Agency Information Collection: Remotely Administered Psychoacoustic Test for Advanced Air Mobility Noise Human Response

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Thank you for the opportunity to submit this comment regarding NASA's Request for Comments on Agency Information Collection: *Remotely Administered Psychoacoustic Test for Advanced Air Mobility Noise Human Response*, NASA Document Number: 25-010.

The Aviation-Impacted Communities Alliance (AICA) is a national coalition of more than 90 groups working to protect communities from harmful levels of aviation noise and pollution through legislative advocacy and industry reform. Studio City for Quiet Skies and UproarLA represent hundreds of thousands of residents in the Southern San Fernando Valley and Santa Monica Mountains, including Studio City, Sherman Oaks, Encino, Bel Air, Beverly Hills, and other parts of Los Angeles.

We previously submitted a comment in response to NASA's earlier request for public input on this effort (*Docket ID: NASA_FRDOC_0001-0545; NASA_FRDOC_001-0562*). We respectfully request that our previous comment be included as part of the official record for this submission, which builds upon that input with additional recommendations.

This comment supports and is consistent with our overarching recommendation: that NASA design, execute, and derive findings from the *Varied AAM Noise and Geographic Area Response Difference (VANGARD)* test in a manner that accurately reflects how impacted communities experience noise.

Respectfully submitted,

Aviation-Impacted Communities Alliance (AICA)
Studio City for Quiet Skies
UproarLA

CC:
Members of the Quiet Skies Caucus
Members of the Aviation-Impacted Communities Alliance

Our comments on questions follow.
Note: Italicized text is used for NASA questions.

(1) Whether the proposed collection of information is necessary for the proper performance of the functions of NASA, including whether the information collected has practical utility.

Yes, the proposed information collection is necessary and will have practical utility **if it is designed and executed to reflect the real-world experiences of communities** likely to be exposed to Advanced Air Mobility (AAM) operations. AAM aircraft are expected to operate closer to people than conventional aircraft, flying at lower altitudes and potentially over new areas. They will also exist in various configurations—each with a distinct acoustic profile—and all of them will sound different from the aircraft noise the public is currently familiar with. These unique characteristics heighten the importance of capturing the expected lived experience of communities.

To be meaningful, the **study must incorporate a range of use case scenarios**—from low-volume operations to high-frequency activity using defined airspace corridors—and present findings in a way that is understandable to non-technical audiences. The VANGARD study should clearly state its assumptions, methodologies, and observed outcomes, while also acknowledging the limitations of what can and cannot be concluded from the results.

A well-prepared study is foundational to identifying and addressing the community impacts of AAM operations. It should be designed with the ability to incorporate key insights from prior research and projects, including the Schultz curve, the FAA's 2021 Neighborhood Environmental Survey (NES), and public comments submitted to the FAA Noise Policy Review. The FAA's 2021 Neighborhood Environmental Survey (NES), found that substantial noise annoyance occurs at DNL levels well below the long-used 65 dB threshold. For example, while the Schultz curve associated 65 dB DNL with 12.3% of people being highly annoyed, the NES national curve shows that this same level of annoyance occurs at approximately 46 dB DNL.

AAM operations, like those introduced under NextGen, are expected to bring new, high-volume, low-altitude traffic—concentrated—at all hours over residential areas. Rigorous, representative testing is essential to ensure NASA's work has practical utility and accurately reflects the expected lived experience of affected communities.

(3) Ways to enhance the quality, utility, and clarity of the information to be collected.

We are providing the following recommendations, including additional details, to enhance the quality, utility, and clarity of the data to be collected—particularly given that AAM will introduce a new acoustic environment with unfamiliar noise signatures, closer proximity to communities, and a variety of vehicle types not previously studied.

