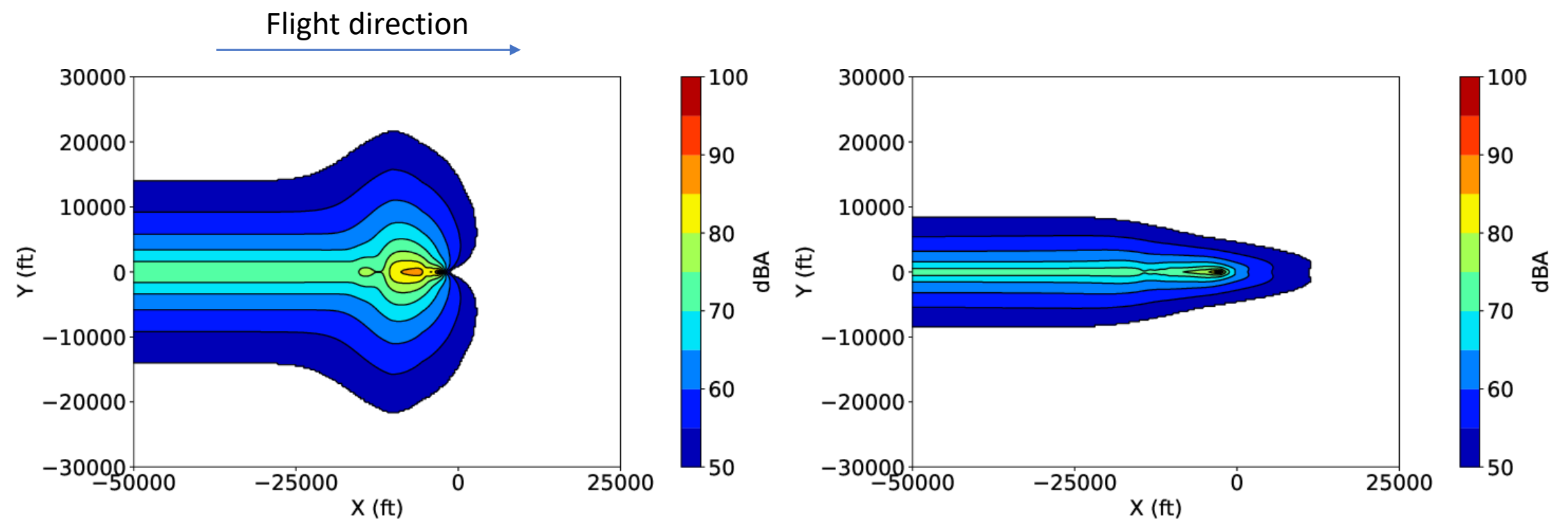
AMAT Comparison – Overflight



Approach



AEDT Comparison – Approach

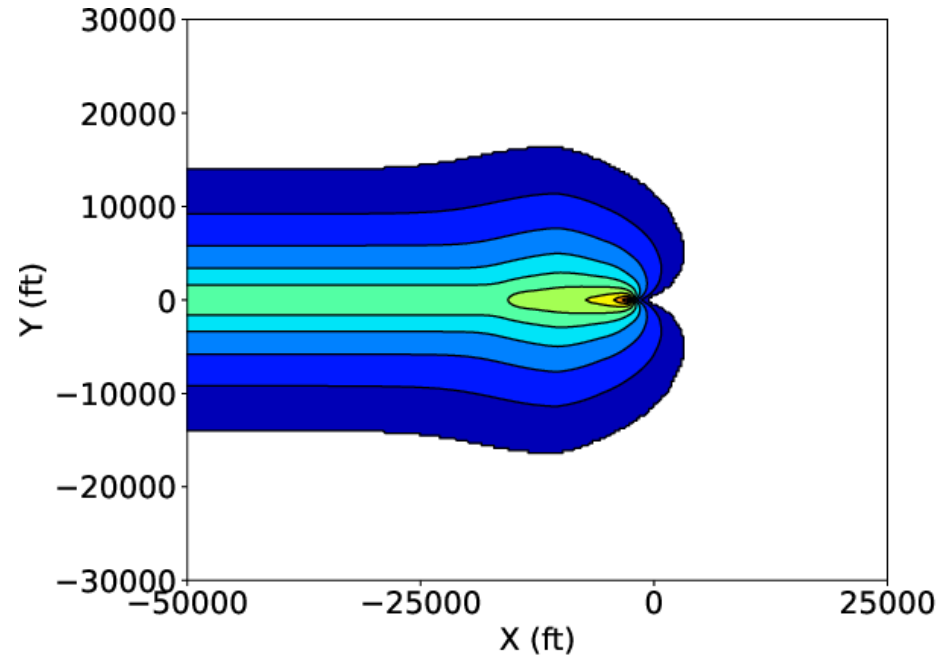


Fixed-Wing

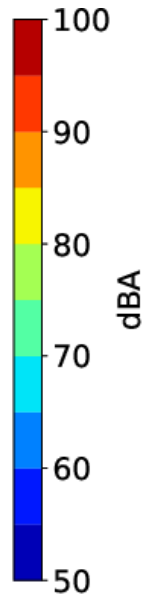
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Helicopter

