Supporting Statement - Part A

Title of information collection: Remotely Administered Psychoacoustic Test for Advanced Air Mobility Noise Human Response
Type of information collection: New information collection
Abstract: This information collection is for conducting a sound response laboratory test, which is called a psychoacoustic test, to better understand human noise response to passenger and equivalent cargo carrying Advanced Air Mobility (AAM) aircraft. These AAM aircraft are expected to takeoff and land in closer proximity to communities than conventional aircraft. The aircraft are being designed to use multiple electrically driven rotors. Different AAM aircraft are unique in their design and geometric placement of rotors around the aircraft. The unique propulsion systems of AAM aircraft means that the sounds they produce will also be unique compared to conventional aircraft. Yet, insufficient data exists on how humans will respond to AAM aircraft noise. The National Aeronautics and Space Administration (NASA) seeks to gather data on the human noise response to AAM aircraft through the Varied AAM Noise and Geographic Area Response Difference (VANGARD) laboratory test. The VANGARD test will play electronically stored sounds of different single AAM aircraft flyovers to test participants and ask for their annoyance response to each sound. The VANGARD test is one of many initial psychoacoustic tests being planned to gather data for research purposes on AAM vehicle noise response. VANGARD test objectives are not designed to affect existing or proposed aircraft operations, and its objectives are not designed to affect noise policy. One aspect of the VANGARD test that is different from many other psychoacoustic tests on AAM vehicle noise is that it will be conducted using an online test application and gather human response data from geographically diverse participants. By addressing insufficient data on AAM aircraft noise response, VANGARD test results will allow subsequent studies on human noise response to AAM aircraft to be more informed in their design and test objectives.

1. Explain the circumstances that make the collection of information necessary.

This collection is being supported by the National Aeronautics and Space Administration (NASA) Revolutionary Vertical Lift Technology (RVLT) Project of the Advanced Air Vehicles Program (AAVP). The collection is a laboratory psychoacoustic test that seeks respondent annoyance response to sounds of different Advanced Air Mobility (AAM) vehicles.

NASA's vision for AAM seeks to develop new air transportation systems that move people and cargo between places previously not served or underserved by aviation. Urban Air Mobility (UAM) is a use case within AAM for transporting cargo and passengers in an urban environment [1]. Representative AAM/UAM vehicle concepts involve the use of electrically driven rotors, and the noise effects of these air vehicles need to be better understood to minimize their noise impact on communities.

There is currently insufficient understanding of the human noise response to cargo and passenger carrying AAM/UAM aircraft. The NASA-led UAM Noise Working Group (UNWG), which consists of participants from academia, industry, and government, published a peer-reviewed white paper containing high-level goals intended to address gaps and recommendations concerning UAM noise research and issues [1]. The recommendations in the white paper are

for organizations like NASA to consider when identifying research goals, although there is no requirement that organizations like NASA form research goals from the white paper recommendations. The white paper identified the need to perform laboratory studies to understand the perception of UAM vehicle noise and to also collect data on variations in perception between geographically different communities.

Based on these recommendations, members of the UNWG proposed that a psychoacoustic test be conducted using test facilities spanning multiple geographic locations to obtain data on community variation in response to cargo and passenger carrying AAM/UAM noise. The psychoacoustic test would play electronically stored sound files of cargo and passenger carrying AAM/UAM aircraft over speakers to respondents who would rate their annoyance response to each sound. Annoyance responses from the psychoacoustic test would be assembled into a publicly available database that can be used by the AAM/UAM noise community for subsequent analyses. After considering the UNWG proposal, NASA decided to perform this psychoacoustic test with cooperation from AAM/UAM aircraft manufacturers.