As stated previously, the study must be designed and executed to reflect the real-world experiences of communities. The study needs to consider multiple parameters, including but not limited to:

- **Different operations volumes** (such as 10 ops/24 hours, 50 ops/24 hours, 100 ops/24 hours, 500 ops/24 hours, 1000 ops/24 hours) with **different times of occurrence with varying splits** (such as 10% night/10% evening/80% day; 10% night/25% evening/65% day; 20% night/30% evening/50% day; 33% night/33% evening/33% day) and **different cadences** (such as noise events every 2 min, every 5 min, every 10 min, every 15 min). Having large volumes of operations at different times and with different cadences is critical to reflect both initial deployment conditions and potential high-volume scenarios as AAM scales.
- **Different levels of ambient noise** such as 35 dB, 45 dB, 55 dB, and 65 dB to represent different community environments.
- **Different use cases** such as package delivery, passenger transportation, medical transportation (patients or organs), and fire & police emergencies if NASA is testing for annoyance perception based on usage. This could be achieved by assigning different percentages for different uses, noting that medical and emergency usage is typically low volume (at most 10%).
- **Different flying altitudes** such as 500 feet, 1000 feet, 1500 feet, 2000 feet, 3000 feet to reflect different noise and visual footprints.
- **Different vehicle designs** (such as stiff rotors and multiple rotors)**, operational behaviors** (such as takeoff/landing, climb/descent, transition, turns, cruising, hovering)**, and payloads** (such as 500 lbs, 1000 lbs, 2500 lbs, 5000 lbs) to reflect different noise footprints.
- **Different masking and existing soundscapes** to understand how AAM vehicles will add noise events to the current environment of various communities.

Below are some additional details on some of the above parameters.

Ambient Noise

Ambient noise must be considered to evaluate the community experience of AAM because ambient noise levels significantly influence how aircraft sounds are perceived by individuals, particularly in quieter communities where AAM operations may be introduced.

NASA stated that “low” and “high” ambient environments are determined from the A-weighted L50 data produced by the National Park Service (NPS) for different United States Postal ZIP Codes.

- Using “low” and “high” levels is too vague. Furthermore, using L50 is problematic because L50 is the median noise (the noise level exceeded 50% of the time). In contrast, L90 (the noise level exceeded 90% of the time) is the background noise that is almost always there and better reflects the typical noise that surrounds a community.
- L50 may be appropriate for the specific acoustical environment of national parks and the NPS goal to preserve natural soundscapes. L50 allows NPS to capture natural sounds such as wind gusts and wildlife noise. However, L50 is not suitable for establishing true background noise levels of residential areas. People do not live in national parks. L90 better represents the true baseline noise because it excludes transient sounds such as vehicles, aircraft, and barking dogs.

> L90 is protective of residential tranquility and essentially represents the noise that is always present. Furthermore, urban noise regulations, including noise ordinances and guidelines, are typically based on L90.

To more accurately reflect the lived experience of communities, NASA should use L90 to determine ambient noise levels, as it better captures persistent background sound and minimizes the influence of intermittent noise events. At a minimum, L90 should be used. L50 may be included if NASA seeks additional context, but it should not substitute for L90. NASA should also share the results publicly. Predicted L90 values may be available from Blue Ridge Research & Consulting to support this analysis.

Use Cases

Emergency medical operations are generally perceived as more acceptable and less annoying to the public. However, not all AAM operations will fall into this category. To ensure test scenarios reflect realistic operational mixes, the proportion of medical versus non-medical use should be clearly defined and incorporated into the use cases. In addition, there should be at least one-use case that includes no medical operations, serving as a control to assess community response to typical commercial or non-emergency AAM activity.