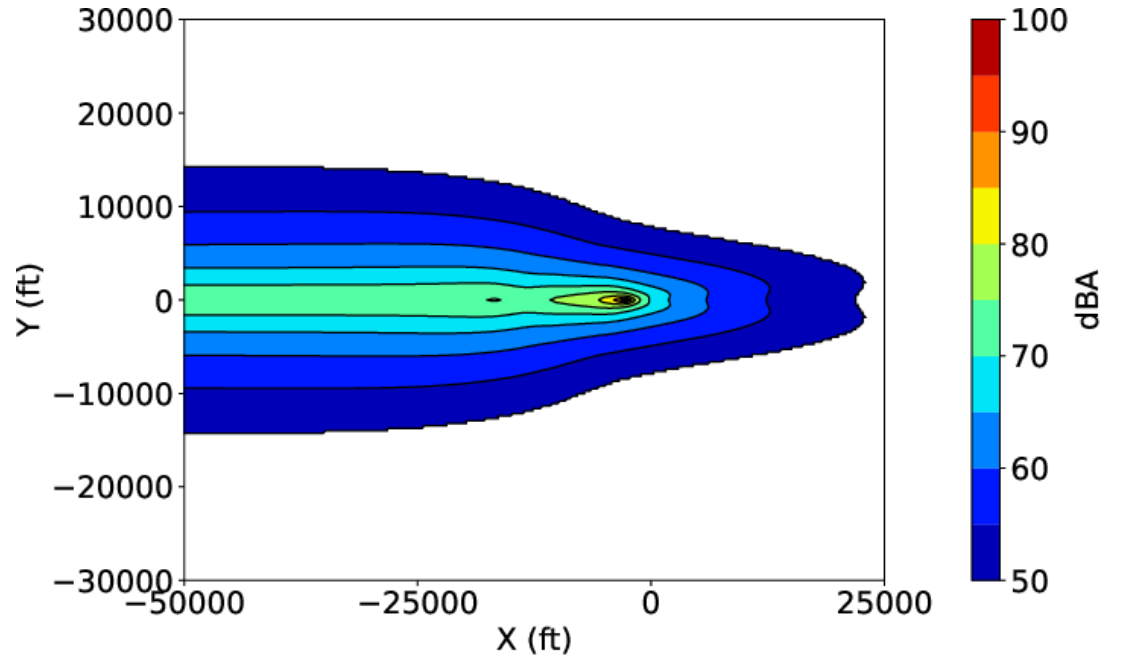
AEDT Results – Approach (Modified)



Fixed-Wing (2-NPD)



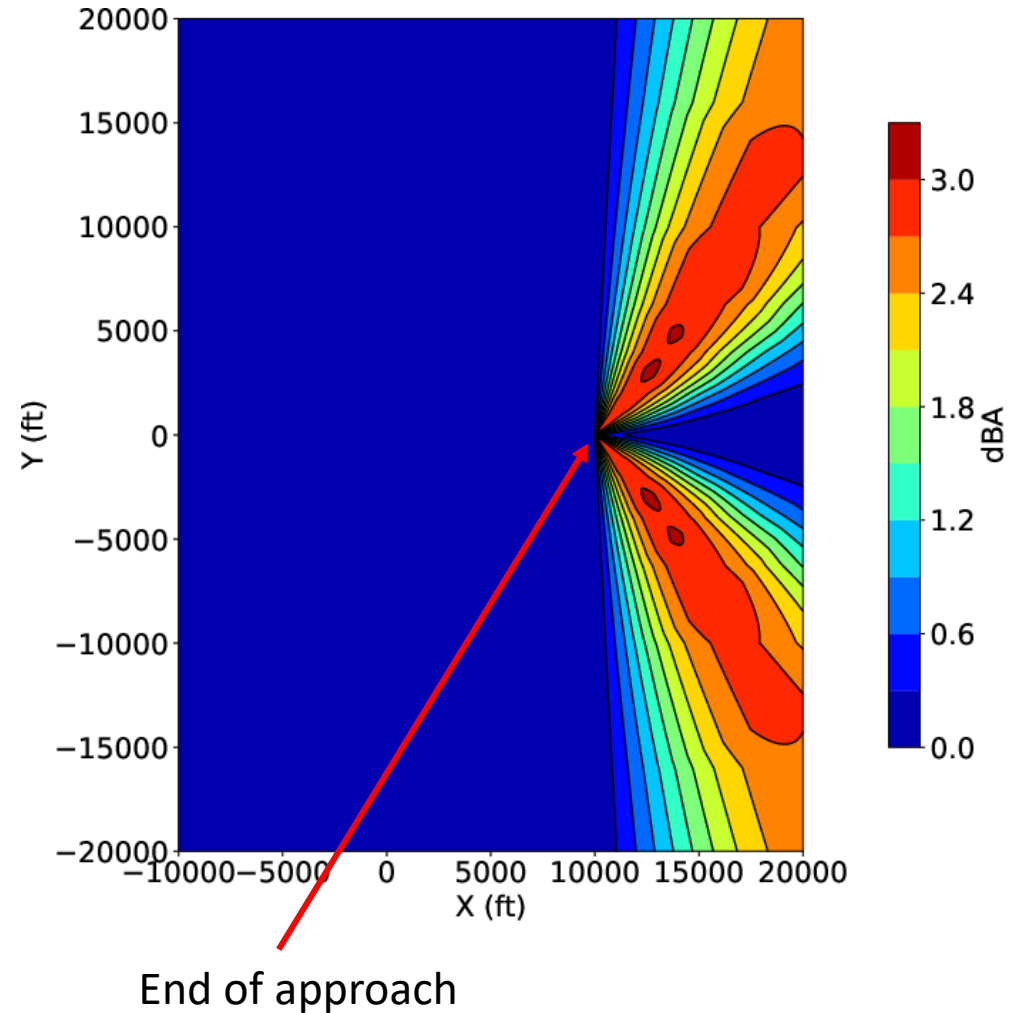
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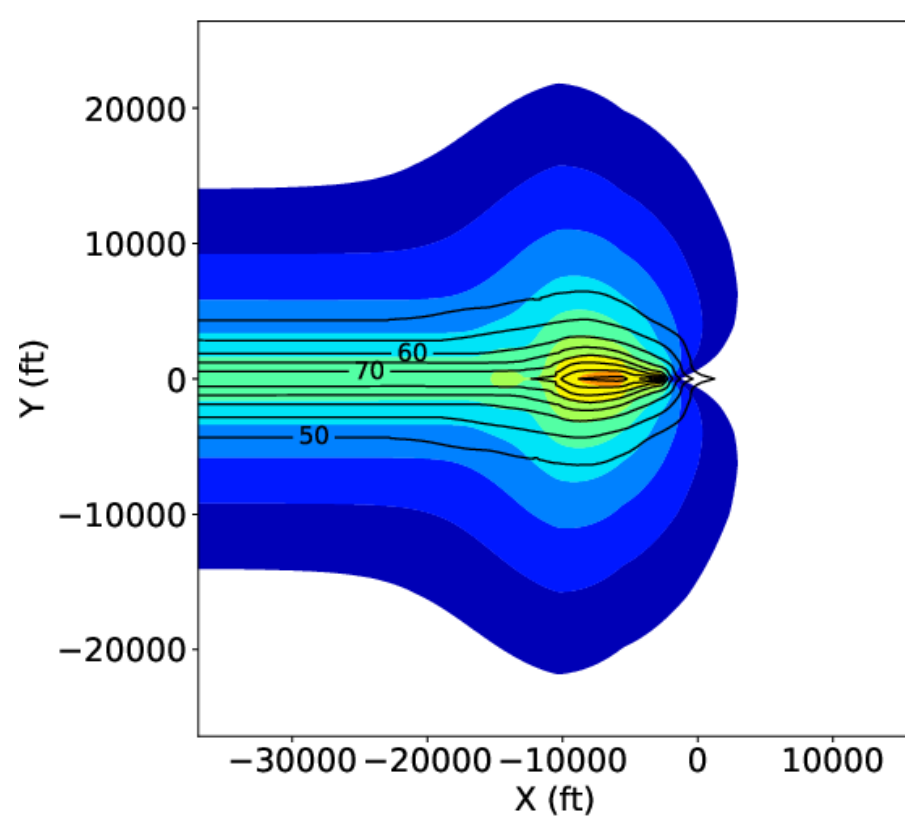
Helicopter (Axisymmetric)

