RE: FAA Request for Comments on Review of the Civil Aviation Noise Policy September 9, 2023

AICA
AVIATION-IMPACTED COMMUNITIES ALLIANCE

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Thank you for the opportunity to submit this comment regarding FAA's Request for Comments of the Civil Aviation Noise Policy; Docket ID No. FAA-2023-0855. The Aviation-Impacted Communities Alliance (AICA) includes 70+ groups across the country dedicated to protecting communities from harmful levels of aviation noise and pollution through campaigns for legislation and industry change nationwide.

The FAA and AICA hosted a virtual panel discussion on the FAA Noise Policy Review moderated by the Federal Mediation and Conciliation Service (FMCS) on July 13, 2023. The parties agreed to discuss the review framework and facilitate the submission of meaningful comments by members of local communities who are substantially affected by noise and noise impacts.

AICA has a track record of collaborating on projects with the Congressional Quiet Skies Caucus. AICA projects: "Is It Time to Retire a 30-Year-Old Aviation Single Noise Metric?" - Aviation Noise and Emissions (ANE) Symposium 2023, AICA Executive and Technical Responses regarding FAA's Report to Congress: DNL Metric and DNL 65 Standard for Airplane Noise - June 2020, House and Senate legislative recommendations and mark-up documents for FAA Reauthorization 2023, AICA Executive Reports on FAA's Noise Policy Review, FAA Community Engagement Scorecard, and "Community Engagement or DISEngagement?" - ANE Symposium 2023, among others.

The noise policy should be updated to represent 21st century aviation including the new impacts of NextGen and the Neighborhood Environmental Study (NES) findings.

Aircraft noise impacts affect the health and quality of life for communities nation-wide. We are hopeful the new noise policy will accurately represent the lived experience of impacted communities and ensure a National Aviation System that works for all.

Respectfully submitted,

Darlene Yaplee and Cindy L. Christiansen, PhD, Aviation-Impacted Communities Alliance Co-founders

CC:

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

Our comments on each question follow and a GLOSSARY is provided.
Note: Italic text is used for FAA questions.

1. Vehicle Type. What types or elements of current or future air vehicle activity (e.g., unmanned aircraft systems (also known as UAS or drones), advanced air mobility, rotorcraft, subsonic fixed wing, supersonic, or commercial space) should the policy describe and disclose?

The policy should describe and disclose all of the above. Initially this should be for current air vehicles (e.g., subsonic fixed wing, rotorcraft, supersonic, and commercial space) followed by a policy roadmap for Advanced Air Mobility (AAM) vehicles.

How should this information be described using noise metrics?

Please see our answers to Questions #2, #3, #4, #5, and #10, re: operations of air vehicles, DNL, averaging, decision-making noise metrics, and miscellaneous.

Should the FAA use this information to make decisions or for public disclosure only?

Please see our answers to Questions #5, #6b, and #6c, re: decision-making noise metrics and communication.

2. Operations of Air Vehicles.

a. What elements of aircraft operations (e.g., en-route, takeoff, landing) should the noise metric evaluate and disclose?

Valid noise metrics capture and represent all health and quality of life factors associated with aviation noise events. Clearly, "no single metric can cover all situations", as the FAA states in its April 14, 2020 Report to Congress FAA Reauthorization Act of 2018 (Pub. L. 115-254) Section 188 and Sec 173 (page 3). A government agency that deals with the complexities and needs of en-route, takeoff, and landing "elements of aircraft operations", is skilled to develop and use a valid system of metrics and thresholds that captures the unique and true burden to the public of noise from all phases of flights for all aircraft vehicle types at locations (e.g., vicinity and overflight) where the noise event occurs.

If metrics are valid, they will "disclose" truths about the negative impacts of aviation noise on the public's health and quality of life.

In addition to a noise policy that addresses "elements of aircraft operations", for decision-making, the policy and its system of metrics and thresholds should:

- **Evaluate the two noise exposure environments separately**: 1) locations adjacent to airport or near an airport, which are in the DNL 65 contour (also called "vicinity of airports") and 2) locations away from an airport and not in the DNL 65 contour (also called "overflight communities").
- **Evaluate NextGen impacts.** The airspace restructuring with NextGen moved flight tracks, concentrated air traffic, lowered altitudes, and implemented speed restrictions over communities. NES comments and the GAO report on Aircraft Noise make repeated reference to the negative impacts on the public from NextGen, PBN, RNAVs, and Metroplex airspace restructuring.
- **Evaluate General Aviation (GA) and AAM elements of aircraft operations characterized by noise impacts of duration times** such as hovering by helicopters, VTOL AAM, repetitive flight training maneuvers including with multiple aircraft, aerobatics, continuous touch-and-go landings with multiple planes and other closed pattern work, and skydiving drop zones.
- **Evaluate visual pollution of aircraft** including vehicles types and elements of aircraft operations for GA today and in the future AAM.
- **Evaluate low altitude en-route operations** for specific General Aviation and AAM vehicles such as helicopters and air taxis, which remain low and loud throughout their entire flights, rarely getting high enough <u>not</u> to cause noise that is audible on the ground. Helicopter pilots decide how high they fly and, in many areas, fly lower than 1000 feet AGL to stay below fixed wing aircraft and sometimes fly as low as 300 feet AGL above densely populated and noise sensitive residential areas.

- **Use ambient noise**, also referred to as background noise, to identify aviation noise events. Ambient noise which is the typical average noise in a community without the noise caused by air vehicles. Noise events that exceed ambient noise disturb people.
- **Do not allow helicopters and recreational piston-driven aircraft to overfly national parks and require offshore routes** such as the New York North Shore Helicopter Route, which has been in place since 2008 and has overwhelmingly been upheld by the second highest court in the nation.
- **Require and include aviation noise measures from all sources for decision-making purposes, total noise impacts.** "All sources" means all air vehicle types, from commercial, general, and military aviation, for all procedures and vectors, to and from multiple origins and destinations, and all phases of operations (takeoff, landing, etc. and including elements of aircraft operations like continuous flight training maneuvers, hovering, and VTOL) instead of limiting the assessment to one procedure to or from one airport at a time or one vehicle type. Please see our answer to Question #10, re: miscellaneous.
- **Do not allow extreme noise impact of sonic boom** of (SEL) 90 dBA[1] for civil aircraft and **penalize startle responses to sonic boom or take-off noise** (exceeding Programmed Lapse Rate thrust) and military sonic booms.

SUPERSONIC

Supersonic aircraft should continue to comply with the noise certification standards in place for subsonic aircraft at the time of aircraft certification.

Supersonic aircraft are another concern because sonic booms are very disruptive both from a noise and vibrations perspective. People are startled and frightened. Sonic booms disrupt sleep, rest, concentration, work, and interfere with communication. In 1973, the FAA banned sonic booms over land for supersonic civilian aircraft (14 CFR Part 91.817). This ban is still in effect and should remain in effect. No sonic boom, even muffled, should be allowed over the United States land and territorial sea: supersonic aircraft should operate as subsonic aircraft over the United States land and territorial sea. In terms of engine noise, supersonic aircraft should be held to the same noise standards as subsonic aircraft (e.g., Stage 5 currently). Absent sonic booms, the noise impacts of supersonic aircraft will be captured through the same decision metrics of all other air vehicles.

Supersonics are expected to consume 3 to 9 times as much fuel per passenger as subsonic aircraft thus exacerbating carbon emissions and aggravating climate change issues. In addition, supersonic aircraft only benefit global premium passengers who can afford very expensive plane tickets. Having the FAA spend taxpayers' dollars for the convenience of a relatively small number of people is not the right priority.

In the NPRM Domestic Noise Certification of Supersonic Aircraft, AEE-18-004-R, Docket ID: FAA-2020-0316, the FAA proposed stage criteria for new supersonic aircraft halfway between the Stage 4 and Stage 5 criteria for subsonic aircraft. Many communities pushed back on this proposal in their comments, arguing that supersonic aircraft should be held to the same stage criteria as subsonic aircraft. It seems the FAA may have accepted this view.

This is consistent with the FAA's published direction dating back to 1978, "With the issuance of these rules, the FAA takes the first step toward ensuring that future supersonic transport (SST) are subject to

[1] Boom Technology, Inc. Comment to Docket No. FAA-2019-0451, FAA Request for Comment Special Flight Authorizations for Supersonic, June 28, 2019

the same noise levels as subsonic aircraft…."[2] This statement followed a recommendation by the EPA to prohibit operation of any subsonic or supersonic airplane to or from any airport within the US unless it complied with Part 36 noise limits for subsonic aircraft.[3] The FAA reaffirmed this direction in 1994[4] and 2008[5].

Stage criteria should not be relaxed to accommodate lower-bypass engines as manufacturers of supersonic aircraft might wish. In an effort to create more fuel-efficient flights, manufacturers of supersonic aircraft might want to minimize drag, especially at high speeds. To do so, they might be tempted to substitute narrower nacelles, which can be expected to lower the bypass ratio of the jet engines.[6] Favoring lower-bypass engines in supersonic aircraft could sharply increase jet engine noise because the sound energy produced by a jet engine increases with the eighth power of the speed of the exhaust relative to speed of the air stream surrounding that exhaust.[7]

Communities have concerns of startle responses to sonic boom or take-off noise (exceeding Programmed Lapse Rate thrust). Sonic boom should also no mar the experience of wilderness areas and outdoor places where solitude and quiet is expected. Studies have found that residents have been more affected by supersonic noise indoors than outdoors.[8] Impact on sleep quality is a concern. Possible effects of sound energy below 100 Hz is a concern.

Should the FAA use this information to make decisions or disclose to the public noise impacts?

Please see our answers to Question #5, #6b, and #6c re: decision-making metrics and communication.

b. What interests or concerns do communities in the vicinity of airports have?

The main concerns of communities in the vicinity of airports are the number of operations, flying over residential areas during nighttime hours instead of using noise abatement procedures to avoid communities, the use of A-weighting, and ground noise, such APU usage, taxiing, start-of-takeoff roll on departure and reverse thrust on arrival landings. For those in the vicinity of airports, the DNL threshold should be lowered to DNL 55 for land-use, NEPA, and for soundproofing or economic mitigation eligibility.

Please see our answers to Questions #2, #3, #5, #6, #7, and #10, re: operations of air vehicles, DNL, decision-making metrics, communication, NEPA and Land Use, and miscellaneous.

