



COMMITTEE ON AVIATION ENVIRONMENTAL PROTECTION (CAEP)

STEERING GROUP MEETING

São Paulo, Brazil, 5 to 9 December 2022

Agenda Item 7: Noise Technical (WG1)

U.S. UPDATES ON ETA NOISE CERTIFICATION

(Presented by the United States of America)

SUMMARY

This paper presents status updates on the current approaches used in noise certification of Emerging Technology Aircraft (ETA) in the United States and associated data collection and research programs. The contents of this paper aim to support further discussions during the CAEP/13 meetings on ETA noise.

Action by the CAEP-SG is in paragraph 6.

1. INTRODUCTION

1.1 Effective generally applicable noise rules require a base of data gathered from a test environment common for relevant aircraft. As discussed in CAEP/12-WP/37, Emerging Technology Aircraft (ETA) are aircraft that are not covered by existing categories in current Annex 16, Volume I certification procedures. Preliminary review of existing Annex 16 procedures has shown that they may not be suitable for ETA due to required test altitudes, weights, speeds, etc. Due to the novelty and variety of ETAs, only limited noise data have been collected, and most of the collected data was acquired in a manner inconsistent with formal noise certification test conditions. Because of distributed propulsion system and its use in flight control, ETAs may exhibit noise and flight performance characteristics that are different from and in some cases even more complex than that of the conventional aircraft. ETAs ability to lift off and land without using a runway and to operate in close proximity to communities adds new considerations, and potential challenges, in understanding human perception of the noise.

2. U.S. RESEARCH OVERVIEW

2.1 The United States continues to invest in further understanding the acoustics of ETA in the form of research programs, working groups, symposiums, workshops, technical committee meetings, and data measurement campaigns.

2.2 The [ASCENT](#) program contains several research projects on ETA noise modeling and measurement. ASCENT project [A77](#), for example, conducts laboratory and field noise measurement on ETA models and studies topics such as scaling sound exposure level with flight altitude, acoustic far field, effect of microphone deployment, noise measurement variability, etc. Those topics are important for noise certification of ETA.

2.3 As part of its [Advanced Air Mobility \(AAM\) Mission](#), the National Aeronautics and Space Administration (NASA) has conducted extensive laboratory, ground and flight noise testing, noise modeling, tool research, and auralization studies to understand human perception of the ETA noise. <https://www.nasa.gov/aamnationalcampaign> Further, NASA has created and supported a community of acoustic experts from industry, academia, and government agencies to identify, discuss, and address noise issues associated with Urban Air Mobility (UAM) vehicles and their operations. The NASA UAM Working Group published [a white paper](#) of UAM Noise: Current Practice, Gaps and Recommendations in 2020 and continues the research and collaborative efforts to address the topics outlined in the white paper through four subgroups: Tools and Technology, Ground and Flight Testing, Human Response and Metrics, Regulation and Policy.

2.4 The U.S. Department of Transportation Volpe Center has been <https://www.volpe.dot.gov/AC-Cert/UA-noise-research> supporting the FAA in noise certification on a range of topics. In 2021, the Volpe Center and the FAA conducted [new noise measurement campaigns](#) of ETA models using a large microphone array and data processing programs created to better understand the acoustic of these aircraft.

2.5 Industry groups and engineering societies in the United States have organized conferences and workshops as well. For example, the Vertical Flight Society (VFS) organizes an [annual Electric Vertical Take-off and Landing \(eVTOL\) forum](#) with sessions on eVTOL acoustics. The Institute of Noise Control Engineering (INCE) USA has organized [two workshops](#) on Unmanned Aircraft Systems (UAS) and UAM as part of the Technology for a Quieter America workshop series.

2.6 The United States expects to be able to share some results of these measurements and research in the CAEP/13 cycle.

3. U.S. APPROACH IN NOISE CERTIFICATION OF ETA

3.1 The FAA has been actively developing certification basis for ETA seeking a type certificate from the United States. At the early phase of noise certification process, the FAA's noise certification team take efforts to understand the aircraft design, performance as well as operational concepts and flight profiles through technical familiarization sessions and via interactions with the applicants. If the aircraft design and its operational characteristics fit into the existing noise measurement procedures, the FAA will use the current noise standards (found in 14 CFR part 36 of the U.S. Code of Federal Regulations) as the certification basis.

3.2 Many ETAs, however, do not align well with 14 CFR part 36 due to their novel design and operating concepts. In such case, the FAA develops a rule of applicability (RPA) for each aircraft model as the FAA builds its noise databases for these aircraft types. To that end, the FAA published [the final rule of particular applicability for the Matternet Model M2 aircraft](#) in September of 2022. In this RPA, the light-weight helicopter noise standard (Appendix J of part 36) is modified to fit the specific aircraft model design and operating concepts. A level flight noise testing procedure is prescribed for noise compliance measurement. In addition to the noise compliance test, the RPA includes supplemental test to measure noise

for hover positions. The supplemental noise test allows the FAA to collect noise data to inform future noise standards.

3.3 The FAA sees the development and publication of RPAs as an interim solution that would lead to, together with research programs and other databases, the eventual development of a general rule (or rules) for UAS noise certification.

4. OTHER NOISE STANDARDS

4.1 The United States continues to monitor noise standards developed worldwide on ETA. For example, the European Union (EU) Easy Access Rules for Unmanned Aircraft Systems ([EU regulation 2019/947 and 2019/945](#)) contain noise standard and limits for very light-weight drones. The International Standard Organization (ISO) is currently developing a [General Requirement of Noise Measurement of Lightweight and Small Multirotor UAS](#). For the past two years, the SAE A-21 technical committee has been working to revise [a guidance document](#) in support of noise monitoring of emerging aircraft such as ETA as well as conventional ones. In October of 2022, the EU Aviation Safety Agency (EASA) [published](#) draft guidelines on noise level measurements for drones below 600 kg currently open for public consultation. The United States notes that the above standards are not developed for standard airworthiness and noise certification. Those development efforts fall either into the “open” category or the “specific” category of airworthiness certification of Remotely Piloted Aircraft Systems, but not into the “certified” category, which ties to type certification. Still, it is useful to continue monitoring those development efforts because some of the noise testing practices and noise data collected may help to inform the development of noise standard for type certification of ETA.

5. CONSIDERATIONS

5.1 The United States continues to support the WG1 Task N.06 in CAEP/13 by presenting noise research findings and sharing noise data as well as knowledge and experiences gained from noise data collection, noise analysis, and from noise certification process. The United States sees the need to keep monitoring noise measurement standard development. The proposed noise standard published by EASA is particularly interesting. Even though it is planned for the “specific” airworthiness category and proposed as voluntary requirement, the proposed guidelines contain many noise measurement elements that are similar to that, for example, used in the RPA for the Matternet M2 model in the United States. The United States will review the proposed guidelines further and submit comments. Importantly, we see the need for continued coordination among regulators regarding ETA noise certification in the absence of international standards in the certified category for ETA, with the goal of resolving, to the extent possible, any differences in noise certification basis.

6. ACTION BY THE CAEP-SG

6.1 The CAEP-SG is invited to:

- a) note the U.S. activities in progressing understanding of ETA noise characteristics and preliminary approach in noise certification of ETA models;
- b) request that Members share research and noise data to progress the WG1 Task N.06 in CAEP/13; and,

- c) note U.S. willingness to work with other regulators in developing international harmonized noise certification standards for ETA.

— END —