

Project 49

Urban Air Mobility Noise Reduction Modeling

Penn State

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Cost Share Partner: Continuum Dynamics, Inc/Penn State



Objective:

- Develop a first-principles noise modeling system for future UAM aircraft with varied configurations
- Produce noise database for notional UAM configurations for hover, transition, cruise
- Identify configuration changes and operational strategies that minimize acoustic impacts

Project Benefits:

- Initial capability to analyze UAM acoustics
- Understanding of UAM noise characteristics
- Identification of noise reduction opportunities
- Low noise design tool for the UAM industry
- Initial UAM noise data for input to Advanced Acoustic Model, which can provide input to AEDT

Research Approach:

- Build on success of helicopter noise prediction system developed under ASCENT Projects 6 & 38:
 - Couple flight simulation, aerodynamic modeling (CDI's CHARM), and PSU-WOPWOP
- Tailor approach to unique characteristics of UAM by modeling flight dynamics of distributed electric propulsion vehicles including multiple propellers and rotors with PSU-DEPSim
- Develop low noise UAM trim strategies

Major Accomplishments (since last meeting):

- Validation of system noise prediction
 - Time-varying broadband noise predictions
 - Steady flight test measurements
 - Modulation captured, but levels under-predicted
- Noise analysis cause by flight control strategies
 - Broadband noise dominant
 - Focus on realistic maneuvers
- Presented conference papers:
 - 2022 VFS Forum 78
 - 2022 AIAA/CEAS Aeroacoustics Conference

Future Work / Schedule: (next 6 months)

- Model ingestion noise generated by aerodynamic interactions
 - Investigate time-varying broadband during interactions