Noise Fraction – Beyond Landing Roll

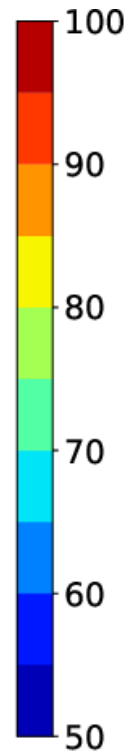
- Extra component of noise fraction calculation
- Only applicable to fixed wing



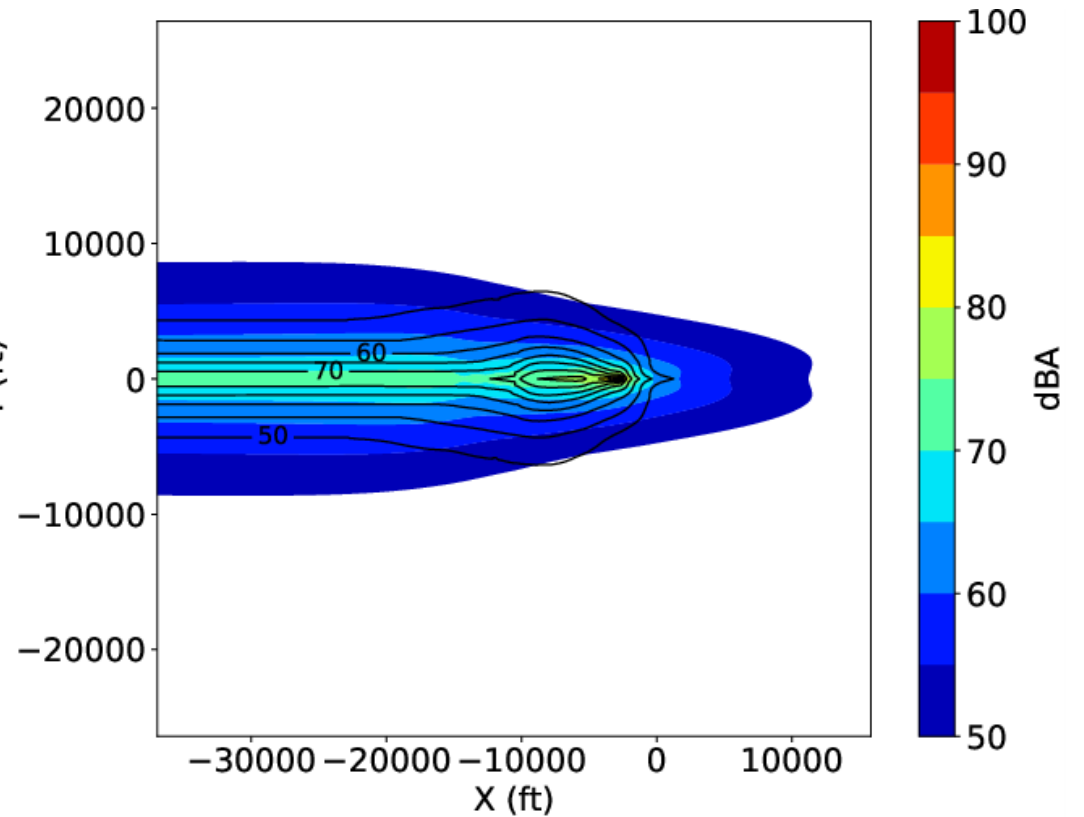
AMAT Comparison – Approach



Fixed-Wing