Having multiple different AAM/UAM noise stimuli would improve the applicability of test results to a variety of AAM/UAM aircraft. Access to available cargo and passenger carrying AAM/UAM noise stimuli are currently limited for a single organization. Without obtaining sounds from external organizations, the variety of sounds that NASA could play in a psychoacoustic test would be limited to one or two different cargo and passenger carrying AAM/UAM aircraft. Therefore, NASA cooperatively obtained sounds of cargo and passenger carrying AAM/UAM aircraft from different AAM/UAM aircraft manufacturers to serve as noise stimuli for this test.

This psychoacoustic test on AAM/UAM vehicle noise was named the Varied AAM Noise and Geographic Area Response Difference (VANGARD) test. VANGARD test objectives are not designed to affect existing or proposed aviation operations and noise policies. The VANGARD test is designed to answer research questions that will serve as a foundation for further investigations with laboratory and community testing of AAM/UAM noise human response. VANGARD test objectives are:

1. Do annoyance responses differ between respondents who reside in low versus high ambient noise environments? See Statement B1 for how low and high ambient noise environments are defined.
2. Do annoyance responses differ as a function of the phase of flight? Here, the phases of flight are the landing, takeoff, and cruise phases.
3. Do annoyance responses differ as a function of distance from take-off and landing operations?
4. Is there a correlation between annoyance ratings and objective parameter analyses of the data? Examples of objective parameters include, but are not limited to, sound quality metrics, spectra, sound exposure level, and amplitude envelope shaping.
5. Is there a correlation between annoyance ratings and noise sensitivity, measured from subject questionnaire data?

Statement A2 explains how answers to the above research questions will be used. Without results from the VANGARD test, subsequent laboratory, and community noise tests on

AAM/UAM vehicle noise may potentially have to be larger and more complex. These subsequent tests will need answers to the above research questions to improve their design to meet objectives while minimizing their complexity. The VANGARD test will provide answers to these research questions so that subsequent testing can focus on answering other research questions concerning AAM/UAM noise.

2. Indicate how, by whom, and for what purpose the information is to be used.

This information collection is new.

VANGARD test results regarding Research Question 1, from Statement A1, may be used by NASA and the UAM noise community, which includes industry, other government agencies, and community groups, to:

1. Design subsequent controlled laboratory tests to better understand reasons for response differences between geographically distinct communities, if the VANGARD test finds differences.
2. When combined with results from other laboratory testing of AAM/UAM noise response, inform the planning of future community noise testing with real aircraft over communities.

Answers to Research Questions 2-5, from the response to Statement A1, will inform NASA and the UAM noise community in the design of subsequent laboratory human noise response testing to answer additional research questions on AAM/UAM aircraft noise. Among these additional research questions are the effects of number and frequency of AAM/UAM flights on annoyance and the effects of background sounds on AAM/UAM noise annoyance. Initial research into the effects of number and frequency of AAM/UAM flights was made by Ref. [2], but this test used stimuli of a single AAM/UAM vehicle flying only in the cruise mode. Initial research into the effects and modeling of AAM/UAM noise annoyance with background sounds was made by Refs. [3] and [4], but results were not based on a variety of AAM/UAM noise stimuli. An improved understanding of what parameters of single AAM/UAM flights, like the flight phase, flight distance, and other objective parameters, affect annoyance can help design subsequent laboratory tests with varied AAM/UAM sounds to improve the understanding of how number and frequency of flights and background sounds affect annoyance. For example, parameters, found from the VANGARD test, that best describe the annoyance response to single aircraft flights can be normalized in a subsequent test to focus on just the number and frequency of flights. VANGARD test results on the effects on annoyance from flight phases and distances can be accounted for in subsequent laboratory tests to reduce the ambiguity in results on how annoyance changes with the number of flights and with background sounds. These additional laboratory test results can then be used by NASA and other government agencies to develop improved AAM/UAM noise prediction models for use in perception-based aircraft design and to inform future laboratory and community noise testing.

