

Annoyance Model Assessments of Urban Air Mobility Vehicle Operations

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As urban air mobility (UAM) vehicles begin to enter service, consideration must be given to vertiport siting and flight routing to help reduce community noise impact and promote adoption by the community. Notwithstanding environmental justice concerns, a possible early strategy is to operate out of existing heliports and fly along established helicopter routes, many of which follow uninhabited waterways and/or roadways (with the thought for the latter that an already noisy ambient environment will mask the sound of the aircraft). However, no prior annoyance model has been fielded that both takes audibility into account and that may be applied to such a real-world strategy. This paper reviews a recently developed annoyance model that includes audibility as a factor and applies it to two flight operations. A simple overflight case is first undertaken to demonstrate the approach. A point-to-point operation in the New York City area is then considered to demonstrate how annoyance varies across an urban soundscape. The cases considered use modeled UAM vehicle noise propagated to a set of ground observers as the signals and either recorded or modeled ambient acoustic data as the maskers.

Supplemental Data

The following sound files are provided as supplemental data to this paper [1]. Each are provided as IEEE 32-bit floating point monaural wave files at a 44.1 kHz sampling rate. The units of the data in this file format are Pascals.

File Name	Description	Associated Figure(s)
Quadrotor_LT_SN_auralization_1.8mm.wav	25 s auralization of RVLT quadrotor reference vehicle with loading and thickness noise and broadband self noise. Observer is flush with the ground.	19 [2]
CentralPark25s.wav	25s of 2018 recording made in Sheep Meadow, Central Park, New York City	4-6 [1]
CitiHall25s.wav	25s of 2018 recording made in City Hall Park, New York City	4-6 [1]

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References

- [1] Rizzi, S.A., Christian, A.W., Letica, S.J., and Lympny, S.V., "Annoyance model assessments of urban air mobility operations," *30th AIAA/CEAS Aeroacoustics Conference*, AIAA-2024-3014, Rome, Italy, 2024, <https://doi.org/10.2514/6.2024-3014>.
- [2] Krishnamurthy, S., Rizzi, S.A., Cheng, R., Boyd Jr., D.D., and Christian, A., "Prediction-based auralization of a multicopter urban air mobility vehicle," *2021 AIAA SciTech Forum*, AIAA-2021-0587, Virtual Meeting, 2021, <https://doi.org/10.2514/6.2021-0587>.