

2020 REDAC - UAM/UAS Acoustics Research Status

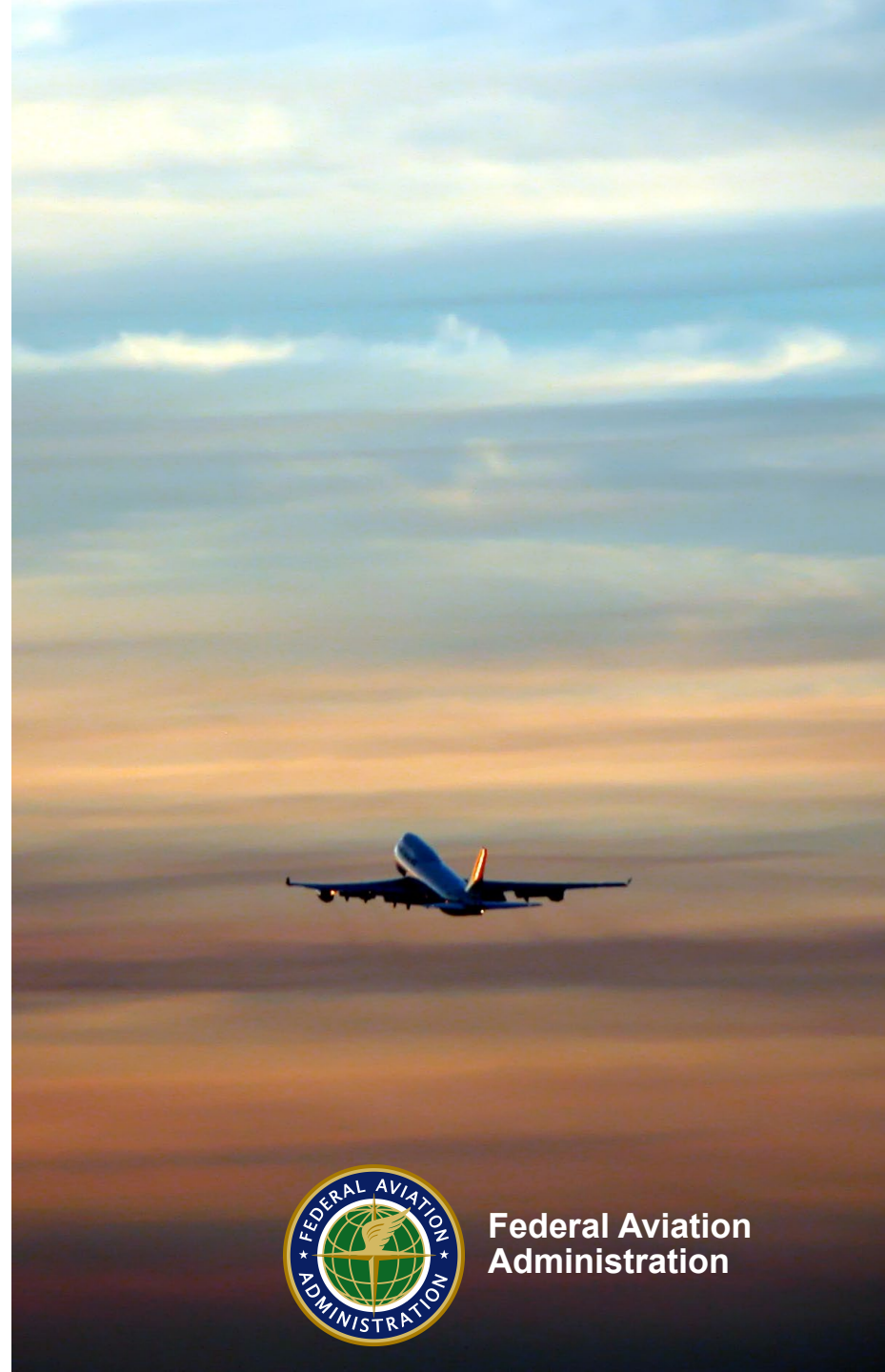
Presented to: REDAC E&E Subcommittee

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Motivation

- Rapidly growing interest in the development and use of Urban Air Mobility (UAM) aircraft
- Noise is widely recognized as one of the challenges to the introduction of UAM.
- UAM are a new category of aircraft and their acoustic characteristics are not well understood
- Information about UAM noise is needed soon:
 - To inform the approach to noise certification
 - To understand the impact on communities
 - To design quiet configurations
 - To understand how to operate UAM quietly



Wisk Cora



BETA Ava XC



ASCENT Project 49

Goals:

- Develop initial capability to predict UAM acoustics
- Improve understanding of UAM noise characteristics
- Identify noise reduction opportunities