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[2] *Civil Supersonic Airplanes, Noise and Sonic Boom Requirements*, 43 CFR 28406-28407, 1978, https://tile.loc.gov/storage-services/service/ll/fedreg/fr043/fr043126/fr043126.pdf

[3] *Airplane noise requirements for operation to or from an airport within the United States*, 41 FR 6270, 1976 https://tile.loc.gov/storage-services/service/ll/fedreg/fr041/fr041030/fr041030.pdf

[4] 59 FR 39679, August 4, 1994, https://www.faa.gov/sites/faa.gov/files/about/office_org/headquarters_offices/apl/noise_policy_on_supersonics.pdf

[5] 73 FR 62871, October 22, 2008, https://www.govinfo.gov/content/pkg/FR-2008-10-22/html/E8-25052.htm

[6] "Supersonic Passenger Flight", Congressional Research Service, 2018, p12. ttps://fas.org/sgp/crs/misc/R45404.pdf

[7] Lighthill's eighth power law, https://en.wikipedia.org/wiki/Lighthill%27s_eighth_power_law

[8] "One trend seen in studies from both the U.S. and Japan is that annoyance to sonic boom noise is greater indoors compared to outdoors. The findings show that indoor annoyance can be estimated based on the outdoor sonic boom exposure." *Aviation Noise Impacts White Paper – State of the Science 2019: Aviation Noise Impacts*, Sparrow, et al., 2019, Published by ICAO. https://www.icao.int/environmental-protection/Documents/ScientificUnderstanding/EnvReport2019-WhitePaper-Noise.pdf

How can these concerns be addressed using noise metrics? What noise metrics would address these concerns? Please explain your reasoning.

Please see our answers to Questions #2, #3, #5, #6, and #10, re: operations of air vehicles, DNL, decision-making metrics, communication, and miscellaneous.

c. What interests or concerns do overflight communities have?

Overflight communities are concerned that the current noise policy does not reflect the true impacts they experience - the number of aviation noise events, their loudness relative to the community's ambient noise, and how often and when the noise occurs. The current policy of metrics and thresholds used for decision-making does not capture the negative health and quality of life impact-factors from NextGen's high volume and concentration low altitude aircraft. Many GA and commercial vehicle overflight communities are impacted by more than one airport, multiple routes, multiple vehicle types, and different elements of aircraft operations. Commercial vehicle overflight communities are also concerned about multiple procedures and vectors. Therefore, the total noise impacts should be assessed - see answer in the 8th bullet from question 2a. FAA's 1050.1F order and Desk Reference[9] should require total noise impacts for all assessments.

Today's one size fits all, DNL 65 has been interpreted as Significant Impact for the two separate noise exposure environments. Overflight communities require different metrics, thresholds, and mitigation including noise abatement procedures and dispersion.

Please see our answers to Questions #2, #3, #5, #6, #7, and #10, re: operations of air vehicles, DNL, decision-making metrics, communication, NEPA and Land Use, and miscellaneous.

SPECIFIC INTERESTS AND CONCERNS

01. **We support the Federal Register comment from Nicholas Miller**, FAA-2023-0855-0150
"I suggest in addition to policy revisions, the FAA needs to provide these citizens with the hopes that some sincere efforts will be made to improve their lives. FAA should not become another government agency in which no one has any confidence that it is capable of responding to their needs or that it is attempting to make their lives better" and "FAA should understand that it is currently behind the eight-ball, having pretty much reduced or eliminated any benefits provided to airport communities by the Part 150 process and the home sound insulation actions. [As you know, these programs made a difference in some restructures of airspace use to reduce aircraft community noise levels and by providing sound insulation for so many homes.] Then, FAA changed airspace use, moved dispersed operations to single tracks, basically giving communities a double whammy of not only eliminating the benefits of months (and years) of effort, but increasing many areas of noise exposure. These two results are certainly likely to produce extreme dissatisfaction" and "...analyze in detail, how much distance, time and fuel are saved with the RNAV, PBN, Metroplex, NextGen or whatever the current procedures are called. This effort must apply to specific procedures, not generic ones. If only minor savings are found, go back to the prior guidance (vectors?). It is a bit hard to believe the new ones are much safer – were the previous ones less safe?"
02. **Represent the public interest and remedy the damage done to communities affected by the NextGen rollout and its "sins of the past"**, a phrase used recently by an FAA employee during a public webinar on the FAA's Noise Policy Review. Communities understand and live daily the

[9] 1050.1F Desk Reference, February 2020, https://www.faa.gov/sites/faa.gov/files/about/office_org/headquarters_offices/apl/15-cumulative-impacts.pdf

comment made to Congress by Paul Rinaldi, President of the National Air Traffic Controllers Association on May 18, 2021, House Transportation & Infrastructure Subcommittee Roundtable on the "Final Approach: An Update on ATC Modernization",

"We hit the same position at the same altitude every time. And the winners and losers. There's a lot of winners in the noise game. They don't say anything because they don't hear any airplane noise. But the losers hear a lot of airplane noise. The FAA, they field a lot of complaints."

The FAA has communicated the new noise policy will not be retroactive and any past decision will not be redone. There should be existing and additional decision-making processes or programs for qualified communities to apply the new noise policy. For example, qualification processes for additional programs to apply the new noise policy:

- based on evidence: either independent, robust analyses could be provided to show Significant Impact or the FAA performs analyses of e.g., 100 or fewer NextGen hotspots nation-wide,
- modeled after Section 190, Environmental Mitigation Pilot Program, FAA Reauthorization Act of 2018 for qualifying overflight communities to pursue projects to reduce noise, and
- through the top 30 major airports who identify their top 3 NextGen changes that created severe NextGen noise impacts on new communities.

It is irresponsible and reprehensible not to improve the lives of NextGen impacted communities.

03. **Should the noise policy allow the highest impacts on a small number of people or be more equitable?** In his article on Unjust Noise[10], Voice states "that noise is a significant source of social harm and **those harmed by noise often suffer not merely a misfortune but an injustice**." He goes on to state that his purpose is "to give normative urgency to the problem of noise by understanding certain instances of it as not merely annoyances and nuisances but instances of injustice."
Voice states that "establishing the fact of a disproportionate burden is only the first step in arguing for its injustice." The disproportionate burden has been established for aviation noise. When using aviation noise as an example in his explanation of necessary noise he states "So, while the airport noise in the example lies below the threshold of an immoral use of noise, it does however constitute an injustice and not a mere nuisance. We can conclude this section by saying that some people bear an unjust burden of public noise even when such noise is necessary noise in the sense defined above; the good that necessary noise is associated with does not cancel out claims of justice." **Noise policy should be equitable.**
04. **There should be a subsequent stakeholder engagement process** similar to this one after the FAA has narrowed its policy options and before issuing a new noise policy. Stakeholders, including the public, should be given a similar opportunity to this one to review the potential changes to the noise policy and relevant orders, regulations, and guidance documents.
05. **Regardless of airport DNL contours, include overflight communities** significantly impacted under the new noise policy in the Part 150 analyses and reports and make such communities eligible for noise monitoring. Historically, only in the vicinity of airport communities have been included in the Part 150 analysis.
06. **Allow some local control such as**:
    - Allow local governments to establish local noise ordinances for civil rotorcraft (e.g., helicopters and drones for local law enforcement, commercial and personal activities –passenger or packages) for air traffic flying below 2000 ft.

[10] P. Voice, Unjust Noise, Ethics in Practice, Nordic Journal of Applied Ethics, No. 2, November 2009

- Give airports some discretion on providing incentives to airlines for noise abatement purposes. This may require asking Congress to modify 14 CFR Part 161 to allow Airports to have more discretion.
- Require a minimum 2,000 ft cruising altitude for all civil helicopters when transporting individuals except for medical emergencies.

07. **Improve AEDT to accurately model impacts and in the meantime display the error bars in modeled assessments.** AEDT is not accurate beyond a few miles from the airport, especially for arrivals. These AEDT limitations have been on-going. AEDT is based on a Noise Power Distance (NPD) model, which assumes that airframe and engine noise correlate with thrust. The NPD model is not as sophisticated as the ANOPP model that simulates aircraft noise based on various aircraft components. Airframe noise is the dominant noise source on arrivals, not engine noise. Recent MIT research, sponsored by the FAA ASCENT project 44, shows that delayed deceleration techniques could potentially reduce noise by 3 to 6 dB on average across different aircraft types in areas beyond 8 nautical miles from an airport. Under delayed deceleration, airplanes maintain higher speeds while flying in a clean configuration at low thrust levels. The AEDT model uses descent profiles that underestimate the use of flaps or slats over overflight communities, especially 10 or more miles away from the airport. This means that noise impacts of arrivals are typically underestimated away from airports. The Giladi and Menachi's paper on validating noise models states that "...the AEDT model underestimates noise levels [emphasis added], sometimes considerably, by **4 to 7 dB(A)** [emphasis added], even when using an accurate flight path for its input." We support Nicholas Miller's FRN comments (FAA-2023-0855-0150) where he proposes "...checks of the accuracy of the noise model database." AEDT has not been calibrated against actual noise monitor measurements beyond a few miles from an airport. No error bar or 95% confidence interval is provided on modeled noise results.
08. **Airframe noise should be addressed both in the AEDT modeling tool** and in the FAA Aircraft Source Noise Reduction plans. The Aircraft Source Noise Reduction plans should go beyond engine noise to include airframe noise, which is the dominant noise for 50% of airport arrivals.
09. **Nighttime penalties should be revised** to reflect the substantial noise impacts of nighttime flights. It is likely the current penalties are insufficient. Investigate and determine how to penalize nighttime flight activities to reflect the actual experiences of people based on existing sleep study research and analysis of available ambient and noise levels for communities.
10. **There is no need to conduct any additional research on impacts (including the sleep study currently underway) or wait for research to be completed before establishing a new Civil Aviation noise policy regarding annoyance.** Even though the noise policy should address all types of air vehicles, current and future, it is urgent to define the new noise policy for current air vehicles (e.g., subsonic fixed wing, rotorcraft, and commercial space). Ample, peer-reviewed research and data (including noise monitoring data) on aircraft noise impacts, including sleep interruptions, already exist. The FAA should integrate new research findings or changes in air vehicle types in a periodic update of its noise policy.
11. **The FAA should order all domestic aircraft's Flight Management Systems (FMS)** to upgrade in order to allow the FMS to accommodate multiple departure, approach, and arrival instrument paths for the purpose of rotating path usage in order to disperse aviation noise more equitably.
12. **All airport landing fees should be noise based as an incentive for airlines** to update their fleets to maximize the use of the quietest aircraft.
13. **Aviation charts of procedures over noise sensitive areas** in the vicinity of airports and overflown communities should indicate the noise sensitivity.
14. **There should be an order to ATC personnel** that requires them to include consideration of those on the ground when deciding runway use at times of light winds and low demand to reduce persistent noise over the same communities.