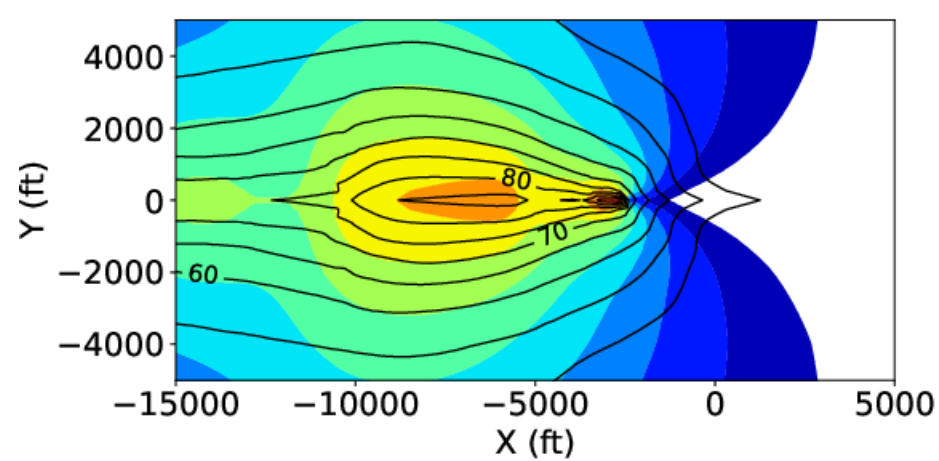


SEL_A

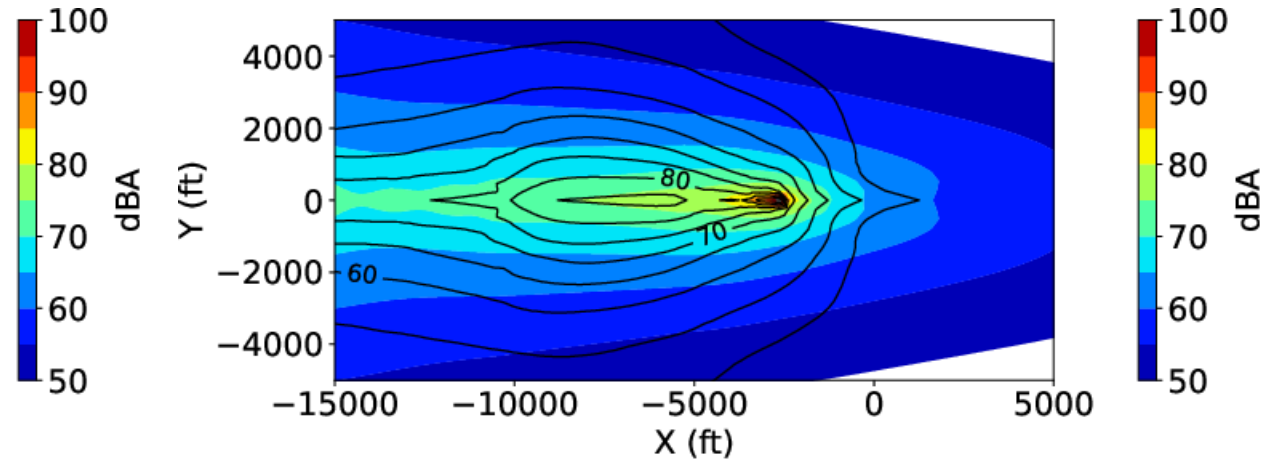


Helicopter

AMAT Comparison – Approach



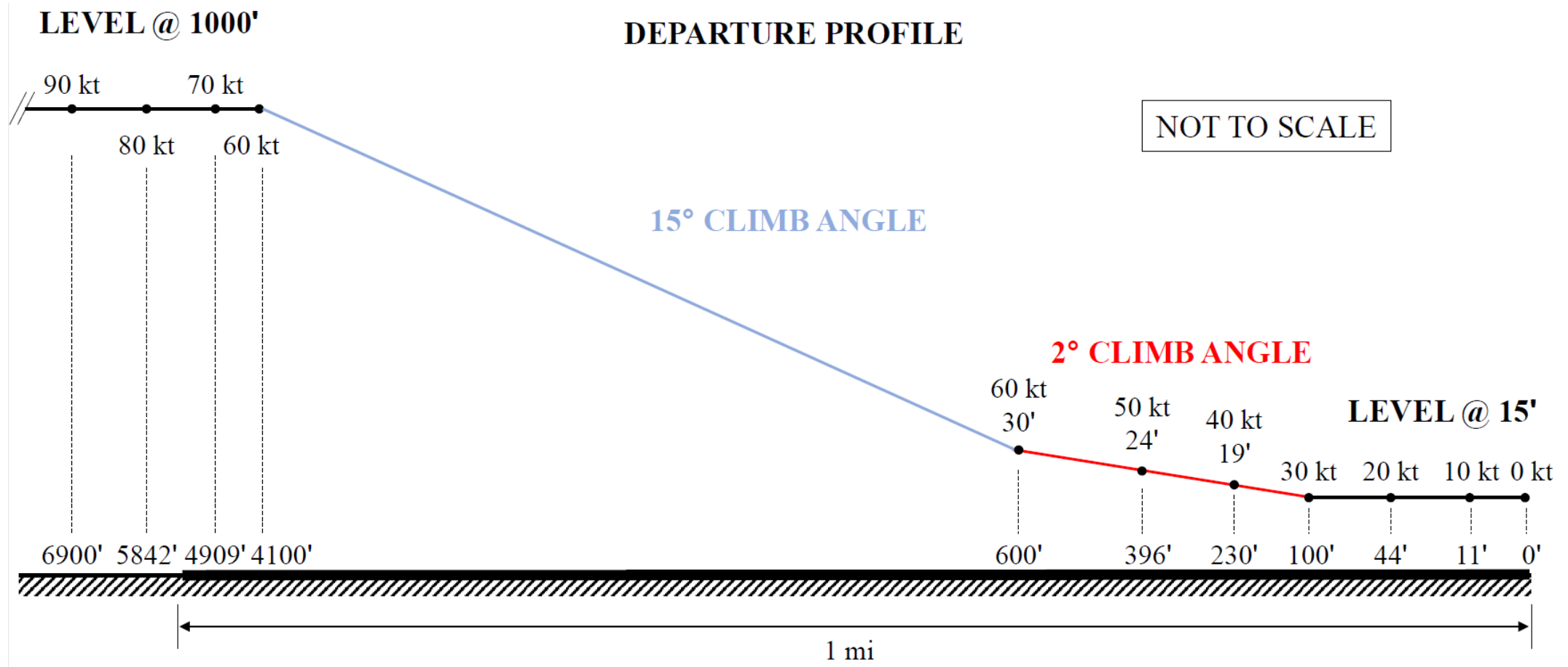
Fixed-Wing



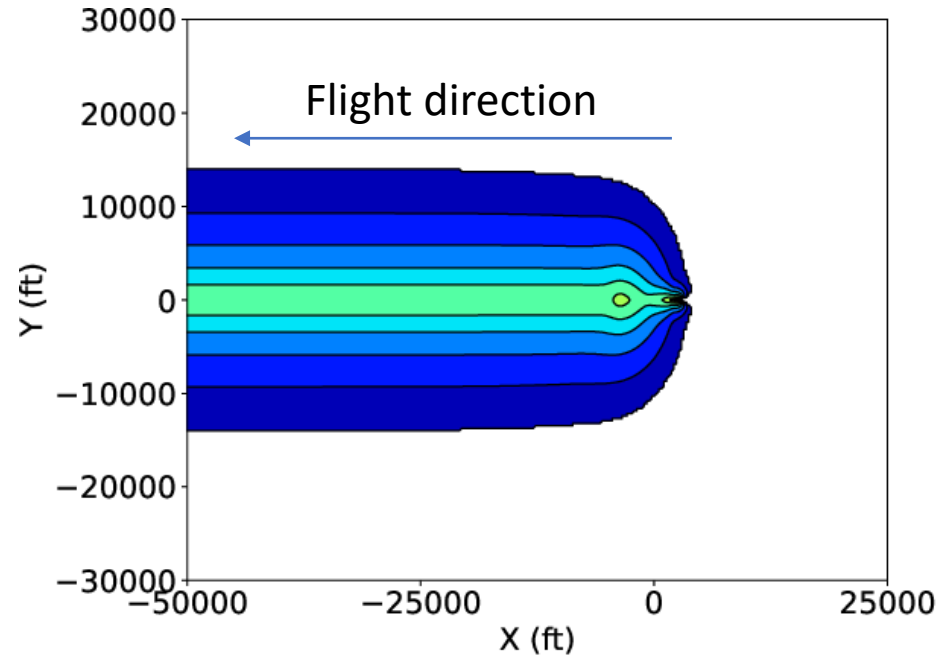
SEL_A