Research Questions 2-4 will also help improve aircraft design tools. An objective metric is optimized in the design of an aircraft by adjusting design parameters, such as the sweep angle or diameter of a rotor, until the objective metric meets certain criteria. An example of an objective

metric meeting a criterion is the derivative of sound exposure level to sweep angle equaling zero. Annoyance response to various aircraft flight parameters may be part of the objective function. An understanding how annoyance changes with flight phase (Research Question 2), with flight distance to an observer (Research Question 3), and other objective parameters (Research Question 4) that are found with the VANGARD test can help generate objective functions for aircraft design. For example, if it is determined that the metric, A-weighted Sound Exposure Level, is a good descriptor of the annoyance response to AAM/UAM vehicles, how much the A-weighted Sound Exposure Level of AAM/UAM vehicles needs to change to give a certain change in the annoyance response will be a needed input to aircraft design objective functions. The VANGARD test will provide data as part of a larger body of human noise response testing results to improve the annoyance response models to AAM/UAM vehicle noise that form aircraft design objective functions.

As mentioned in Statement A1, VANGARD test objectives are not being designed to affect existing or potential aviation operations and noise policies.

Subsequent testing may also revisit VANGARD test results to validate/verify conclusions with additional data.

3. Describe whether, and to what extent, the collection of information involves the use of automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g. permitting electronic submission of responses, and the basis for the decision for adopting this means of collection.

Recruitment of respondents for the VANGARD test will be conducted through the NASA Open Innovation Services 2 (NOIS2)-169 contract. Respondent recruitment will focus on three metropolitan areas that are described in Statement B. The Contractor will recruit respondents using the following recruitment channels:

- Social Media: Facebook Ads, IG, Linkedin, X
- Local Marketing Platforms: NextDoor Ads, Craigslist
- Freelance Marketplaces (Upwork, Guru, freelancers in metropolitan areas of interest)
- University Outreach (Recruit students in metropolitan areas of interest)
- Email outreach within the recruitment channels
- The Contractor's InnoBear Network

The document, "RecruitmentAdvertisements.pdf," gives the recruitment advertisements that will be used. The document, "ChallengePage.pdf," is the landing page that will appear when potential respondents click on links in the recruitment advertisements.

The "OfficialRulesDoc.pdf" will be sent to respondents by email after they are recruited to take the VANGARD test. The document gives additional details on test procedures and expectations.

VANGARD test administrators will also send respondents Informed Consent and Privacy Act Notice forms before they sign into the online VANGARD test application. See "RemoteTest_InformedConsent.pdf" and "RemoteTest_PrivacyActNotice.pdf" for the Informed

Consent and Privacy Act Notice forms, respectively. When respondents sign into the test application, they will acknowledge having received the Informed Consent and Privacy Act Notice forms, as indicated on Figure 6 of the "TestApplicationProcedure_VANGARD.pdf" document.

NASA decided that the VANGARD test would be a remotely administered psychoacoustic test. This decision was made with the recognition that remotely administered tests would enable a larger number and more geographically diverse respondent pool than in-person human noise response test facilities.

Without using a remote testing method, respondents would need to travel to the nearest in-person human noise response test facility, which are in a select-few cities across the United States. Using in-person test facilities would limit the number and geographic diversity of VANGARD respondents. It is also not certain that NASA will be given access to some of these human noise response test facilities.

NASA assessed the efficacy of the remote testing methodology by developing its Remote Psychoacoustic Testing Platform and exercising the platform to understand if the results of a previous in-person test could be recreated. Results of this exercise and developing the Remote Psychoacoustic Testing Platform are documented in Ref. [2], where a remote test reproduced results of in-person testing and demonstrated that a remote test method may be used for the VANGARD test.