15. **Noise policy should be reviewed every 5 years at a minimum.** The policy should also be updated within 2 years of any major finding (e.g., a National Academies consensus report on public health).
16. **To ensure communities have a voice in new and updated noise policy**, we request an Impacted Communities National Advisory Committee (under the Federal Advisory Committee Act, FACA) to advise the FAA on current and future noise and pollution issues. Regionally, communities have little influence or voice on FAA decisions; nationally, they have virtually none. Aviation noise will continue to be a problem for communities. We do not know what the noise impacts from advanced air mobility will be. Congressman Lynch's Impacted-Communities Advisory Committee, H.R.2565 mandates a national FACA-based advisory committee to provide a community voice and to deal with current and future aviation noise problems. The FAA's Noise Policy should require this advisory committee, as laid out in H.R.2565, be formed immediately.
17. The noise policy review **does not include the impact of aviation emissions on public health.**
18. **The high-quality methodology based on an algorithm and ADS-B trajectory data for noise monitoring should be required** for airports to more accurately detect aircraft noise events than the threshold-and-duration method.

How can these concerns be addressed using noise metrics? What noise metrics would address these concerns? Please explain your reasoning.

Please see our answers to Questions #2, #3, #4, #5, #6, and #10 re: operations of air vehicles, DNL, averaging, decision-making metrics, communication, and miscellaneous.

d. What interests or concerns do communities in the vicinity of commercial space transportation operations have? How can these concerns be addressed using noise metrics? What noise metrics would address these concerns?

AICA's 70+ alliance is not currently impacted by significant noise from space transportation operations, and we have no comment.

e. What interests or concerns do communities in the vicinity of UAS (drone) package delivery or other newly emerging technology operations have? How can these concerns be addressed using noise metrics? What noise metrics would address these concerns?

Communities are concerned about the premature rollout of UAS or other newly emerging technology operations before a new noise policy is available and that addresses the true impacts to communities, including new elements of aircraft operations such as visual pollution and hovering. Innovate 28 (I28) should require that "collecting data" include the count of aviation events above ambient (N-Above-Ambient), environmental impacts, the type of AAM vehicles, and community engagement reports. State and local governments laws should control, within their boundaries, all aspects of AAM that create noise impacts including locations of flights, low altitude airspace, land use, infrastructure, and aircraft operations (e.g., EVTOL helicopters and drones for local law enforcement, commercial and personal activities–passenger or packages)**.** The evaluation and decision-making for environmental impacts, including AAM, should relate to and represent the layperson's lived experience by using the realistic metric of N-Above in Lmax bands, some reasonable threshold(s) for significant impacts, and ambient noise consideration. Categorical Exclusions should not be used. Changes to airspace design and/or new routes for AAM should be published. Community as a key stakeholder should be included early and in all high-level activities of the AAM Integrated Master Schedule. The current plan involves Community only in "Phase 5: Post -implementation". AAM is an incremental impact and therefore should not further

burden communities already highly impacted. Total impacts (noise and visual) should include ALL current aviation impacts from (see recommendation in Question #10 Miscellaneous):

- multiple airports/helipads/drone launching & landing pads,
- multiple vehicle types (including new AAM),
- multiple flight paths - procedure or vector, and
- multiple elements of aircraft operations (e.g., hovering).

Please see our answers to Questions #2a, #2b, #2c, #3, #4, #5, #6, #7, and #10, re: operations of air vehicles, DNL, averaging, decision-making metrics, communication, NEPA and land use, miscellaneous, and AICA Comment to Docket No. DOT-OST-2023-0079-0104, DOT Request for Information on Advanced Air Mobility (AAM), August 10, 2023.

3. DNL.

What views or comments do you have about the FAA's core decision-making metric, DNL? How would these views regarding DNL be resolved if the FAA employed another noise metric (either in addition to, or to replace DNL) or if the FAA calculated DNL differently? Please explain your reasoning.

DNL IS AN INVALID METRIC FOR OVERFLIGHT COMMUNITIES

DNL is a statistically invalid metric for assessing aviation noise annoyance; the decades of noise complaints since DNL65 have been used to determine significant aviation noise and now the Neighborhood Environmental Survey study verifies that DNL65 is invalid. A measurement system is ***valid*** if it measures what it claims to measure (e.g., "significant noise"), and the ***results closely correspond to real-world values*** (e.g., "survey reactions of people to noise"). In statistics a measurement system is *valid* if it is both *accurate* and *precise*, i.e., unbiased with small estimation error. The NES shows that DNL does not correspond well to survey reactions of people to aviation noise.

DNL estimates are imprecise. According to Vincent Mestre, February 26,2021 (ANE Symposium) the AEDT software with good data, produces DNL estimates with the margin of errors about ±1.5 dB @ 65 DNL, ±3 dB @ 60 DNL, ±5 dB around 55 DNL, and ±10 dB at ≤ 50 DNL. Therefore, the estimates cannot be used to determine significant or reportable increases in noise as FAA's 1050.1F requires. The margin of error is too great. With 95% confidence an estimate of 55 DNL could be as great as 60 dBA which is a reportable increase.

Estimated DNL of 50, 55, and 60, but with 95% Confdence, DNL Could Be Any Value shown in Red Interval																									
DNL50	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
DNL55	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
DNL60	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65

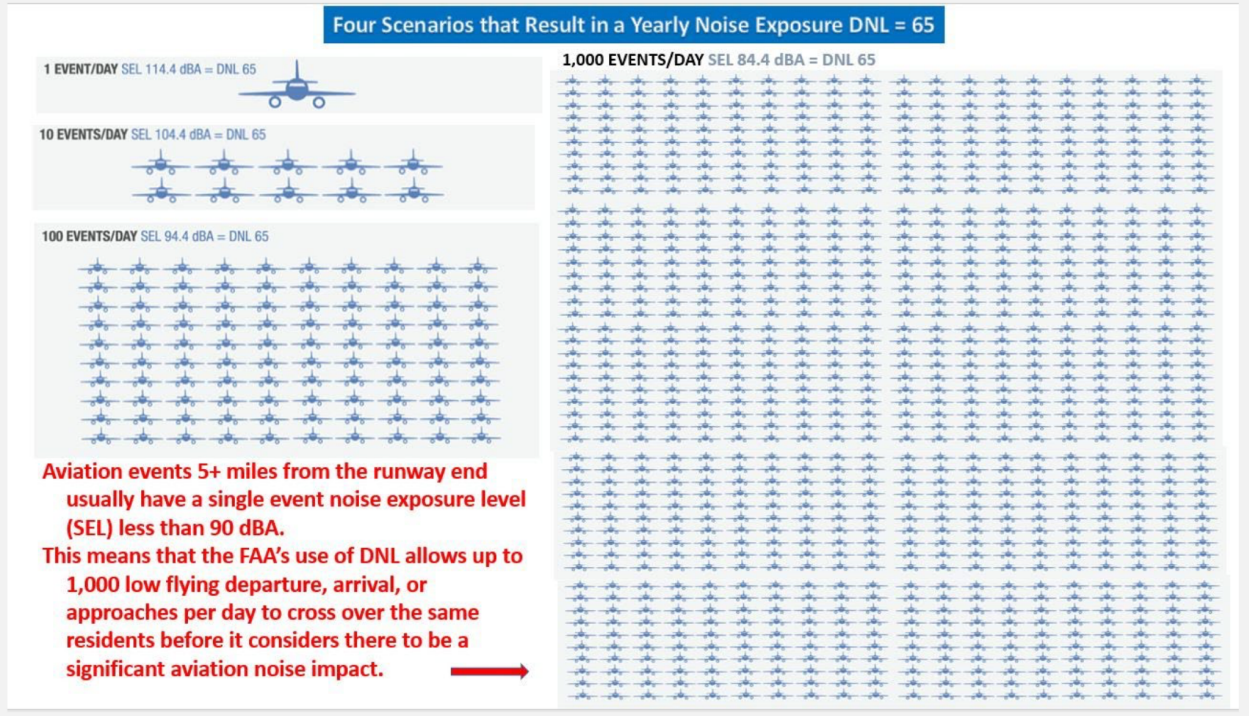
Also, the metric does not capture the variation in noise, which is what people react to. It does not report the frequency of events nor the change from ambient levels.

The DNL metric does not adequately represent the noise impacts for overflight communities (GA, Commercial, and future AAM) who experience numerous and frequent flights, sometimes less than 90 seconds apart. **See our answers regarding elements of aircraft operations in Question #2a, re: operations of air vehicles.**

DNL is an especially problematic averaging metric. Its calculation averages over multiple factors (noise intensity, number of noise events, time, seasons, temperature, and aircraft type), allowing the same

value to represent locations with large differences of sound intensity, weather, the number of noise events and aircraft types.

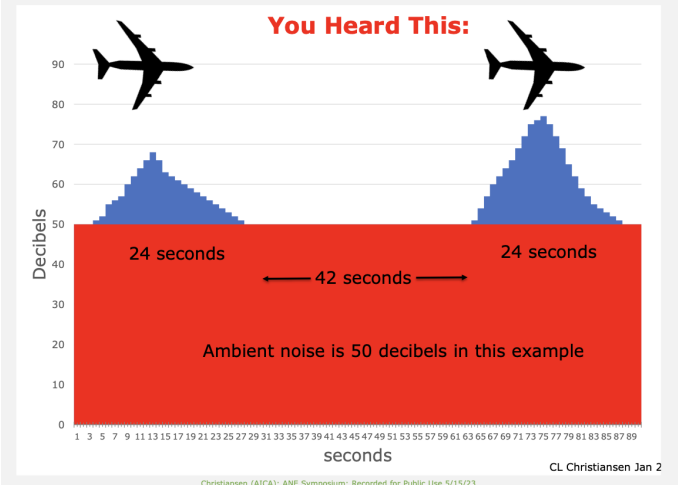
People are disturbed by the count of noise events and by the noise above ambient that is associated with each event. DNL does not count the number of aircraft and their individual noise levels. One very loud event or many less loud events can lead to the same DNL number. 10, 100, or 1000 aircraft can have the exact same DNL value even though 10, 100, or 1000 aircraft create very different noise experiences. The chart below shows four scenarios with the same DNL where DNL is calculated for an Average Annual Day (ADD).