Helicopter

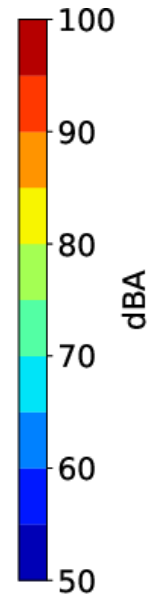
Departure



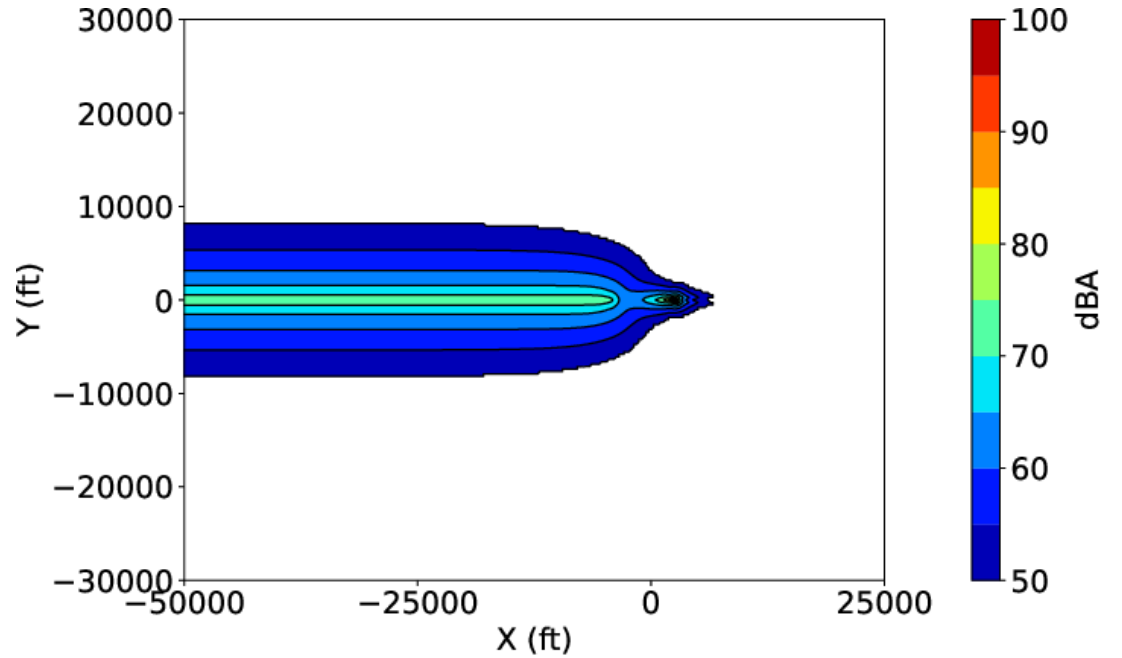
AEDT Results – Departure



Fixed-Wing

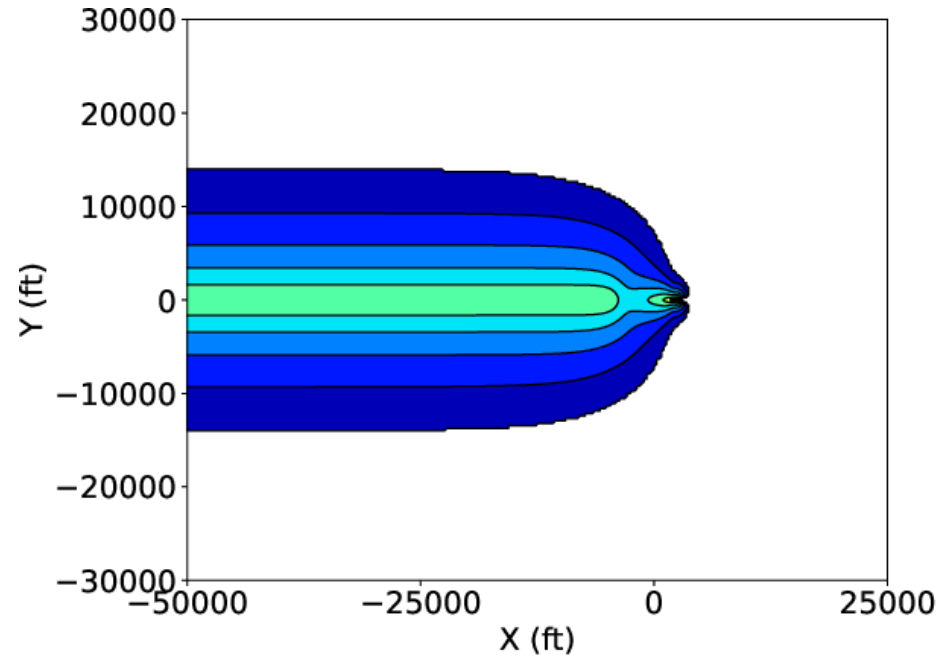


SEL_A

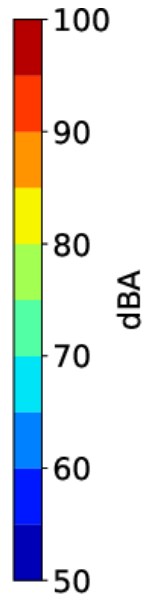


Helicopter

