

Advanced Air Mobility (AAM) Ecosystems Working Group Briefing

Urban Air Mobility Noise Working Group (UNWNG)

Subgroup 2: Ground & Flight Testing

29 April 2021

Virtual Meeting

Group Leads:

Devin Boyle (NASA, GRC), Juliet Page (Volpe, US DOT), Kyle Pascioni (NASA, LaRC)

Goal: Ground & Flight Testing Subgroup Goal

Develop a research measurement standard or set of guidelines which can be used to adequately quantify community noise impact

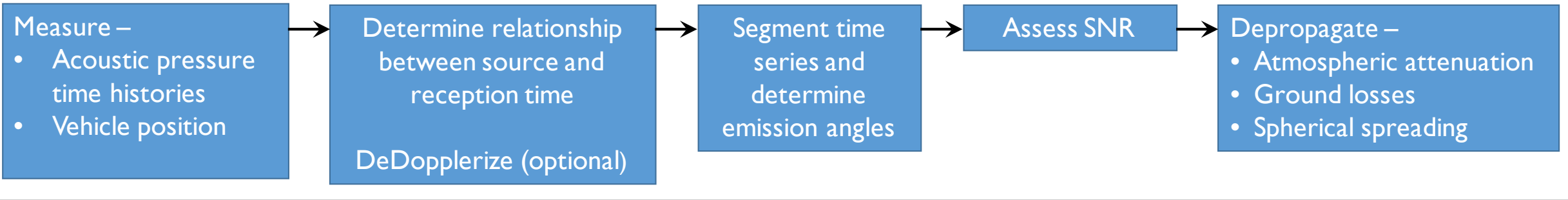
Approach: *Define measurements suitable for the creation of acoustic spheres*

- Ensure sufficient data gathered to support quantifying community noise impacts
- Activities coupled with all the other SGs: Tools/Technologies, Metrics, Regulation & Policy
- Taking steps towards a standard or set of guidelines
 - Define a prioritized list of all possible measurements that would fully define the acoustic environment for the community – potentially perform an extensive test (possibly multiple tests)
 - Define a subset of measurements and requirements for a standard – this will likely require analysis (from multiple groups) of the data from an extensive measurement campaign
 - Starting small and developing group input on specifying best practices/requirements

Empirical Data Processing

- Connection with other Subgroups
- Process ground-based acoustic measurements of steady flight conditions to provide input to Subgroups 1 and 3

Subgroup 2



Subgroup 1 -

- High quality time series (for tonal), harmonically averaged
- High quality spectra (for broadband)

Subgroup 3 -

- to compute metrics
- use for auralization

SG2 Discussion Topics

Review current research, existing standards, certification procedures and guidelines. Discuss interrelated items and develop SG consensus on testing topics, including confidence level needs.

- **Environment:**
 - Temperature profiles
 - Wind Profiles
 - Humidity
 - Ground Impedance
 - Terrain / Obstructions
 - Background Noise
- **Time Synchronization:**
 - Acoustics & Flight Vehicle
- **Signal Acquisition and Processing:**
 - Frequency Range
 - Dynamic Range
 - Spectral Resolution
- **Acoustic Measurements:**
 - Microphone orientation
 - Ground board material / geometry
 - Microphone location / array layout

Progress Towards the Standard

Topic	Part 36-H	ANSI S12.75	UNWG Subgroup 2 Decision
Temperature	14 – 95 F	36 – 95 F	1) Adopt Part 36 Wording – “There may be no temperature inversion or anomalous wind conditions that would significantly alter the noise level of the airplane when the noise is recorded at the required measuring point.” 2) Measure at 2 altitude 3) Measurement location will depend on aircraft altitude
Pressure	Measurement required	Measurement required	1) Measure at 2 altitude 2) Measurement location will depend on aircraft altitude
Humidity	1) Between 20-95% 2) 8kHz 1/3 octave band no greater than 12 dB/100 meters 3) Measure within 30 min of test @ 44ft	1) Between 10-95%, 20-95% preferred 2) Measure @ 5ft AGL	1) Should be frequency dependent 2) Specification should be based on predicted impact
Wind Speed	< 10 kt	1) < 8 kt sustained 2) 8 – 12 kt discretion of director	1) Should be aircraft weight based

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Background Noise	1) SNR > 3 dB for each 1/3 octave band, else corrected “Last Good Band” 2) measure 30s average, 1/3 octave band	1) SNR > 10 dB for each 1/3 octave band, else toss 2) Measure 30s average, 1/3 octave from 20 – 12.5 kHz	1) get away from 1/3 octave, use 1/12 octave or narrowband

SG2 Activities

- Co-Leadership:
 - Devin Boyle (NASA, GRC)
 - Juliet Page (Volpe, US DOT)
 - Kyle Pascioni (NASA, LaRC)
- Monthly Team meetings:
 - Third Thursday of the month, 12-1pm ET
 - Appx. 20-30 in attendance at meetings
 - Appx. 45 on distribution
- Actively developing a working document identifying measurement guidelines
- File sharing of documents via OneDrive
 - Eric Greenwood (PSU) provided a collection of empirical noise model literature
 - PSU is hosting the shared drive

We have an active subgroup!

- The following topics were briefed:
 - Anthony Martinez, Rory Nicholls, University of Salford (UK) – Data exchange / measurements for human response testing
 - David Read (Volpe) – Unconventional Aircraft Measurements - Choctaw Nation
- Upcoming Discussions (@Breakout):
 - Robert Downs (Volpe) – “Some considerations for fractional octave band spectrum calculations”

Ground and Flight Testing SG Data Status and Requests

- Datasets with sharing potential for advancing procedure development via analysis:
 - FAA UAS National Airspace Integration Pilot Program – Measurements of Unconventional Aircraft - Choctaw Nation of Oklahoma, Daisy Ranch
 - 4 UAVs: three multicopters (5-45 lbs) and one fixed-wing vehicle (span ~7 ft)
 - PSU/FAA multirotor UAS, Beta Technologies vehicle (to be acquired soon)
 - NASA/FAA civil helicopter data (limited set of R44 flyovers)
- Request to the UAM community:
 - Vehicles for acoustic measurements
 - Would provide crucial data!
 - Would provide you with quality acoustic measurements and a better understanding of potential community impact
- Request to other UNWG subgroups:
 - Input from tools group on what outcomes from measurements may be useful
 - Input from metrics group on any specific attributes of importance

Ground & Flight Testing Subgroup Info

- Please reach out to Leadership to join UNWVG SG2
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