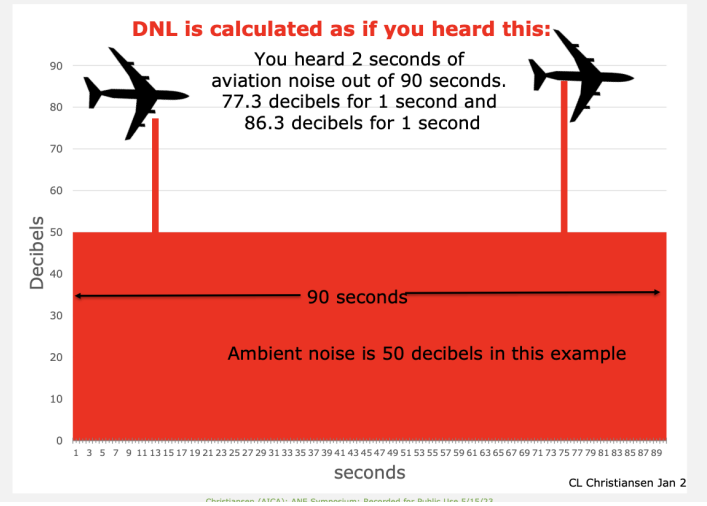


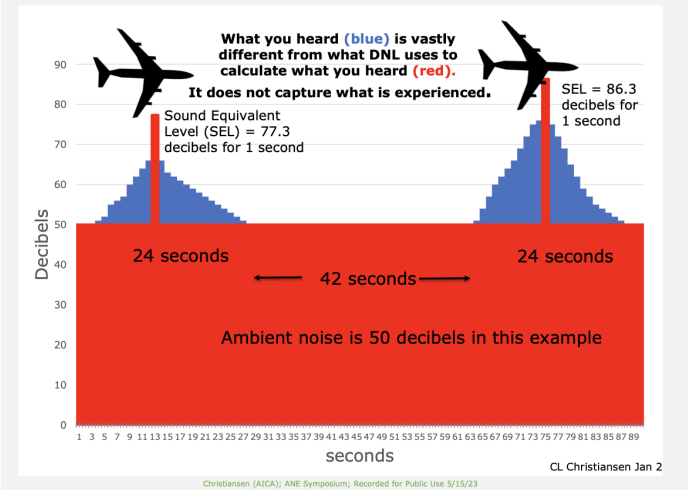
DNL, calculated for an Average Annual Day, underestimates the real impacts of aviation noise events. It does not reflect seasonality or when one configuration is used persistently. Furthermore, when calculated for environmental reviews, DNL does not count the total aircraft noise events to which people are exposed (multiple vehicle types, multiple airports, multiple vehicle operations) or the ambient noise levels of the affected communities.

Regardless of the time period used in the calculation (daytime, nighttime, peak hour, 4-hour, average annual day, etc.), DNL will always be an average noise level that neither counts aircraft noise events nor captures how people experience noise on the ground, especially for overflown communities. People do not hear average noise.

People experience the noise of each individual event when the noise exceeds the ambient noise level. DNL uses Sound Equivalent Level (SEL) in its calculation. SEL compresses the noise as if it occurred in one second. Nobody experiences DNL or SEL. Furthermore, most people do not understand DNL, and its logarithmic scales are not averaged like arithmetic values. It is improper for the FAA to expect the public to comment on the DNL metric and threshold when it does not provide DNL estimates for locations outside the DNL noise contours, leaving people, mostly in overflight communities and those affected by GA and helicopters, at a loss as to how far their burden is from FAA's determination of "significant".







DNL FOR VICINITY OF AIRPORT COMMUNITIES

The DNL metric may be appropriate for communities in the vicinity of airports because these communities are affected by takeoffs, landings, and ground-based noise. However, the current 65 dB

DNL threshold is no longer appropriate for the vicinity of airport communities and the validity of A-weighted, compared with C-weighted, should be explored. The current DNL 65 metric and threshold is outdated and it is not compliant with ASNA, 49 U.S. Code § 47502 for the reasons stated below in "SINGLE SYSTEM, NOT SINGLE METRIC". The NES curve found 12.3% of people are Highly Annoyed at 46 dB. In the Schultz curve, 12.3% of people were estimated as being annoyed at 65 dB.

If DNL remains the decision-making metric for communities in vicinity of airports, lower the DNL threshold for these communities based on the World Health Organization guidelines, EPA, and NES results, **please see the answer to our Question #7, re: NEPA and land use.**

C-WEIGHTED AND A-WEIGHTED

For both overflown and vicinity of airport communities, C-weighted and A-weighted dB should be calculated. The larger of the two should be used for the decision-making metrics. By doing so, the policy will more accurately reflect the lower frequencies of vehicle types and/or operations (such as ground based noise). **Please see our answer to Question #9, re: FAA noise thresholds for low-frequency events.**

SINGLE SYSTEM, NOT SINGLE METRIC

The new noise policy should be compliant with ASNA, 49 U.S. Code § 47502, which requires a single system, not a single metric. The Introduction section of the Analysis of the January 2021 NES misinterpreted the law as requiring a single metric "Through the Aviation Safety and Noise Abatement Act (ASNA) of 1979, Congress directed the Federal Aviation Administration (FAA) to establish **a single metric** [emphasis added] for assessing land use compatibility with respect to noise from aircraft operations, and to establish standards and methods for assessing the noise environment associated with ongoing aircraft operations near airports." This misinterpretation is confusing to the public.

N-ABOVE-AMBIENT (NAA) TO REPRESENT IMPACTS ON OVERFLIGHT COMMUNITIES

As mentioned in an NES comment, N-Above is the best predictor of impacts and annoyance for overflight communities experiencing many and frequent overflights.

- N-Above counts the number of noise events based on their maximum noise level.
- Fractional-day N-Above metrics (such as N-Above per hour or specified hours) can also be used to increase correlation with the level of annoyance and complaints.
- The NES data showed a strong correlation between N-Above 50 dB (NA50) and the level of annoyance. The FAA should perform and publish the analysis of the NA50 as a single independent variable using NES data as this information could inform comments and recommendations on a new noise policy.

Using N-Above requires selecting two things: the period of time for calculating N-Above and the noise level that each aircraft maximum noise must exceed.

- Period of time: the peak day of the year should be used because:
    - An Average Annual Day (AAD) does not account for traffic seasonality or changes on runway configurations due to weather conditions. AAD underestimates the true impact experienced by overflown communities.
    - In contrast, peak day represents the highest impact in a given year. Given that air traffic has steadily increased for decades, except during the COVID-19 years, using peak day is reasonable. For example, volume of air traffic and associated impacts will likely occur in the future and would be captured by peak day versus having to wait for a full year average of data.

- Noise level to exceed: although a representation of disturbance, N-Above a fixed value (like N-Above 50 dB, 55 dB, etc.) is a choice independent of a community's ambient noise. To represent true impact on overflight communities, N-Above should be counted relative to ambient noise. Note that the Federal Railroad Administration and the Federal Highway Administration take into account ambient noise when assessing impacts.

The N-Above-Ambient (NAA) metric represents the true impact on overflight communities and N-Above-(Ambient+offset) should be used for decision-making. NAA counts all noise events that are louder than ambient noise.

N-Above-Ambient (NAA) metric is defined as the count of noise events with a maximum noise level (Lmax) that exceeds ambient noise for the peak day of the year.

- **Number of all noise events:** count of all noise events caused by all air vehicles from commercial aviation, general aviation, or military operations, regardless of their vehicle types and including supersonic aircraft and space operations, to and from multiple origins or destinations (airports, helipads, launch pads, drone pads) using one or more flight paths (procedure, visual, or vectors), for all air vehicle operations (from being at the gate to taxiing to taking off to cruising to landing, and including all elements of aircraft operations such as repetitive flight training maneuvers) and with time penalties or change to thresholds, e.g., nighttime threshold 10dB lower than daytime threshold.
    - Although the FAA noise policy is limited to Civil Aviation, the impacts of military air vehicles, including any space operations, should be counted when evaluating the total impact on communities.
- **Maximum noise level:** maximum sound level (Lmax) expressed using either C-weighting or A-weighting, whichever is largest.
    - Lmax should be used instead of Sound Exposure Level (SEL) because SEL is not a metric that people hear. People hear instant noise, including a maximum noise level, not SEL. SEL is necessary for comparing noise events or as a building block to calculate DNL. Neither purpose applies to a non-DNL based noise policy.
    - Lmax can be determined through historical data from noise monitors or modeled in AEDT using both C-weighting and A-weighting because some air vehicles, including subsonic planes, create low-frequency vibrations that are not captured by A-weighting decibels even though people can feel them.
- **Ambient noise**, also referred to as background noise, is the typical average noise in a community <u>without</u> the noise caused by air vehicles. Noise events that exceed ambient noise disturb people.
    - If a 24-hour average ambient noise is used, nighttime penalties of at least 10 additional noise events per event should be used. Alternatively, the "above" value requirement to count an event should be 10 dB or more lower for nighttime occurrences. Note: In the Massport/FAA RNAV study, the consultant used N-Above with different "above" values for day and night.
    - Data on community ambient noise levels may already exist based on current or past noise monitoring by airports or could be collected through temporary noise monitoring. Until it is measured, ambient noise could be estimated using evidence-based community characteristics (for example, ambient of 35 dB for rural, 40 dB for low-density suburban, 50 dB for medium density suburban, 60 dB for urban, etc.). Estimates should be evidence-based, e.g., informed by noise monitoring data from other communities of a similar type.

- **Period of time**: the peak day of the year should be used because
    - An Average Annual Day (AAD) does not account for traffic seasonality or changes on runway configurations due to weather conditions. AAD underestimates the true impact experienced by people.
    - In contrast, peak day represents the highest impact in a given year. Given that air traffic has steadily increased for decades, except during the COVID-19 years, using peak day is reasonable: such a volume of air traffic and associated impacts will likely occur in the future and not just on one day.
    - Using other time periods (e.g., rush hour periods). is of course possible but would add complexity.