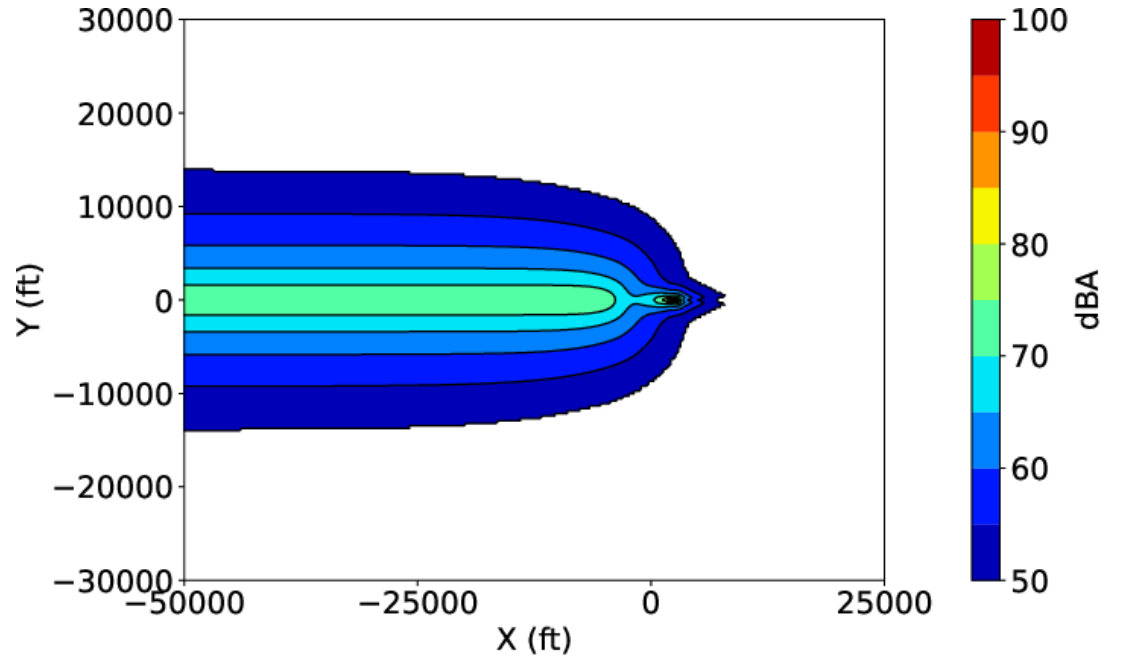
AEDT Results – Departure (Modified)



Fixed-Wing (2-NPD)

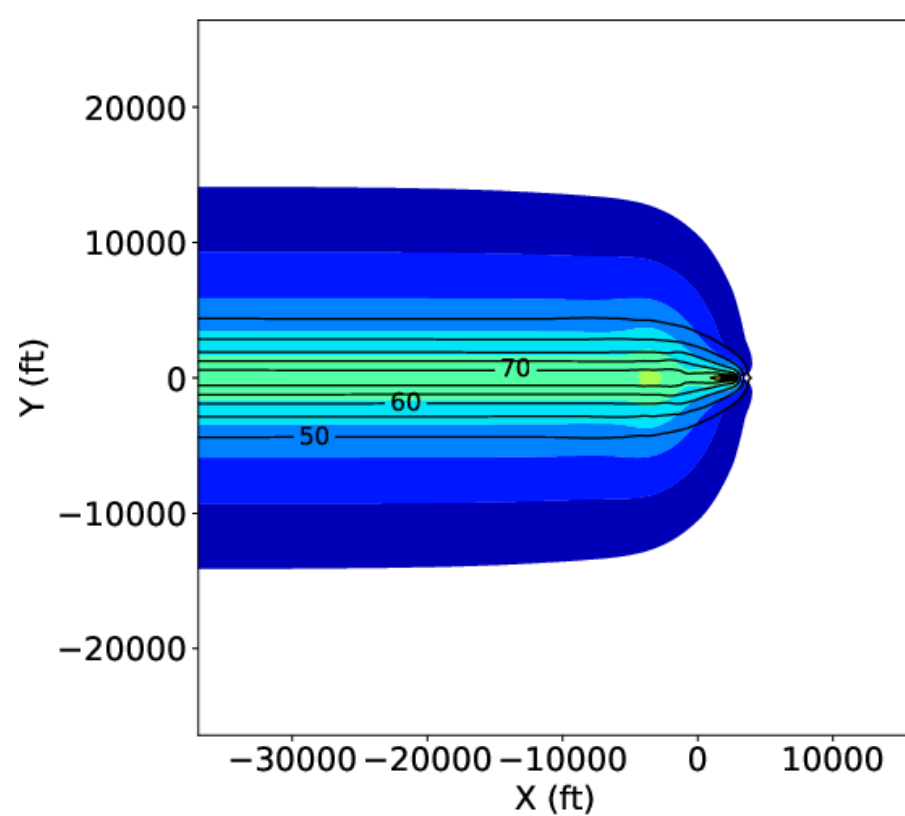


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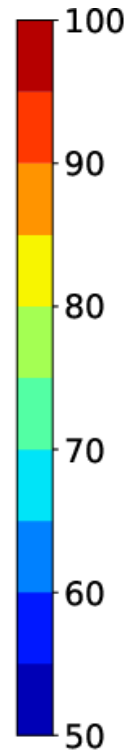