The NASA Remote Psychoacoustic Testing Platform allows respondents to access the psychoacoustic test online through web browsers on their own computers and listen to sounds using their own audio devices. The test application is deployed from the NASA Amazon Web Services (AWS) cloud service, which is approved by the Federal Risk and Authorization Management Program. To comply with NASA Information Technology requirements, VANGARD respondents will sign into the test application by creating a NASA Launchpad Guest username and password. The test application streams test stimuli to respondent computers but will not download test stimuli to the computers. The document "TestApplicationProcedure_VANGARD.pdf" details the steps that will be taken by respondents as they navigate the online test application. Steps include giving consent to taking the test and performing sound calibration. Further details on the Remote Psychoacoustic Testing Platform are given in Ref. [2]. An update to the NASA Remote Psychoacoustic Testing Platform now enables respondents to pause, exit, and resume a psychoacoustic test at any time without restarting the test. No aircraft visualizations will be shown by the test application for the VANGARD test.

The main portion of the online test is to respond to sound stimuli. For the VANGARD test, respondents listen to a randomized sequence of 50-60 AAM/UAM sound stimuli, with each stimulus lasting approximately 20-30 seconds. After listening to each stimulus, the participant makes an "annoyance rating" on a 0-10 scale, per standardized method ISO/TS 15666 [6]. Participants are instructed as follows: "Imagine hearing this sound several times each day while outdoors and near your home, how annoying would this sound be to you?"

The VANGARD test will include recordings of AAM/UAM aircraft. Due to the challenge in acquiring a relatively larger number of AAM/UAM aircraft recordings, test stimuli will also include simulated sounds, or auralizations, of AAM/UAM flights. NASA has developed techniques for generating auralizations of rotorcraft from numerical predictions of the flight physics and acoustics. These techniques have been implemented in the NASA Auralization Framework (NAF) [7]. Auralization techniques begin from first computing the aerodynamics and physics that govern the flight of the vehicle and then using the physics of flight information to generate acoustic predictions of the noise emitted by the vehicle. Acoustic predictions, by themselves, are not in forms that are audible. Predictions may be generated for just fractions of a second or may not have signal phase information. Synthesis techniques then transform the acoustic predictions into audible sound that can be heard for an extended amount of time. NASA has developed sound synthesis techniques for rotorcraft loading and thickness noise and broadband self noise [8, 9, 10]. The NAF simulates sound propagation from the vehicle to a listener using established techniques to determine atmospheric attenuation, ground reflection, time delay (Doppler), and spreading loss. Some stimuli will be scaled according to the physics of atmospheric sound propagation to represent different sideline distances between the aircraft and a potential listener.

The main portion of the VANGARD test is expected to take ~30 minutes or less to complete. The main portion will be divided into at least three sessions where test participants may take a break between each session before continuing to the next session. There is no time limit to complete the test, other than the 4-week testing window provided by the test administrators. Test participants also have the option to pause or exit the test and subsequently return to the test at any time within the 4-week test window period. When returning to the test, test participants will resume the test from their last test question. They are also asked to set their computer volume to their last recorded computer volume, which is displayed by the test application. If participants select that they changed their audio settings, they are directed to performing manual sound calibration again. At the end of the study, a questionnaire is provided to determine their overall sensitivity to noise and to drone aircraft. See the attachment, “PostTestQuestions.pdf,” for the list of noise sensitivity questions.

All test responses from respondents will be returned electronically to the NASA AWS.

4. Describe efforts to identify duplication.

There is no duplication as there are no other sources available to collect this information.

5. If the collection of information impacts small businesses or other small entities, describe the methods used to minimize burden.

Collection of this information does not have a significant impact on small businesses.

6. Describe the consequence to federal program or policy activities if the collection is

not conducted or is conducted less frequently, as well as any technical or legal obstacles to reducing burden.

Without results from the VANGARD test, subsequent laboratory tests by NASA and subsequent community noise tests by the United States government on AAM/UAM vehicle noise may potentially have to be larger and more complex, which may increase their expense, to meet their objectives and to provide answers to the research questions in Statement A1.

Further, the VANGARD test offers the opportunity to obtain various AAM/UAM sound stimuli from different organizations. Insufficient AAM/UAM sound stimuli is a considerable hurdle to obtaining the sounds to understand the human noise response of AAM/UAM vehicles. Not conducting the VANGARD test will mean additional efforts will need to be taken in the future to acquire the AAM/UAM vehicle sounds.