N-Above-Ambient metric applies to all air vehicles in all community environments (quiet or loud, rural, suburban, urban, national parks or wildlife refuges, etc.). In particular, NAA can be used for all elements of aircraft operations such as helicopters and drones as long as a representative analysis of air traffic (using NOMS or noise monitoring data) is done or simple, realistic assumptions are used such as:

- Helicopters and VTOL AAM:
    - Overflights: count the same way as any other aircraft.
- Hovering and VTOL AAM: For helicopter and VTOL events that hover, T-Above-Ambient (TAA) should be used and then converted to an N-Above-Ambient (NAA) number. For illustrative purposes only, if a helicopter hovered overhead for 3 minutes and an NAA event was calculated at 30 seconds, then the TAA would be converted into 6 events using NAA.
- Specific GA operations with duration impacts - airshows/aerobatics, continuous touch-and-gos and other closed pattern work with multiple planes, skydiving drop zones, and concentrated and repetitive flight training maneuvers such as turns about a point:
    - Overflights: count the same way as any other aircraft.
    - May warrant using TAA or converting TAA into an NAA count as suggested above in “Hovering and VTOP AAM”.

Not all air vehicles, and consequently not all aviation noise events are identifiable today. For example, tracking helicopters and commercial drones are not required to have a transponder on board, which allows automatic detection. Civil helicopters and commercial drones should be equipped with transponders to allow tracking of more air vehicles and capture their associated noise impacts.

GENERAL AVIATION

General Aviation encompasses a range of vehicles (AAM, helicopter, propeller, jets) and operations (repetitive flight training maneuvers including multiple planes, repetitive touch-and-go landings and other closed pattern work, skydiving drop zones, pattern work, banner flying, tours, delivery, air shows, and tow planes for gliders) which represent the noise impact to communities.

NAA should be used for all events and TAA converted to NAA for events longer than a typical noise event duration (e.g., 30 seconds). GA impacts should be analyzed to understand how various vehicle types or elements of aircraft operations (e.g., hoovering, continuous flight training maneuvers with multiple aircraft) affect communities. Penalties could be considered based on the analyses of the measured noise experience in GA environments. If insufficient data is available to determine the noise experience, then the data should be collected..

Quiet settings, such as national parks, should not be overflown by Helicopters. Furthermore, Helicopter individual flight impacts are sporadic, widespread and not proximate to airports and because most helicopter flights occur only during daylight hours, DNL is not an appropriate metric to assess impacts.

The Robinson R44 is the most commonly used and one of the quieter civilian helicopters in use today. According to FAA Advisory 36-1H, when flying level at 500 feet AGL, this helicopter causes 81.9 dB SEL on the ground with an approximate Lmax of 72 dB. When flying over residential areas that have 45-50 dB ambient noise levels, a single flight will likely be many times louder than the ambient noise level on the ground. In addition, helicopter rotors periodically cause blade vortex interaction (blade flap) which can cause noise levels to suddenly increase by about 10 dB which adds to community annoyance.

SUPERSONIC

DNL is an invalid predictor of annoyance from sonic booms. Perhaps unintentionally, Boom Supersonic made this point convincingly in a letter to the FAA:

The lowest quantity of noise that would generate a significant impact is that which would raise DNL from 63.5 to 65. Concorde's nominal cruise sonic boom produced an overpressure of 1.94psf, for a sound exposure level (SEL) of 90 dBA. Since most supersonic flight testing could be expected to take place during the day, it would take 80 daytime Concorde-level booms per day in a single location to raise ambient DNL from 63.5 to 65. Therefore, *even an action that exposed a test area to 28,835 daytime Concorde-level booms per year would fail to be significant under this [DNL] standard*.[11] [emphasis added]

The noise threshold for sonic boom over land should be zero. In 1973, the EPA recommended that "The disturbance by individual noise events and occasional high noise levels should be controlled by maximum permissible noise levels for individual events established by local authorities. Control over such events should not be attempted by lowering the average sound level."[12]

Please see our answers to Question #2 and #3 re: operations of air vehicles and DNL.

NIGHT OVERFLIGHTS

Since night overflights create more severe impacts, nighttime penalties should continue to be applied to NAA calculations. Events used in calculating DNL get penalized at night (and in the evening in California). Similarly, events used to calculate NAA could be penalized: apply the penalty to the maximum noise level (Lmax) of each event before calculating NAA.

The California 5 dB evening penalty (7 pm and 10 pm) should be maintained and expanded to all states to have a consistent system of measurement. Additionally, the current nighttime penalties should be revised to better capture the night impact severity.

4. Averaging.

DNL provides a cumulative description of the noise events expected to occur over the course of an entire year averaged into a representative day, described as an Average Annual Day (AAD).

a. Do you believe an AAD is an appropriate way to describe noise impacts? Please explain why or why not.

AAD is not an appropriate way to describe noise impacts for overflown communities regardless of the average scheme. **Please see our answer to Question #3, re: DNL.**

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[11] Docket ID: FAA-2019-0451, *Boom Technology, Inc. comments on proposed rule, Special Flight Authorizations for Supersonic Aircraft*, June 28, 2019

[12] *Impact Characterization of Noise Including Implications of Identifying and Achieving Levels of Cumulative Noise Exposure*; EPA Aircraft/Airport Noise Study 27 July 1973.
http://nepis.epa.gov/Exe/ZyPDF.cgi/9101DPQN.PDF?Dockey=9101DPQN.PDF

b. If not, what alternative averaging schemes to AAD should be considered and why? What information would the use of an alternative averaging scheme capture that AAD does not?

There is no averaging scheme or alternative averaging scheme that should be considered to describe noise impacts for overflight communities. Please see our answers to Question #3 and #5 re: DNL and decision-making noise metrics.

5. Decision-making Noise Metrics.

The FAA currently uses DNL as its primary decision-making metric for actions subject to NEPA and airport noise compatibility planning studies prepared pursuant to 14 CFR part 150.

a. Should different noise metrics be used in different circumstances for decision-making?

Yes.

VALID NOISE METRICS SHOULD BE USED IN DIFFERENT CIRCUMSTANCES FOR DECISION-MAKING

The current noise policy relies on the DNL 65 metric and threshold for every decision (including environmental reviews, airport noise compatibility planning, soundproofing eligibility, and permanent noise monitoring eligibility) for all communities whether they are in the vicinity of airport or overflown communities, regardless of the communities' ambient noise level.

Furthermore, the use of the DNL metric and its threshold (DNL 65 threshold) is unachievable for many overflight communities, if not all, and guarantees a Finding of No Significant Impact (FONSI) on any Environmental Assessment. The current definition of Significant Impact is inadequate in light of the NES results and reflects neither the severity, nor the experience of noise impacts on overflight Communities, especially for NextGen impacted communities.

The noise policy should address the multiple community environments – vicinity to airports/veriports and overflight communities – separately. This distinction for overflight communities requires using different metrics and thresholds than today given that the impacts and mitigation solutions are different. Communities in vicinity to airports are impacted because of their proximity to runways and gates; noise reduction solutions typically consist of land use policies, soundproofing, and actions on the airport grounds. On the other hand, overflight communities suffer from high event counts, high concentration, low-altitude traffic; for such communities, solutions such as noise abatement procedures and dispersion are needed.

Vicinity of airports should use an A-or C-weighted DNL metric with a threshold of 55 dB or lower as their primary decision-making metric based on NES, EPA recommendations, and WHO guidelines. Overflight communities should use N-Above-Ambient as their primary decision-making metric, replacing DNL. These primary decision-making metrics used for the two noise exposure airport environments should apply for Part 150 (new noise policy should qualify inclusion of some overflight communities using NAA), NEPA, and eligibility (e.g., some overflight communities should qualify for noise monitoring). For communities in the vicinity of vertiports and those overflown by helicopters and AAM, the decision-making metrics described in #5c. should be used. The use of different metrics complies with ASNA, which requires "a single system" to measure noise and for determining annoyance.

Simplicity in a noise policy as emphasized by the FAA cannot be at the expense of Communities whose impacts are underrepresented today under the current noise policy. There should be different noise metrics for different circumstances to address the characteristics of noise exposure environments.

The current reportable increases using DNL underrepresents the true impacts experienced by communities. One reason is that DNL is an invalid metric. Today, the reportable information required for NEPA is: a noise increase by DNL 1.5 dB or more for a noise sensitive area that is exposed to a noise at or above the DNL 65 dB, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. Changes in noise exposure of DNL +/-3dB between 60 dB and 65 dB DNL and DNL +/-5dB between 45 dB and 60 dB DNL, noise changes should be disclosed.

When the level of significance or reportable impact is exceeded, mitigation is only required for an area exposed at or above DNL 65 with a noise increase by DNL 1.5 dB. DNL is an invalid metric for overflight communities. DNL can be considered for vicinity of airport communities at a lower DNL levels for the new noise policy.

A decision-making system of valid noise metrics eliminates the need for reporting "reportable" increases in environmental assessments. With a system of multiple statistically valid and reliable metrics that capture the true burden of aviation noise on health and quality of life, along with properly defined thresholds (obtained from public health expert consensus) that define significant impacts will eliminate the need for reportable increases. All increases cause either significant impacts or they do not.

Please see our answers to Questions #2, #3, #4, and #5, re: operations of air vehicles, DNL, averaging, and decision-making metrics.

b. If the answer to Question 5.a. is "yes," please identify: the metric, the information it provides that DNL does not, and explain when and how it should be employed by the FAA in its system (e.g., should the FAA use a noise metric other than DNL to evaluate noise exposure in quiet settings, such as national parks, national wildlife and waterfowl refuges, etc.)? Should this metric be used when the FAA is making decisions that affect noise in these settings? Should this metric be used alone or in combination with another metric?

Please see our answers to Questions #2, #3, #4, and #10 re: operations of air vehicles, DNL, averaging, and miscellaneous in addition to below.

c. If the metric should be used in combination with another metric, please describe how they should be used together for decision-making.

Please also see our answers to Question #2, #3, and #10, re: operations of air vehicles, DNL, and miscellaneous in addition to below.

NUMBER-ABOVE-AMBIENT METRIC

The decision-making metric to replace DNL for overflight communities should be N-Above (Ambient+Offset) for the peak day of the year. Notationally, for example N-Above-Ambient$_{+10}$ or NAA$_{+10}$ would be the number of events over Ambient + 10 dB using A-weighting or C-weighting whichever is higher.

N-Above-Ambient + X dB with a threshold of Y events

X is the delta above ambient (for example, 10 dB).

Y is the decision-making threshold for the number of events (for example, 50 events).

Lmax is the maximum noise level of an event.

- Counts the number of events with a maximum noise level, Lmax, above a certain level (Ambient+Offset) (I hear many loud planes).