Helicopter (Axisymmetric)

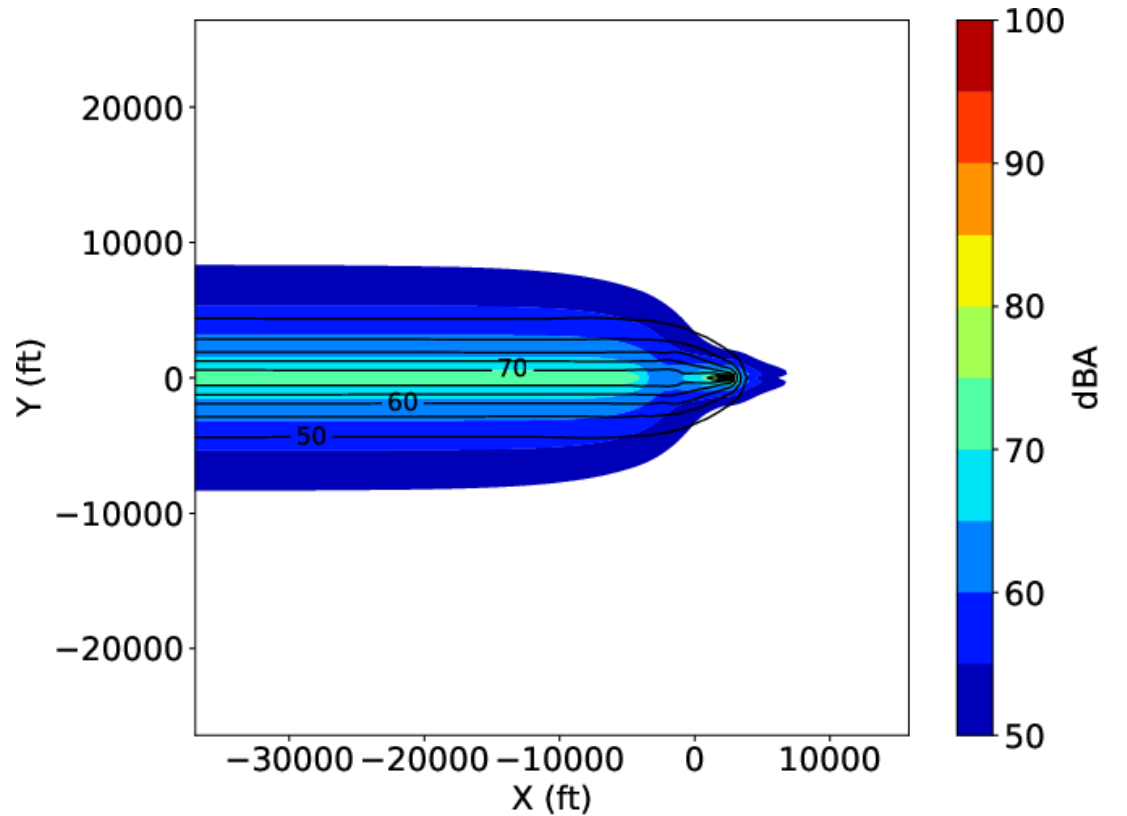
AMAT Comparison – Departure



Fixed-Wing

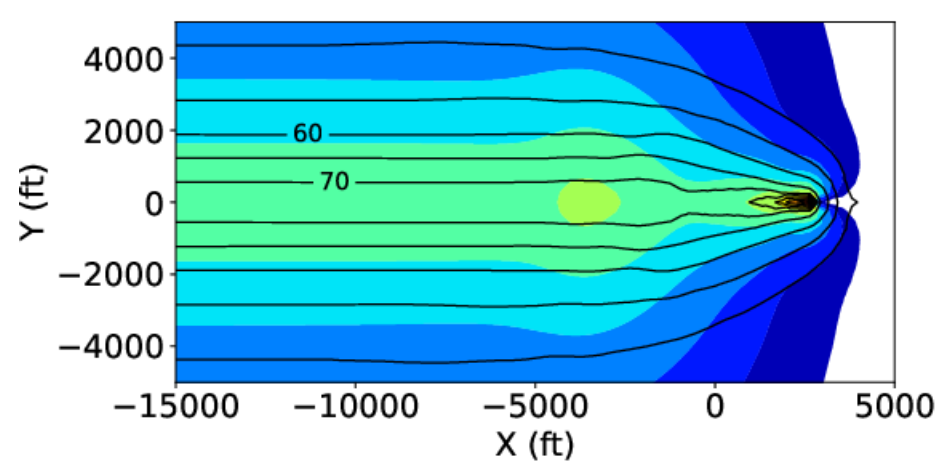


SEL_A

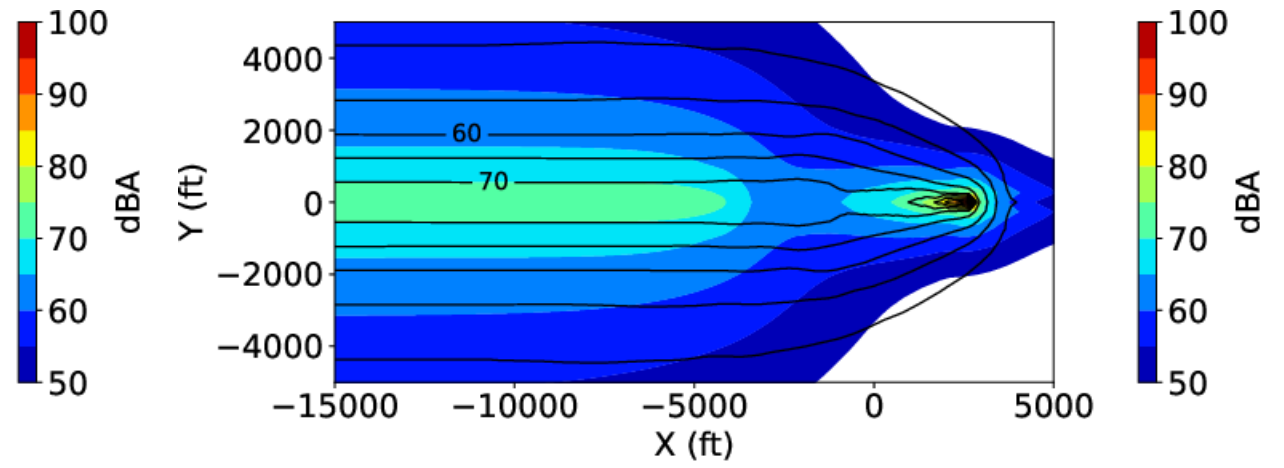


Helicopter

AMAT Comparison – Departure



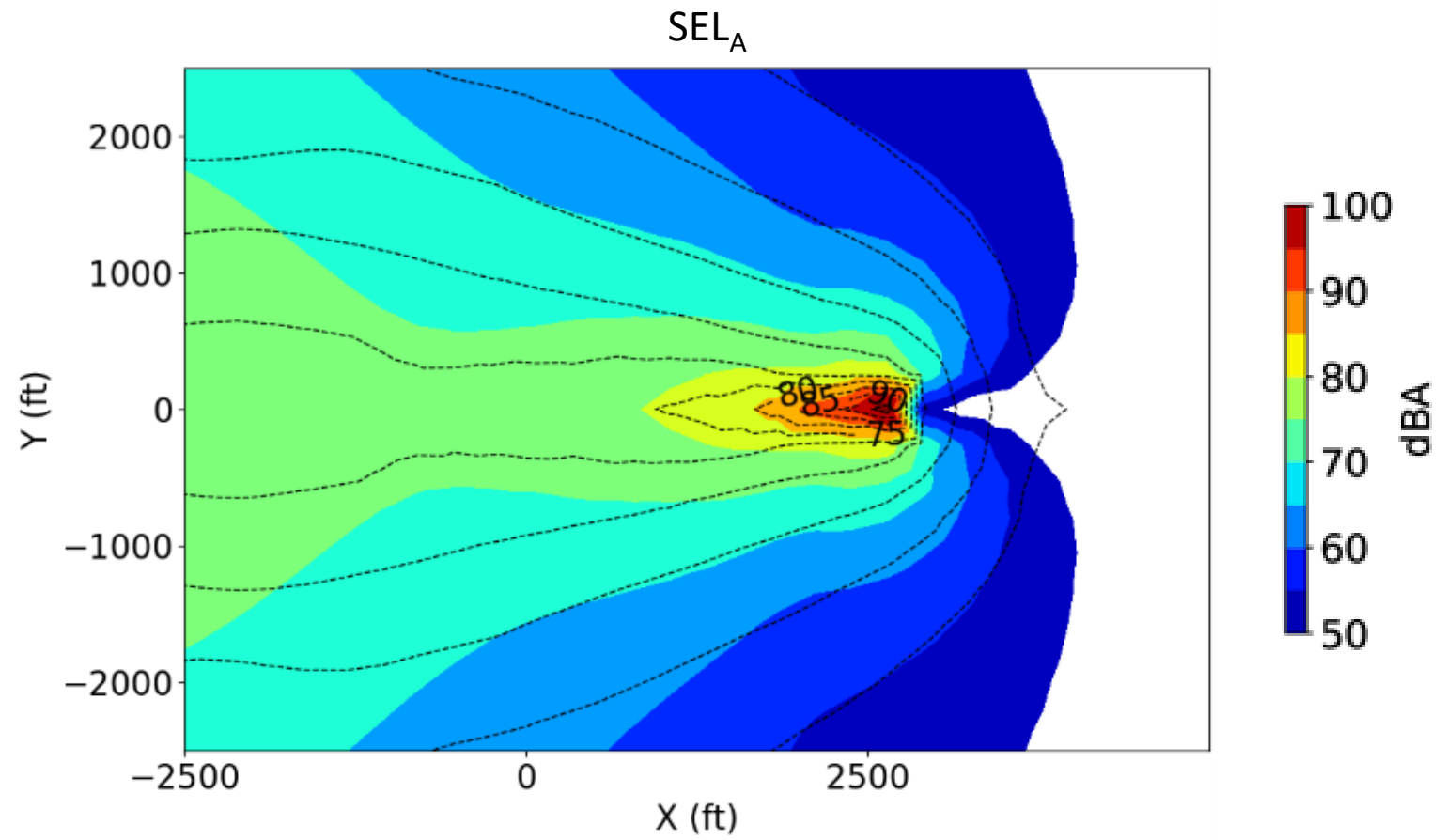
Fixed-Wing



Helicopter

SEL_A

AMAT Comparison – Departure





Summary

- Overflight
 - Both modes of AEDT analysis provide good comparisons directly under the flight path
 - Lateral directivity adjustment in helicopter mode makes sideline comparisons more favorable
- Approach/Departure
 - Fixed-wing mode captures features directly under the flight path that helicopter mode does not, due to reduced # of operating states
 - Noise fraction calculation is a major source of differences between modes
 - Noise fraction differences are not reflected in simulation data for either mode



Acknowledgments

- This work is funded by the NASA Revolutionary Vertical Lift Technology (RVLT) project.
- The authors would like to acknowledge Kevin P. Shepherd for his contributions.

Methodology