Vehicle Design and Operational Behaviors

NASA's Advanced Air Mobility (AAM) Ecosystem Aircraft Working Group (RVLT Project: Handling and Ride Qualities, May 13, 2025) highlighted how the wide range of AAM vehicle designs can significantly influence noise impacts. As presented a NASA speaker, features such as stiff rotors, multiple rotors, interactional aerodynamics, fixed-pitch blades with RPM control, lightweight airframes, and multiple control effectors—including ducted rotors—all contribute to unique flight dynamics and distinct acoustic signatures. Many of these vehicles reach cruising altitude (approximately 500 feet) within 50–60 seconds, further affecting how communities experience noise. In addition, a second NASA speaker noted that deceleration and hovering characteristics vary based on pilot technique, adding another layer of variability that must be considered in any testing protocol. Together, these factors underscore the importance of including a representative range of vehicle types and operational behaviors in noise testing to reflect the full scope of potential community impacts. Finally, for each scenario used, relevant details on the vehicle design and flight profile (such as distance between vehicle and listener, altitude, speed, and duration of exposure) should be clearly documented. Flight conditions that cannot be tested should be clearly disclosed to ensure accurate interpretation of the results.

Masking and Existing Soundscape

The existing soundscape can influence how AAM noise is perceived, depending on ambient noise levels and whether AAM operations are replacing, supplementing, or adding to existing sources such as helicopters. In some cases, AAM may mask or be masked by existing noise; in others, it may be additive. For example, if AAM replaces a louder aircraft, the impact may be reduced. However, if AAM introduces a greater volume of operations—e.g., three AAM flights for every one helicopter it replaces—the community may experience increased annoyance despite lower individual event levels. Therefore, understanding the location and current soundscape of test participants will be essential to interpreting their responses in the context of existing noise exposure. Participants may live near airports (experiencing layered noise), under commercial or general aviation flight paths (with varying degrees of overflights), or in areas with little to no current aviation activity. These differences can affect not only the incremental impact of AAM noise but also participants' sensitivity to it. For example, individuals in quieter areas may be more sensitive to additional noise, while those in already impacted locations may be less or more tolerant of further intrusion. The study should therefore account for participants' existing noise environments as part of the analysis to better understand how prior exposure influences perception of AAM operations.

Regarding sound masking, it is typically effective for intermittent noise events in environments with a continuous background sound like a freeway. In other words, sound masking is much more likely to occur in areas with high levels of ambient noise (such as 55 dB or above) than at lower levels. NASA should account for varying soundscape conditions in its testing framework by evaluating AAM noise perception across a representative range of community soundscapes—including quiet suburban, rural, and already aviation-impacted areas—to better understand both when masking reduces audibility and when low masking may increase perceived disruption.

Metrics to Characterize Community Noise Exposure

- **Using N-Above and N-Above-Ambient metrics**

  People are affected by how many noise events occur, how loud they are above ambient levels, when they happen, and how frequently they repeat. Annoyance stems from the total experience of aviation noise, which may include multiple airports and aircraft types, flight paths, and operational phases such as takeoff, climb, cruise, descent, landing, and hovering.

  We recommend that NASA include **N-Above** and **N-Above-Ambient** as key metrics to characterize community exposure and better capture the impacts of AAM operations.

  We do not support the use of average-based metrics like DNL to assess community noise exposure. As a cumulative energy metric, DNL averages noise over a 24-hour period—meaning that a single loud event or hundreds of quieter events can yield the same DNL value. This was evident in the Final Environmental Assessment and Finding of No Significant Impact/Record of Decision for Zipline International Inc.'s drone package delivery operations in Kannapolis, NC, where the analysis modeled daily drone deliveries in increments from 1 to 500. Despite the wide range in operations, the resulting DNL remained at 65 dB, whether the community experienced 1 or 500 drone deliveries per day. This averaging conceals meaningful differences in noise exposure and fails to reflect how communities experience noise. Large increases in operations may produce only minor or no changes in DNL—despite causing significantly greater disruption and annoyance.[1]

[1]U.S. Department of Transportation, Federal Aviation Administration. *Final Environmental Assessment and Finding of No Significant Impact/Record of Decision: Zipline International Inc. Drone Package Delivery Operations, Kannapolis, NC and Surrounding Area.* Washington, D.C., February 2022

In contrast, metrics such as N-Above provide a direct count of how often noise exceeds a defined threshold, offering a clearer picture of event frequency and timing. N-Above-Ambient further enhances this by identifying how many noise events exceed the local ambient sound level, therefore representing how many noise disturbances may affect communities. Together, the N-Above and N-Above-Ambient metrics offer a more accurate and relevant understanding of Advanced Air Mobility (AAM) noise impacts, particularly in noise-sensitive environments. Note that the FAA has recently added the capability to add ambient noise levels to the Aviation Environmental Design Tool (AEDT), indicating the importance of considering ambient noise in estimating noise impacts.