7. Explain any special circumstances that would cause an information collection to be conducted in an exceptional manner.

The information collection will not be conducted in an exceptional manner. Respondents will need to take the VANGARD test only once, not need to provide a written response in fewer than 30 days, not need to provide documentation, not need to retain records, not provide data that will be under unapproved data classification, not swear a pledge of confidentiality, and not submit proprietary trade secret(s) or other confidential information.

8. Provide the date and page number of publication in the Federal Register for the 60-day and 30-day FNRs, soliciting comments on the information collection prior to submission to OMB.

60-day FRN: 89 FR 18973 on 3/15/2024.
Comments were received and a summary is attached.

30-day FRN: 90 FR 16888 on 4/22/2025.

9. Explain any decision to provide any payment or gift to respondents, other than remuneration of contractors or grantees.

Respondents will be compensated $25 by the NOIS2-169 Contractor if they fully complete the VANGARD test.

Justification for the monetary compensation are as follows:

1. This study is a laboratory test where annoyance responses to sounds will be ascertained to answer research questions to advance scientific understanding of AAM/UAM vehicle noise response. Having a test with sufficient power to resolve statistically significant results is important to this understanding. The power of the test is influenced by the

number of respondents, as described in Statement B1. Monetary compensation has been approved by the NASA Institutional Review Board, with Study eIRB Number STUDY00000862 and FWA Number 00019876, as a means to incentivize test completion. A precursor to the VANGARD test, the Feasibility Test *[5]*, was also conducted online with respondents from across the United States. The Feasibility Test did not monetarily compensate respondents. Out of 146 recruited respondents for the Feasibility Test, 86, or 58%, accepted receiving a link to the test application, but only 48 respondents completed the Feasibility Test. As mentioned in Statement B1, at least 180 respondents are needed for the VANGARD test over all three metropolitan areas of interest to obtain statistically significant results (30 for each of the two ambient noise regions in each of the three metropolitan areas). Based on experience with the Feasibility Test, it was estimated that 50% of VANGARD respondents will create test accounts. With monetary incentives, it is assumed that most of the respondents who create test accounts will complete the VANGARD test. A test completion rate of 50% is then assumed instead of 58% (the percentage of accounts setup for the Feasibility Test) to allow for an incorrect assumption that all respondents who set up accounts to take the test will complete the test. These estimates and assumptions are why 360-400 respondents are being recruited. If no monetary compensation will be provided, the test completion rate may be similar to the 33% completion rate as seen in the Feasibility Study. Based on the experience with the Feasibility Test, potentially 145 to 185 more respondents will need to be recruited to have a test with enough power to resolve statistically significant test results. Also, the Feasibility Test is the only previous experience with a test like VANGARD, which introduces uncertainty into how much test participation will be diminished if monetary compensation is not provided. Thus, more time and resources would be needed to recruit enough respondents to resolve statistically significant results if respondents are not compensated for the VANGARD test.

2. Respondents in this study will be providing their own computers, audio devices, internet connections, and proper testing locations to take the test, which is an unusual effort for the respondents. If there is poor internet connectivity, respondents will be unable to take the test due to streaming audio needing to be played through the test application. Respondents will have to wait until a time/location when internet connectivity is adequate. Respondents without audio devices will be unable to complete the test. Respondents without computers larger than cellular phones will be unable to complete the test because the test is not designed to be taken through cellular phones or smart phones. Respondents are asked to find a quiet location to take the test and to not be recently exposed to loud noises. These test conditions impose an unusual burden to respondents who sign into the test application and is a reason for the incentives.
3. Respondents will need to set up NASA Launchpad Guest accounts with their own passwords. Problems may occur during NASA Launchpad account registration. NASA Information Technology has recommended that accounts be set up before 5 pm US Eastern to avoid potential delays in receiving emails to set passwords, which is a time that may be difficult for some respondents. If passwords are not set within 24 hours, respondents will need to wait another 24 hours before re-registering their accounts. These potential issues with NASA Launchpad Guest setup are an unusual burden for respondents who set up test accounts.