- Factors in the community's ambient noise level for determining the maximum noise level per event (I live in a quiet community).
- Uses peak day of year (could select other fractional or time periods e.g., per hour) to address seasonality, etc. (this is the worst day of the year or I get constant noise, seasonal noise, noise during rush hour, etc.).
- Provides the option for penalties, one or many e.g., nighttime, specific elements of aircraft operations are consistently and significantly above the X - delta above ambient noise level, unnecessary persistent use of a configuration, vehicle type or unique environments (planes wake me up or a particular aircraft operation/vehicle type is unusually loud).
- Focuses on the number of aircraft for a specified noise level (ambient + X) versus all events and their noise levels (is a proxy for impacts).
- Gives option to use Time-Above-Ambient where applicable for elements of aircraft operations by converting TAA into NAA (simplifies decision making by using only NAA).
- Uses A--weighting or C-weighting (uses the appropriate weighting to the scenario).

The values for X and Y can be determined using existing data such as noise monitoring, complaints, and NES. No additional data collection is required as a representative sample of existing data can be used.

Please see our comment regarding ambient noise in Question #3, re: DNL.

d. If the answer to Question 5.a is "no," should DNL remain the core decision-making metric or should another metric be substituted in all circumstances?

N/A

e. How would the use of the metrics that you recommend support better agency decision-making? Please explain and illustrate with specific examples how the use of the recommended metric(s) would benefit agency decision-making.

For overflight communities the recommended primary decision-making metric reflects the true impacts for communities and complies with ASNA which is not the case today with DNL.

Please also see our answers to Question #2, #3, #10, re: operations of air vehicles, DNL, and miscellaneous in addition answers in question in #5.

6. Communication.

a. Please identify whether and how the FAA can improve communication regarding changes in noise exposure (e.g., what information FAA communicates, where and with whom FAA communicates, what information methods FAA uses to communicate and the venues at which FAA shares this information).

Communication can be improved by providing information proactively, in a timely manner, and to potentially impacted communities that represent the true noise experience of communities using decision-making metrics. **Please see our answers to Questions #2, #3, #4, #5, and #10 re: DNL, averaging, decision-making metrics, operations of air vehicles, and miscellaneous.** Communication should be to all potentially impacted communities for any change (or combination of changes) to flight paths, concentration of flights for specific times of day, new flight operations or vehicle types, how and where aircraft fly such as change in waypoints, approaches, and over energy use, etc.

Communication should be shared at public venues, not limited to Roundtables or Noise Forums given that not all communities are members of such organizations. Non-Roundtable communities attending Roundtable meetings with FAA presentations are not permitted to dialogue and can only make a public

comment. Cities, towns and/or regional forums who do not have Roundtables can provide venues for communication. For example, the City of Palo Alto, who is not a member of a Roundtable, hosted multiple webinars for communities with live dialogue regarding the SFO GBAS project. Provide materials in advance of the meeting so the public has adequate time to familiarize themselves with the content and prepare questions to be asked. Label and/or specify cities, towns, and locations so each community knows if they are impacted or not. **This would provide public notification of changes to all potentially impacted communities.**

Communities are impacted by the number of aircraft noise events, not the number of passengers in the aircraft. Share information that reflects the true noise impacts of communities, especially from the community perspective. Avoid communicating misleading and/or outdated information such as the visual labeled "Historical Trends in Noise Exposure and Enplanements" that community noise exposure at 65 dB DNL decreased by over 90% while enplanements (i.e., number of passengers) increased by almost a factor of 5. The claim covers 45 years of data and uses population percentages. Between 2010 and 2019 (pre-COVID), the number of people exposed to 65 dB DNL has increased by over 100,000 people, a 39% increase Source: US Department of Transportation, Bureau of Transportation Statistics. The visual uses the outdated DNL 65 (Schultz Curve, 1992) instead of the recent Neighborhood Environmental Survey (NES, National Curve 2021). The NES shows 12.3% people highly annoyed at DNL 46.

A community technical specialist should be allowed to participate in technical meetings (such as Full Working Groups for procedure design) as the Community representative. A Roundtable or Noise Forum could nominate a technical representative. In addition, Communities not represented by a Roundtable or Noise Forum should also have their Technical Representative at the meetings.

The noise policy review should have provided better information about stakeholder roles and process steps and timeline. Key external stakeholders should have been engaged to provide feedback on the process and content before it was made public to ensure transparency and understanding.

b. Should the FAA consider revisions to its policy on the use of supplemental noise metrics in the FAA's NEPA procedures? Please explain how this policy should be modified to improve FAA communication of noise changes when the FAA is making decisions that affect noise. Please explain your reasoning.

No. If the new noise policy is updated with decision-making metrics that reflect the lived experience of communities, then a policy change on using supplemental metrics is not needed. For example, N-Above-Ambient should be a decision-making metric, not a supplemental metric, given that it is a more valid measure for overflight communities and therefore would be communicated. As a decision-making metric, N-Above-Ambient is straightforward and would be understood by communities, unlike DNL today.

Please see our answers to Questions #3, #4, #5, and #10 re: DNL, averaging, decision-making metrics, and miscellaneous.

c. What information about the change in noise resulting from civil aviation operations (e.g., UAS or drones, helicopters, fixed wing aircraft, rockets/commercial space transportation vehicles, and new entrant technologies) should the noise metric communicate to the public? Please explain your reasoning.

Noise metric(s) should communicate changes in noise and procedures for all aviation operations for each city, town, and location that may be impacted. The communication should compare noise impacts before and after the change (e.g., single procedure) and also the total noise exposure (e.g., all

overflights for all procedures and routes regardless of the destination or origin) by comparing total noise impacts before and after the change. Information on the changes in noise compared to the current state provides data to communities that reflects the true change they will experience. **This would provide public notification of changes to the current state.**

Please see our answers to Questions #3, #4, #5, and #10 re: DNL, averaging, decision-making metrics, and miscellaneous.

d. Please explain how the public will benefit if the FAA implements your proposal in response to Questions 6.a and 6.b.

Please see our answers to Question #6 above and Questions #3, #4, #5, and #10 re: DNL, averaging, decision-making metrics, and miscellaneous.

7. NEPA and Land Use Noise Thresholds Established Using DNL or for Another Cumulative Noise Metric.

a. How should the FAA consider this information (i.e., the Schultz Curve and Neighborhood Environmental Survey findings) when deciding whether to retain or modify the FAA noise thresholds established using the DNL metric or to establish new FAA noise thresholds using other cumulative noise metrics? Please explain your reasoning.

The NES used state-of-the-art survey methodologies and its results provide reliable new evidence about aircraft noise annoyance that should be promptly incorporated and replace the Schultz Curve as the foundation for the new noise policy. The DNL threshold should be lowered for communities in the vicinity of airports based on NES. DNL as a decision-making metric should be replaced with N-Above-Ambient with a relevant threshold to represent the true impacts for overflown communities. **Please see our answer to Question #2c and #5, re: operations of air vehicles and decision-making metrics.**

The NES shows 12.3% people highly annoyed at DNL 46 (Schultz curve shows 12.3% people highly annoyed at DNL 65). The NES does not show that people are more sensitive to noise than in the past. Rather, previous studies on which FAA policy is based (Schultz curve, FICON study) underestimated aircraft annoyance because they included all transportation noise (e.g., road and rail), and used a mix of older, less robust study methodologies. Annoyance with aviation noise has only increased since the timeframe when the NES was completed because it was conducted prior to the implementation of NextGen Performance Based Navigation (PBN) in most locations. For additional information on this see April 14, 2021 AICA Comment ID FAA-2021-0037-3765 for FAA Request for input on Research Activities to Inform Aircraft Noise Policy.

Schultz Curve	NES Curve
All transportation noise	Aviation noise
Combination of multiple surveys and questions	Specific study designed to capture annoyance to aviation noise
Used data from multiple countries	US data from residents living around 20 US airports
Inappropriate statistical model (best they had)	State of the art statistical model

Inconsistent with what communities report as significant noise	Closer to what communities report as significant noise

b. Should the FAA consider other or additional information when deciding whether to retain or modify the FAA noise thresholds that were established using the DNL metric or to establish new FAA noise thresholds using other cumulative noise metrics? Please describe the reason for the recommendation and identify the data, information, or evidence that supports the recommendation.

Yes.

MITIGATION

The two distinct noise exposure environments of overflown communities and vicinity to airport/vertiports communities should pursue different mitigations. The Significant Impact determination for overflown communities should require mitigations such as procedure redesign (e.g., dispersion, runway use rotation, speed brakes, angle of descent, ground track, altitude, speed), nighttime procedures, dispersion and/or capacity limitations. For helicopters, the mitigation would be for routes to avoid noise-sensitive areas, offshore routes wherever possible and not voluntary, and altitude requirements over certain areas.

ADDITIONAL CONSIDERATIONS OR INFORMATION

An analysis should be done for the NA50 NES data as the sole predictor of High-Annoyance (i.e., not as a moderator variable to DNL65) to inform a new noise policy using NAA especially for overflight communities. The NES data showed a strong correlation between N-Above 50 dB (NA50) and the level of annoyance.

Measured and monitored data relevant to NAA is available and should be analyzed to determine new noise policy for overflight communities. The FAA, airports primarily, consultants, and researchers should make existing data publicly available. Analyses should be performed for overflight communities including NAA, offsets above ambient (e.g., ambient + 10dB or other offset, ambient levels, thresholds for number of events, and maximum noise levels for different time periods (e.g., peak day, fractional hours). Complaint data should be used as indicators of Significant Impact for Overflight communities. Complaints by community locations can indicate the relationship of complaints to higher exposure. During the COVID-19 lockdown the Stanford MONA group found an obvious correlation in the reduced complaint volume, down 50% while the traffic decreased to 55% of its original level.

Airports that do noise monitoring have ambient noise data but typically do not publish it. Collect and analyze existing data on community ambient noise levels from current or past noise monitoring by some airports. Alternatively, if not already available, data could be collected through temporary noise monitoring for a few weeks. Until it is measured, ambient noise could be estimated using community characteristics (for example, ambient of 35 dB for rural, 40 dB for low-density suburban, 50 dB for medium density suburban, 60 dB for urban, etc.). Estimates should be evidence-based, e.g., informed by noise monitoring data from other communities of a similar type.