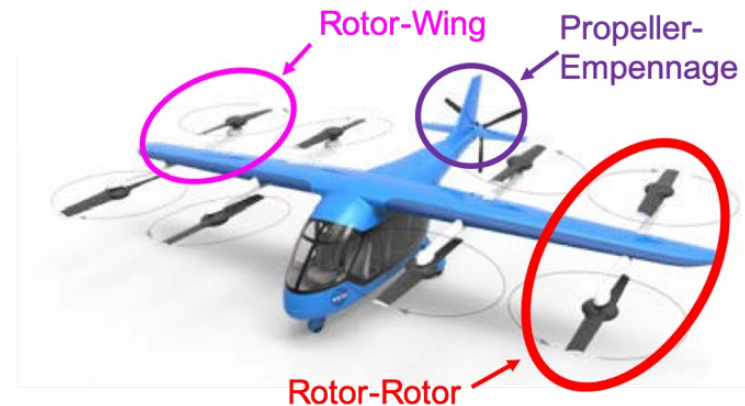
Approach:

- Build on success of helicopter noise prediction system developed under ASCENT Projects 6 & 38
- Tailor approach to the unique characteristics of UAM
 - PSU DEPSim for flight state of multirotor vehicles 🌀
 - Unsteady loading with CDI's CHARM
 - Increase efficiency of PSU-WOPWOP for many rotors
 - Generalize broadband noise models for UAM

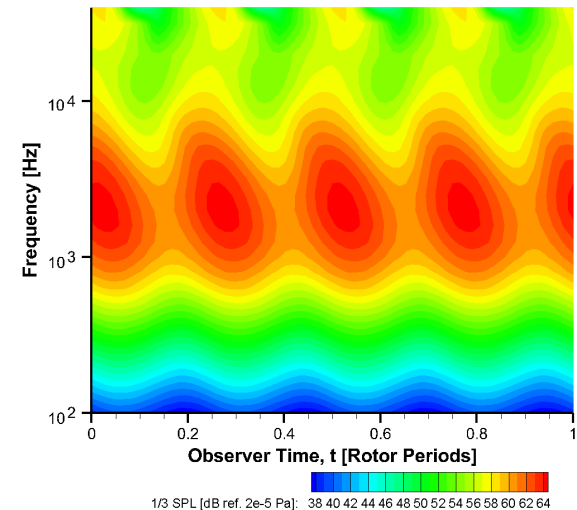
Status:

- Investigating applicability of physics-based Brooks, Pope, and Marcolini (BPM) model for UAM noise
- PSU-WOPWOP implementation allows for analysis of time-varying broadband noise, which may be especially important for UAM due to the complex interactional aerodynamics

NASA UAM Reference Vehicle



Lift + Cruise “Air-Taxi”



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ASCENT Project 61: Noise Certification Streaming (GeorgiaTech team led by Jimmy Tai)

Goals:

- Evaluate and improve the business process of noise certification
- Increase efficiency and flexibility in noise certification of both existing and future aircraft type

Approach:

- Quantitative assessment of noise certification process via System Engineering tools and methods
- Leverage knowledge of technical experts and specialists

Status:

- Project kicked off on August 24, 2020
- Project Advisory panel of industry experts is formed



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ASCENT Project 77

Goals:

- Develop noise measurement and data analysis techniques for repeatable characterization of UAS and UAM noise
- Establish a database of UAS and UAM noise measurements across a wide range configurations and operating conditions
- Inform the development of noise certification standards and identify effective noise reduction opportunities through design and operation

Approach:

- Develop noise source separation for multirotor vehicles
- Leverage Project 49 predictions to determine effective experimental procedures before flight
- Investigate microphone types and installations
- Develop reconfigurable multirotor UAS
- Collect noise data on UAS and UAM vehicles

Status:

- Awaiting official start of project
- Preliminary UAM noise measurements conducted with Beta Technologies in Plattsburgh, NY



PSU Multicopter UAS



Beta Alia-250



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Beta Alia-250

UAS Noise Analysis Methodology Development

- While focusing on the introduction of UAS into the NAS, FAA must still consider the environmental impacts of these new operations (e.g. via NEPA)
- Such considerations are the responsibility of the 'Office of Primary Responsibility – OPR'
- Given the dynamic development of the industry and a lack of acoustic data, such analyses are difficult and without precedent
- To support the OPR, AEE has engaged to develop and test a methodology to analyze the noise impacts of these aircraft



UAS Noise Analysis Methodology Development

- **AEE has identified three work elements to address this need:**
 1. Develop and test an analysis methodology for Part 107 Operations over People/Night Final Rule
 2. Develop and test an analysis methodology for waivers, exemptions, and Part 135 approvals
 3. Develop and test a capability that can be implemented by the OPR during their consideration of noise impacts
- **AEE has kicked off Element 1, and is in final negotiations for Element 2.**
- **Element 3 is still in development, but should be started this fall.**



QUESTIONS ?