10. Describe any assurance of confidentiality provided to respondents and the basis for the assurance in statute, regulation, or agency policy.

To comply with NASA Information Technology requirements, respondents will set up NASA Launchpad Guest accounts with a username and password, which the respondents will use to sign into the VANGARD test application. When creating the NASA Launchpad Guest account, respondents will need to provide their last name, email address, and country of citizenship. The username will be the email address of a respondent. The email address will be stored, encrypted, on the NASA AWS cloud service to authenticate that the respondent is supposed to have access to the VANGARD test application. Email addresses of respondents will be deleted from the NASA AWS once the test is completed. Email addresses will not be associated with test responses after the test is completed. A NASA Launchpad Guest account will automatically expire one year after a respondent creates the account, but the respondent may choose to have the account expire earlier.

Respondent United States Postal ZIP code, which the respondents self-reports to the NOISE2-169 Contractor, will only be associated, along with test responses, with a respondent number, which will be between one and the total number of respondents. The ZIP code will not be associated with respondent name and email address. The ZIP codes will help categorize respondents into being in "high" or "low" ambient geographic locations.

A Privacy Impact Assessment (PIA) has been conducted commensurate with NASA Launchpad authentication. The Privacy Act System of Record Notices, "NASA 10SECR – Security Records System" and "NASA 10HERD - Human Experimental and Research Data Records," apply to the information collected for the VANGARD remote test.

The VANGARD test was approved by the NASA Institutional Review Board with Study eIRB Number STUDY00000862 and FWA Number 00019876. The Institutional Review Board reviewed the VANGARD remote test to ensure that it follows the Federal Policy for Protection of Human Subjects, or 45 CFR 46.

The NASA Institutional Review Board requires that respondents be provided an Informed Consent document that explains the purpose, procedures, benefits, and risks of the test. Respondents are also provided a Privacy Act Notice document. Upon entering the VANGARD test application, respondents will be shown a Consent Request and Privacy Notice screen where they acknowledge having received an Informed Consent document (see "RemoteTest_InformedConsent.pdf"), having received the Privacy Act Notice document (see "RemoteTest_PrivacyActNotice.pdf"), and having read the Paperwork Reduction Act approval notice. See Figure 6 of the "TestApplicationProcedure_VANGARD.pdf" for a screenshot of the Consent Request and Privacy Notice screen. Respondents consent to taking the test within the screen to proceed with the test.

11. Provide additional justification for any questions of a sensitive nature, such as sexual behavior and attitudes, religious beliefs, and other matters that are commonly considered private.

The noise sensitivity questions asked in the post-test survey, which are given in "PostTestQuestions.pdf," do not cover sexual behavior and attitudes or religious beliefs, but the questions are regarding personal attitudes to noise. No written responses are required to the noise sensitivity questions, and answers to the questions will not personally identify a respondent.

The noise sensitivity questions are being asked to determine if there are relationships between noise sensitivity responses and annoyance ratings to AAM/UAM noise. If relationships are found, insights/evidence may be found on why certain groups of respondents, like those from high or low ambient environments, responded a certain way to AAM/UAM noise. These insights/evidence may help form hypotheses for further testing to understand reasons more deeply regarding annoyance differences among respondents.

12. Provide estimates of the hour burden of the collection of information.

Respondent category	Number of respondents	Estimated completion time	Annual burden
Individual VANGARD Respondents	400	1 hour	400 hours

The number of respondents that the VANGARD test would ideally need is 360 total respondents across three targeted metropolitan areas, given in Statement B, with each metropolitan area being divided into high and low ambient noise regions. With a total of 360 total respondents, there can potentially be 60 respondents per ambient noise regions (high or low) in each of the three targeted metropolitan areas. Based on previous human noise response testing results, 60 respondents per ambient noise region from each metropolitan area should allow statistically significant results to be obtained for an online test. Respondents will use various audio devices to listen to test stimuli, and the relatively high number of respondents per ambient region in each metropolitan area will help minimize the effects of audio device variation on average/median annoyance responses.