GA noise exposure should be based on measured data that reflects the true impacts experienced by communities. Noise impacts should be measured for GA communities which include all elements of aircraft operations including impacts of duration times. **Please see our answer to Question #5b, re: decision-making metrics.** Until measured data is available modeling can be used for estimating impacts. For example, take a typical single-prop training plane, and model the noise impact per event at a grid of locations for actual dB of full close pattern (normally touch-and-go landings) use. Assume each plane is

at 1,000ft AGL in the middle downwind, and adopt a reasonable profile for climb to that and descend from that.

The FAA has consistently concluded that only DNL and DNL 65 be used for decision making. In response to the reports mandated in sections 173 and 188 of the 2018 FAA Reauthorization Act, the Quiet Skies Caucus sent a letter to then FAA Administrator Dickson on September 23, 2020 stating that "After conducting a detailed review of the FAA's report, we find it wholly inadequate, failing to meet the mandate in the law". Because of these past reports and conclusions on metrics and thresholds and prior to issuing a new noise policy, **an agreement should be entered with the National Academies (with equal representation of the three divisions) to produce a consensus report on metrics and thresholds for noise annoyance to provide independent, unbiased, and peer-reviewed analysis and recommendations.** Such a report is described in Congressman Lynch's Peer-Reviewed Report on Measuring Metrics and Thresholds, H.R. 2561. A report request has previously been made in the NES comments and was listed in the "Summary of Comments from FAA Noise Research Federal Register Notice" as one of the top two response comments for the sub-topic for Noise Metrics and Thresholds.

c. How should research findings on auditory or non-auditory effects (e.g., speech interference, sleep disturbance, cardiovascular health effects) of noise exposure caused by civil aircraft and vehicles be considered by the FAA when it decides whether to retain or modify the FAA noise thresholds that were established using the DNL metric? How should the FAA consider this same research when deciding whether to establish new FAA noise thresholds using other cumulative noise metrics?

New DNL noise thresholds should be consistent based on the World Health Organization aircraft noise guidelines from October 2018: average noise exposure of 45 dB Lden and night noise exposure below 40 dB Lden (Lden –Day Evening Night Sound level, is the average sound level over a 24-hour period with a 5 dB evening penalty between 7 pm and 10 pm and a 10 dB nighttime penalty between 10 pm and 7 am). Additionally, consider the EPA recommendation in 1974 to set the DNL threshold to 55 dB or lower for outdoors (see March 1974 report from the Office of Noise Abatement and Control of the Environmental Protection Agency "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety").

The FAA does not have the expertise to develop a noise policy that captures the impact of aviation noise (and pollution) on the public's health. Health experts should address the Noise Policy Review health questions. An independent, unbiased, and peer-reviewed consensus report should be commissioned from the National Academies Division of Medicine on aviation impacts on public health. Congressman Lynch's Air Traffic Noise and Pollution Expert Consensus Act, H.R.2562 addresses this. A consensus report is NOT new research. It reviews the existing body of research (such as the literature review comments submitted for Question #11). The consensus report has an outcome of policy recommendations. The National Academies is a group of independent experts, separate from industry and government, whose work is peer-reviewed. The FAA should take the responsible step and support and initiate an independent peer-reviewed consensus report on aviation noise and health.

d. In examining whether to change its metrics and thresholds for noise, the FAA needs reliable information to support any changes. One type of information that the FAA can rely on is epidemiological evidence. This means the study (scientific, systematic, and data-driven) of the distribution (frequency, pattern) and determinants (causes, risk factors) of health-related states and events (not just diseases) in specified populations (neighborhood, school, city, state, country, global). What amount of epidemiological evidence is sufficient to provide the FAA with a sound basis for establishing or modifying the FAA noise thresholds either using the DNL metric or another cumulative noise metric? Please explain your response.

There is enough scientific, independent, high-quality epidemiologic data and research for the FAA to conclude that current aviation noise problems are a major public health risk. Please also see our response in 7c.

An independent group of Swiss experts reviewed the current state of scientific knowledge for annoyance and health regarding aircraft noise and produced Recommendations of the Federal Noise Abatement Commission (EKLB), to the Swiss Federal Council (highest executive authority in the country-seven elected members), 2021. This is an example of sufficient evidence as a sound basis for considering new noise thresholds and metrics for noise policy. A consensus report from the National Academies would produce something similar for US policy based on existing research on health impacts.

e. Should the FAA consider using factors other than annoyance to establish FAA noise thresholds using the DNL metric or other cumulative noise metrics? What revisions to existing FAA noise thresholds or new noise thresholds do you recommend be established and why? Please explain your response.

Yes. **Please see our answers to Questions #7c, 7d above**. Additionally, visual pollution should be a factor in establishing metric(s) and thresholds and will likely increase with AAM. Consider a penalty to the count of any and/or specific type of vehicles at a specified noise level for high visual pollution.

8. FAA Noise Thresholds Using Single-Event or Operational Metrics.

As the FAA learned from the results of the NES, people are bothered by individual aircraft noise events, but their sense of annoyance increases with the number of those noise events. Should the FAA consider employing new FAA noise thresholds using single-event or operational metrics? If the answer is "yes," which metrics should be used to establish the FAA noise thresholds? What should be the relevant noise exposure level for the new noise thresholds you propose?

Yes. **Please see our answers to Question #2, #3, #5, and #10, re: operations of air vehicles, DNL, decision-making metrics, and miscellaneous.**

9. FAA Noise Thresholds for Low-Frequency Events.

Should FAA establish noise thresholds for low-frequency events, such as those associated with the launch and reentry of commercial space transportation vehicles authorized by the FAA Office of Commercial Space Transportation? If the answer is "yes," which metrics should be used to establish the noise thresholds? What should be the relevant noise exposure level for the new noise thresholds you propose? Please explain your reasoning. If the answer is "no," please explain your reasoning.

Noise thresholds for low-frequency events beyond commercial space transportation vehicles should be addressed in decision-making noise threshold(s) and metric(s). An evaluation should be performed for A-weighted and C-weighted to determine which has the higher noise level that reflects the true experience for all vehicle types and operations (e.g., backblast). The higher noise level of A versus C-weighted should be used for decision making.

Generally speaking, backblast noise contains a significant amount of low-frequency energy and even C-weighted measurements somewhat underestimate that.[13] A 2007 study undertaken by the FAA, NASA and Transport Canada concluded.

The Tokita & Nakamura annoyance thresholds were validated as predictors of annoyance due to low-frequency aircraft noise. They were found to relate favorably to the subjective annoyance assessments.

[13] *Wyle Acoustics Group, Sharp, Gurovich & Albee, for SFO Noise Abatement Office, 2001.*

Linear regression analysis showed that the C-weighted sound exposure level *LCE* was the best single-metric predictor of subjective annoyance response, explaining over 90% of the variability of the data set. *LCE* correlated better with the subjective data than metrics specifically designed to quantify low-frequency noise impact.[14]

Please see our answer to Question #2b and #3, re: operations of air vehicles and DNL.

10. Miscellaneous.

What other issues or topics should the FAA consider in this review regarding noise metrics, the method of calculating them, the establishment of noise thresholds, or FAA's method of communicating the change in noise exposure?

Another option to better represent the significance of noise impacts than DNL 65 and would support superior FAA decision making is using a Total Noise Index. This option makes visible all events over ambient. **Please see our response regarding number-above-ambient metric in Question #5c, re: decision making noise metrics.**

Total Noise Impact (TNI) Metric

TNI is the total decibels for all events above ambient.

A decibel threshold would be applied to TNI.

TNI sums up the differences between the maximum noise levels (with penalties applied) and ambient noise for all the noise events. The Total Noise Index (TNI) is the sum of the penalized maximum aircraft noise above ambient noise for all N-Above-Ambient (NAA) events. TNI does not require selecting an offset value above ambient because it factors in/captures all noise above ambient. The TNI value makes the impacts for all events visible. For example, 200 aircraft with maximum noise levels 20 dB above ambient noise would have a TNI of 4000 dB (= 200 x 20), and 200 aircraft with maximum noise levels 10 dB above ambient would have a TNI of 2000 dB (= 200 x 10). 4000 dB is a more severe impact than 2000 dB.

$$\text{Total Noise Index} = \sum_{n=1}^{n=NAA} (\text{Lmax} + \text{penalty}) - \text{ambient}$$

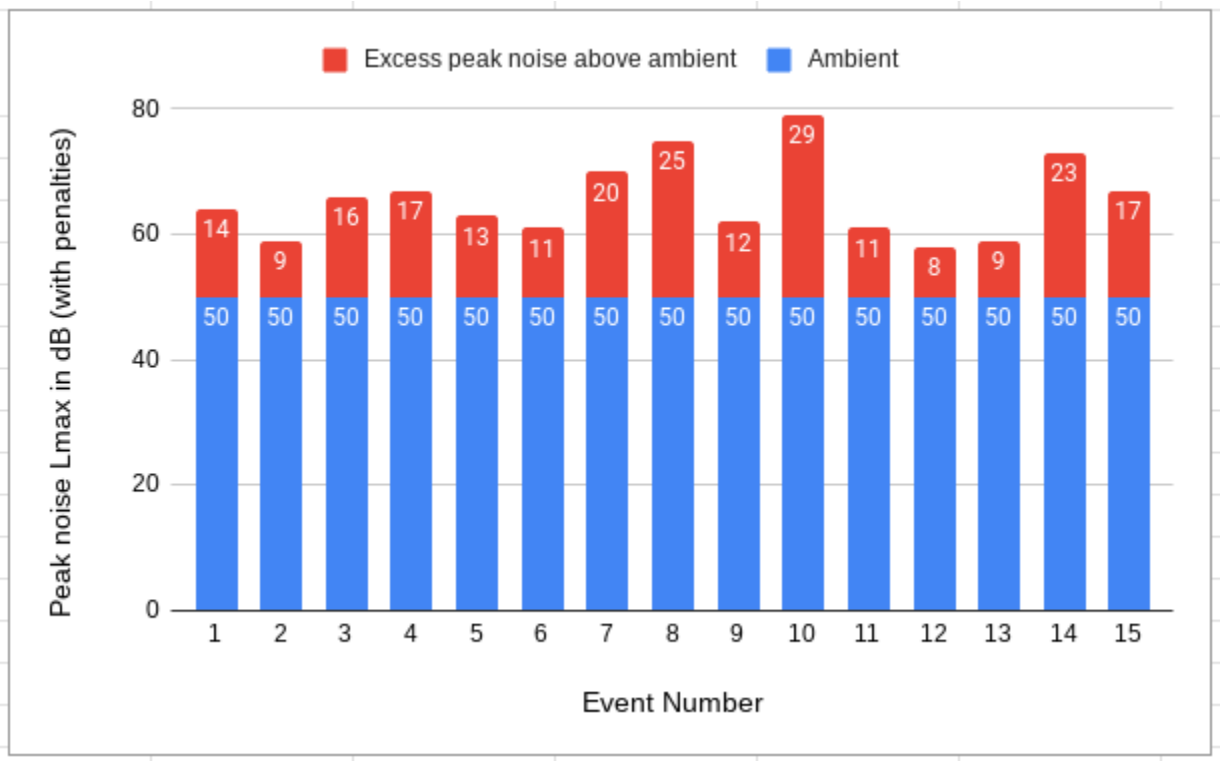
The decision-making metric would be the Total Noise Index, labeled as TNI, for the peak day of the year and is expressed in decibels. The threshold Z is a number of decibels.