- **Using Time Based Penalties**
  The DNL metric incorporates a 10 dB penalty for operations occurring between 10:00 p.m. and 7:00 a.m. to account for increased nighttime sensitivity. CNEL includes both a 5 dB evening penalty (7:00 p.m. to 10:00 p.m.) and a 10 dB nighttime penalty (10:00 p.m. to 7:00 a.m.). To support meaningful comparisons, the NASA study should apply equivalent time-of-day penalties consistent with DNL or CNEL, respectively, on the non-DNL metrics of N-Above and N-Above Ambient.

Data Availability and Disclosure

It is important that NASA design this study to ensure that results are accessible for public review and independent analysis. In past efforts—such as the FAA's Neighborhood Environmental Survey—the Paperwork Reduction Act (PRA) was cited as a basis for not releasing raw or disaggregated data. While the PRA requires agencies to minimize public burden and protect personally identifiable information, agencies retain discretion in how they interpret and apply these requirements. In some instances, this has resulted in more limited data access, which may reduce opportunities for external analysis and broader research engagement.

To support openness and maximize the utility of the information collected, we respectfully request that NASA adopt an interpretation of the PRA that allows for the public release of appropriately de-identified, disaggregated data. NASA could incorporate strategies from the outset that both protect respondent privacy and enable broader public and research access. Recommended strategies include:

- Incorporating informed consent language that anticipates the public release of de-identified data;
- Recognizing that sharing digital data imposes minimal burden when planned in advance;
- Clarifying in supporting documentation that the data are intended to inform publicly accountable policy and regulatory decisions;
- Designing the dataset to be easily aggregated, shared, and reused, while safeguarding respondent privacy;
- Including a data use statement outlining permissible uses and expectations for secondary researchers;

- Engaging with external research stakeholders early in the process to identify formats and variables that will maximize utility, reproducibility, and public trust.

In addition, all scenario details and test assumptions should be fully disclosed to provide context on the results and prevent potential misinterpretations.

Calibration of Test Sounds to Actual Recordings

To ensure realistic and meaningful results, information should be provided on the test sounds used and how they were calibrated against actual AAM vehicle recordings. As mentioned earlier, a NASA speaker shared a variety of AAM designs, each with distinct acoustic signatures—underscoring the importance of accurately representing these differences in the testing process. Where possible, the study should incorporate real AAM acoustic data recorded under comparable conditions, including assumed distance from the vehicle, flight altitudes, and duration of exposure. Using authentic or well-calibrated proxy sounds will provide critical context for interpreting test results and for comparing future AAM vehicle designs to those evaluated in this study.

Conclusion

Our overarching input is for NASA to design, execute, and derive findings from the Varied AAM Noise and Geographic Area Response Difference (VANGARD) test to accurately reflect how impacted communities experience noise.

The new Advanced Air Mobility (AAM) technologies are expected to have negative impacts from the number and type of aircraft such as: the loudness (including the whirring of the multiple rotors - representative AAM vehicles and distinguish these in the findings), the sheer frequency of noise events, the operational mode and phase of flight (take-off and landing, hovering, turns, other), the low altitude of overflight, the time of day (noise in the early AM and late PM hours has greater impact, and of course much greater impacts at night). It is our hope that NASA will do its utmost to represent the lived experience of potentially impacted communities in the design, execution, and derived findings of the VANGARD test.