It is expected that not all respondents will attempt or complete the VANGARD test. Recruiting 400 respondents will minimize the risk of not determining statistically significant results on average/median annoyance responses because of a relatively low number of respondents who fully completed the VANGARD test.

13. Provide an estimate of the total annual cost burden to respondents or record keepers resulting from the collection of information.

Respondent wage: $25/hour
Labor burden per response =1 hour
Respondent wage per response = $25/hour

Total annual labor burden = $25/hour x 400 hours = $10,000

14. Provide estimates of annualized costs to the Federal government.

The annual cost of Federal employees for monitoring the development and execution of the VANGARD test is 1 FTE. This estimate includes the Principal Investigator and another investigator each spending approximately half their time for half of the past year to plan and execute the VANGARD test and the Principal Investigator spending their full time for the remainder of the past year to plan and execute the VANGARD test.

The cost of developing test stimuli is estimated to be $45,000 based on purchase order costs, Space Act Agreement cost estimates, and the labor hours of contractor staff.

The cost of the NASA Open Innovation Services 2 (NOIS2)-169 contract for respondent recruitment, test administration, and test support, excluding the amount from Statement A13 that is paid to respondents, is $25,000.

The final expected cost associated with updating the NASA Remote Psychoacoustic Test Application and providing technical support, based on the cost of the contract EAST2.CP.114 and NCAPS.C3.00090, is $25,000.

15. Explain the reasons for any major program changes or adjustments to burden hours or annualized costs to respondents.

This is a new collection.

16. For collections of information whose results will be published, outline plans for tabulation and publication.

The VANGARD test is currently scheduled to be executed from July 28 – August 18, 2025. Respondents may take the VANGARD test at any point within this four-week time window.

An informal report will be submitted to NASA by the NASA Open Innovation Services 2 (NOIS2)-169 contractor within two weeks of the VANGARD test being completed. The report will inform how respondents were recruited, how many respondents took and completed the VANGARD remote test, any challenges or issues that occurred during the test administration, a distribution of the age ranges of respondents, and a sex (male or female) distribution of the respondents. The age ranges and sex or respondents will not be associated with test responses. The age ranges and sex of respondents will be aggregated to generate the distributions. The informal report will not include further test analyses.

A NASA Technical Memorandum detailing how test stimuli were generated and how test stimuli were distributed among the respondents will be published by June 30, 2025.

Analyses of test results and how the test met objectives (See Statement A1) will be submitted to an appropriate technical conference or journal within six months of the VANGARD test completion.

Proposed analyses techniques for VANGARD test results are based on analyses techniques used to analyze results from the first application of the NASA Remote Psychoacoustic Test Platform. This first application was called the "Feasibility Test," which found human annoyance responses to small unmanned aircraft and ground vehicles, and its design and results are detailed in Ref. [5]. The Feasibility Test used the Sign Test and linear regression for its analyses.

The Sign Test can compare the median annoyance between two groups of respondents. See Ref. [5] for additional details of the Sign Test and how it was used to analyze annoyance responses between two groups of respondents in the Feasibility Test. Examples of two groups in the VANGARD test would be the responses to test stimuli from respondents in the "high" and "low" ambient environments. The Sign Test is nonparametric, and hence, it does not require any distributional assumptions on the annoyance responses. The p-value obtained from the Sign Test indicates if the median annoyance between the two groups is statistically significant. A significance level of 0.05 was used in Ref. [5], and this significance level is expected to also be used to analyze VANGARD test results. The Sign Test will be used to answer Research Questions 1 and 2 from Statement A1. They are on how AAM/UAM vehicle noise annoyance is different between respondents from high and low ambient environments (Research Question 1) and is different depending on the flight phase (Research Question 2).