Below is a simple example of a Total Noise Index calculation for illustration purposes.

- Assumptions:
  - Community has an ambient noise of 50 dB.
  - 20 aircraft noise events are recorded on peak day.
  - Penalties are applied to all Lmax values: no penalty for daytime events, evening penalty for evening events in California, and night penalty for nighttime events.
- Results: 15 events exceed ambient noise and 5 events are below ambient noise.
  - NAA = 15

[14] *Low Frequency Noise Study*, Partnership for Air Transportation Noise and Emissions Reduction FAA/NASA/Transport Canada, Hodgdon, Atchley, Bernhard, April 2007.

- TNI is calculated by summing up all the excess maximum noise values for the 15 NAA events (red bars in the graph below). TNI = 234 dB, which is 14 + 9 + 16 + 17 +....+ 9 +23 +17



Note that TNI is a proxy for the total noise exposure because TNI uses only the maximum noise level of events instead of the total noise of events over their full durations. The actual total noise impact is higher than TNI because noise events last many seconds (typically 30 s). However, using TNI as a proxy is appropriate because of the very strong correlation between total noise and maximum noise.

11. Literature Review.

In this review, the FAA will examine the body of scientific and economic literature to understand how aviation noise correlates with annoyance as well as environmental, economic, and health impacts. The FAA also will evaluate whether any of these impacts are statistically significant and the metrics that may be best suited to disclose these impacts. A bibliography of this body of research is available for review in the Background Materials tab in the Docket and as Appendix 1 to the FAA framing paper entitled, The Foundational Elements of the Federal Aviation Administration Civil Aircraft Noise Policy: The Noise Measurement System, its Component Noise Metrics, and Noise Thresholds. This framing paper is available at: https://www.faa.gov/noisepolicyreview/NPR-framing.

Please identify any studies or data regarding civil aviation noise not already identified by the FAA in the bibliography that you believe the FAA should evaluate.

FRN Comments - Inform Aircraft Noise Policy, Civil Aviation Noise Policy, and AAM

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2. Aviation-Impacted Communities Alliance, Comment on Docket No. FAA-2021-0037-3765 FAA Request for Input on Research Activities to Inform Aircraft Noise Policy, April 14, 2021
3. Nicholas Miller, Comment to Docket No. FAA-2023-0855-0150, FAA request for Comments on the Review of the Civil Aviation Noise Policy, May 17, 2023
4. Aviation-Impacted Communities Alliance, Comment on Docket No. DOT-OST-2023-0079-0104, DOT Request for Information on Advanced Air Mobility (AAM), August 10, 2023
5. Studio Cities for Quiet Skies, Comment on Docket No. DOT-OST-2023-0079-0021, DOT Request for Information on Advanced Air Mobility (AAM), July 31, 2023

Presentations

6. "Is It Time to Retire a 30-Year-Old Aviation Single Noise Metric?" - Aviation Noise and Emissions (ANE) Symposium 2023, Dr. Cindy L. Christiansen
7. "Community Engagement or DISEngagement?" - Aviation Noise and Emissions (ANE) Symposium 2022, Darlene Yaplee
8. "Updating Swiss Guidelines for Transportation Noise" - Aviation Noise and Emissions (ANE) Symposium 2022, Dr. Martin Roosli
9. "FAA Community Engagement Scorecard – Is the FAA's Community Engagement Improving?" - Aviation Noise and Emissions (ANE) Symposium 2023, Darlene Yaplee

Reports and Peer-Reviewed Literature

10. Recommendations of the Federal Noise Abatement Commission (EKLB), Limit values for road, railway and aircraft noise, Switzerland 2021
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GLOSSARY	
TERM	**DEFINITION OR EXPLANATION**
A-weighted	The most common type of weighting system used to analyze noise measurements described in decibels as a dBA or dB(A). It de-emphasizes low-frequencies below 400 Hz and high-frequencies above 4000 Hz.
Ambient noise	Also referred to as background noise, to identify aviation noise events. Ambient noise which is the typical average noise in a community without the noise caused by air vehicles.
ANOPP	The NASA Aircraft Noise Prediction Program (ANOPP) provides a capability to predict noise from aircraft in flight including sources, propagation, and metrics.
ASNA	Aviation Safety and Noise Abatement Act of 1979; 49 U.S. Code § 47502
Average Annual Day (AAD)	DNL provides a cumulative description of noise events expected to occur over the course of an entire year averaged into a representative day, AAD.
C-weighted	A weighting system used to analyze noise measurements described in decibels as a dBC or dB(C). The C-weighted sound level does not deemphasize low and high frequencies and measures uniformly over the frequency range of 30 to 10,000 Hz.

GLOSSARY	
TERM	**DEFINITION OR EXPLANATION**
Concentration	The number of aircraft overflights within some range or corridor distance of a particular area over a time period.
Cumulative noise metric	FAA uses this term for a metric that combines noise exposure over a specified time, e.g., aviation noise combined over a typical 24-hour period to estimate DNL.
Current metric	DNL is the FAA's single current metric for decision-making.
Decision-making metrics	Used for policy decisions about significant noise impact, NEPA/environmental assessments, etc.
Duration	How long an aviation event lasts. Some aviation events have a longer duration than typical events from commercial flights, e.g., hovering helicopters or VTOLs.
Elements of aircraft operations	The FAA uses this phrase to mean en-route, approach, arrival, and departure components of a flight. The AICA comment provides a list of "elements of aircraft operations" such as NextGen, visual pollution, and the two noise exposure environments of vicinity to airports and overflight communities.
Ground based noise	Ground noise from aircraft operations, such APU usage, taxiing, start-of-takeoff roll on departure and thrust reverse on arrival and "backblast" noise from aircraft taking off.
Lmax	Maximum Noise Level. The maximum noise level reached by a single aircraft event. Note: Lamax, Lcmax are used to distinguish between A-weighted or C-weighted Lmax.
Measured noise	Actual noise values obtained from monitors (e.g., may include levels and count of aircraft events).
Modeled noise	Noise estimated through models (e.g., may include levels and count of aircraft events).
N-Above-Ambient (NAA)	Number of aviation noise events for the peak day of the year that have an Lmax (with penalties applied) above ambient noise level using either A-weighting or C-weighting, whichever is higher. See also the specific time period.
NAA_{+10}	Number of aviation noise events for the peak day of the year that have an Lmax (with penalties applied) above ambient + 10 dB noise level using either A-weighting or C-weighting, whichever is higher.

GLOSSARY	
TERM	**DEFINITION OR EXPLANATION**
N-Above-Ambient + X dB with a threshold of Y events	X is the offset above ambient (for example, 10 dB). Y is the decision-making threshold for the number of events (for example, 50 events). Lmax is the peak noise level of an event of the year.
National Airspace System (NAS)	The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, manpower and material.
NES	Neighborhood Environmental Survey
Noise metric	A quantitative measure of noise.
NOMS	Noise and Operations System (NOMS) are tools to help airports analyze, track and report on noise issues associated with aircraft activity such as the number of operations for departures and arrivals per procedure, and noise levels.
Noise Policy Review (NPR)	FAA's Noise Policy Review
NPRM	A Notice of Proposed Rulemaking is the document an agency issues and publishes in the Federal Register that describes and solicits public comments on a proposed regulator action.
Overflight Communities	Land areas outside the DNL 65 dB contour under or near flight paths of aircraft and are distressed by aviation noise.
Penalties	Penalties to capture higher annoyance aviation impacts such as time of day, vehicle type, #events per fractional time period (includes high T-Above-Ambient events).
SEL	Sound Exposure Level - represents all the acoustic energy (a.k.a. sound pressure) of an individual noise event as if that event had occurred in a one-second time period.
Specified time period	NAA and TAA can be calculated using a specific time period such as full day or fractional-day such as peak day of year, peak hour/day over 365 days, specific hours/day.
Statistic	A quantity that is calculated from data.
Supplemental metric	FAA definition, a noise metric used to improve the public's understanding of the expected change in aviation noise that is not used for decision.

GLOSSARY	
TERM	**DEFINITION OR EXPLANATION**
T-Above-Ambient (TAA)	Seconds of aviation noise over Ambient noise for the peak day of the year above ambient noise level using either A-weighting or C-weighting, whichever is higher. It is possible to convert TAA to NAA using an estimated seconds per event calculation.
Threshold	Using the same scale as the metric, a threshold is the level required for a metric to indicate "significant impact". For example, the threshold for the current decision-making metric is DNL65. For the NAA metric, the threshold is the number of aviation events over a specified Lmax value. (Note the scale for NAA is a count of events and the corresponding threshold is the NAA count that determines too much noise).
Total Noise Impact (TNI)	A metric that sums up the differences between the maximum noise levels Lmax (with penalties applied) and ambient noise for all the noise events. The Total Noise Index (TNI) is the sum of the penalized peak aircraft noise above ambient noise for all N-Above-Ambient (NAA) events. $\text{Total Noise Index} = \sum_{n=1}^{n=NAA} (\text{Lmax} + \text{penalty}) - \text{ambient}$
Valid noise metric	A quantitative measure of noise that is accurate, precise, and that closely corresponds to real-world experiences of those on the ground.
Vicinity of airport	Locations near airports or locations exposed to noise levels which meet or exceed DNL 65 dBA.
Visual pollution	Deterioration and negative aesthetic quality of natural and/or man-made landscapes caused by the physical and/or illuminated aviation vehicles
Vertiport	Vertical landing and take-off locations.
VTOLS	Vertical take-off and landing aircraft vehicles that can land and take off vertically without relying on a runway.