A t-test and Analysis of Variance (ANOVA) may also be used to answer Research Questions 1 and 2 if it can be shown that annoyance responses of two groups of respondents are jointly Gaussian distributed.

Linear regression can analyze the annoyance response to different stimuli against a range of metric values for the stimuli. The metric used in the Feasibility Test was the A-Weighted Sound Exposure Level of each stimulus. The coefficient of determination from the linear regression of the Mean Annoyance Rating and A-Weighted Sound Exposure Level of the test stimuli indicated how well the metric linearly predicts the Mean Annoyance Rating. A higher coefficient of determination indicates higher linear prediction capability. Linear regression will be used to answer Research Questions 3 and 4 from Statement A1. They are on how AAM/UAM vehicle noise annoyance changes with distance to the aircraft (Research Question 3) and with objective parameters like sound quality metrics and sound exposure level (Research Question 4).

Correlation coefficients will be used to answer Research Question 5 on how noise sensitivity affects annoyance. There are 26 noise sensitivity questions that appear in post-test survey, and they are given in "PostTestQuestions.pdf." Except for noise sensitivity Question 5, all noise sensitivity questions ask respondents to provide a numerical rating. Statement B4 gives more details on how correlation coefficients will be used to analyze the post-test survey questions. Noise sensitivity Question 5 requires a "Yes" or "No" response. The Sign Test will determine if the median annoyance response to test sounds is significantly different between respondents who answered "Yes" and those who answered "No" to Question 5.

17. If seeking approval to not display the expiration date for OMB approval of the information collection, explain the reasons that display would be inappropriate.

NASA will display the expiration date for OMB approval on the Consent Request and Privacy Notice screen, which appears when respondents enter the Remote Psychoacoustic Test Platform for the VANGARD test. See "TestApplicationProcedure_VANGARD.pdf" for a screenshot of the Consent Request and Privacy Notice screen.

18. Explain any exception to the below certification statement.

There are no exceptions to the below certification statement.

The proposed collection of information –

(a) is necessary for the proper performance of the functions of NASA, including that the information to be collected will have practical utility;

(b) is not unnecessarily duplicative of information that is reasonably accessible to the agency;

(c) reduces to the extent practicable and appropriate the burden on persons who shall provide information to or for the agency, including with respect to small entities, as defined in the Regulatory Flexibility Act (5 U.S.C. 601(6)), the use of such techniques as:

(1) establishing differing compliance or reporting requirements or timelines that take into account the resources available to those who are to respond;

(2) the clarification, consolidation, or simplification of compliance and reporting requirements; or

(3) an exemption from coverage of the collection of information, or any part thereof;

(d) is written using plain, coherent, and unambiguous terminology and is understandable to those who are targeted to respond;

(e) indicates for each recordkeeping requirement the length of time persons are required to maintain the records specified;

(f) has been developed by an office that has planned and allocated resources for the efficient and effective management and use of the information to be collected, including the processing of the information in a manner which shall enhance, where appropriate, the utility of the information to agencies and the public;

(g) when applicable, uses effective and efficient statistical survey methodology appropriate to the purpose for which the information is to be collected; and

(h) to the maximum extent practicable, uses appropriate information technology to reduce burden and improve data quality, agency efficiency and responsiveness to the public; and

(i) will display the required PRA statement with the active OMB control number, as validated on www.reginfo.gov

19. The NASA office conducting or sponsoring this information collection certifies compliance with all provisions listed above. Certifying individual must be a civil service employee.

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[1] S. A. Rizzi, D. L. Huff, D. D. Boyd, Jr., P. Bent, B. S. Henderson, K. A. Pascioni, D. C. Sargent, D. L. Josephson, M. Marsan, H. He and R. Snider, "Urban Air Mobility Noise: Current Practice, Gaps, and Recommendations," *NASA/TP–2020-5007433*, October 2020.

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