Vashon Island Fair Skies http://www.vifs.org
PO Box 1250 info@vifs.org
Vashon, WA 98070 (206)682-8638

Dedicated to restoring the pre-NextGen dispersed arrival paths and procedures at Seattle/Tacoma International Airport that had been in place since the introduction of commercial aviation to the Puget Sound region, decades ago.

Comments on the FAA's Noise Policy Review 27 September 2023
Docket No. FAA-2023-0855-0001

Thank you for this opportunity to provide written comment on the Noise Policy Review. This review has been long needed as the current noise policy, and especially its single metric DNL, satisfies neither the letter nor intent of ASNA[1]'s "highly reliable relationship" standard. The end result of this review must bring FAA regulation in alignment with the law.

For some of the specific questions posed by the Federal Register notice, Vashon Island Fair Skies supports and will defer to the comprehensive and excellent submission by the Aviation-Impacted Communities Alliance (AICA), comment FAA-2023-0855-2206. Our submission will highlight questions germane to (1) ambient noise considerations and (2) challenges in modeling airframe noise generation for arrival segments between 8000 and 4000 feet. Vashon Island, being a rural Island accessible only by ferry, shares much in common with National Parks from a soundscape perception and thus can provide valuable insight into the best noise policy to conform with ASNA. For a majority of Vashon Island resident under the PBN arrival routes, these ~250 arrivals a day (in Southflow) are the only manmade noise experienced on a daily basis. As these are arrivals, the challenges of accurately modelling their entire noise signal, especially when already in a "dirty" configuration due to an Optimized Profile Descent (OPD) which has backfired, must be confronted.

The questions posed will be addressed in the order suggested, with the exception of "10. Miscellaneous", as I believe the chosen topics to be under-addressed by other commenters and thus I want to front load them in these comments. For questions not answered, please refer to AICA's answers.

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, [37] or FAA's method of communicating the change in noise exposure?

I will address two topics: (1) The method of computing Sound Exposure Level (SEL) and (2) airframe noise, especially on arrivals, and most particularly when in a "dirty" configuration.

ALLOWED SEL EVENT INTERVAL APPROXIMATION

14 CFR Appendix A to Part 150[2] - "Noise Exposure Maps: Part C - Mathematical Descriptions, Sec. A150.205(d)" contains:

[1] Aviation Safety and Noise Abatement Act of 1979, Public Law 96-193: https://uscode.house.gov/statutes/pl/96/193.pdf
[2] https://www.govinfo.gov/content/pkg/CFR-2022-title14-vol3/pdf/CFR-2022-title14-vol3-part150-appA.pdf

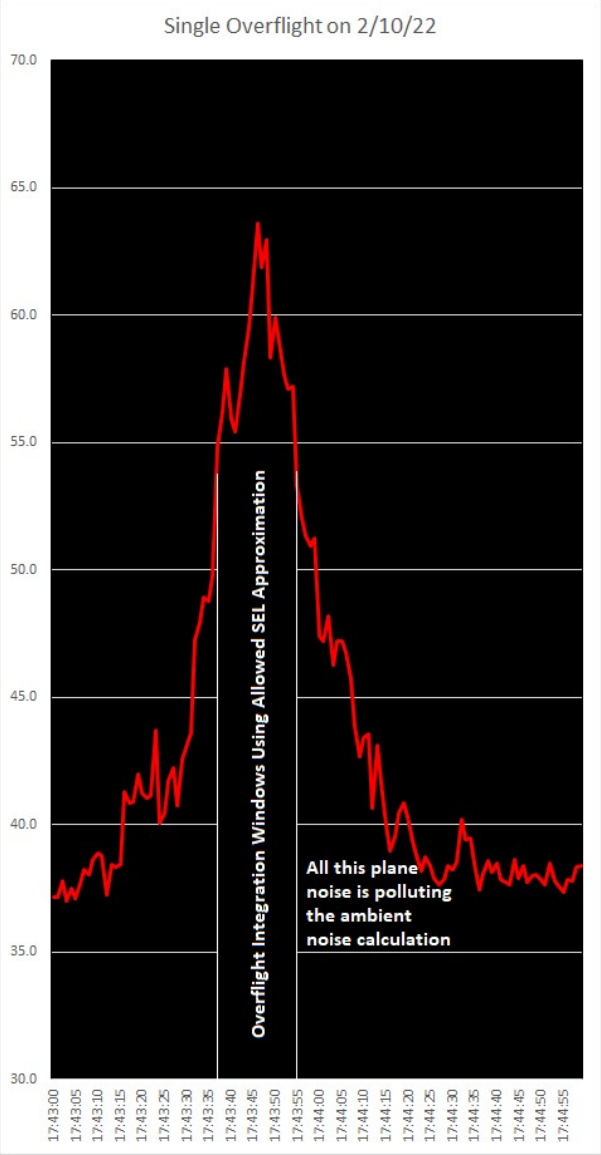
> "The time interval should be sufficiently large that it encompasses all the significant sound of a designated event. The requisite integral **may be approximated** with sufficient accuracy by integrating $L_A(t)$ over the time interval during which $L_A(t)$ lies within 10 decibels of its maximum value, before and after the maximum occurs."

This approximation is predicated on the logarithmic nature of the SEL summation such that the wide shoulders on either side of the noise peak does not materially impact the overall SEL value and thus the final DNL result. Two very important observations follow:

1. The fact that this approximation "works" in the sense that the SEL value is effectively unchanged by ignoring over a minute of significantly disruptive noise above ambient powerfully indicts a simplistic cumulative metric, such as DNL, as completely failing the requirement of ASNA.

2. For precisely the same reason the approximation "works" for computing SEL, i.e. large values dominate in a logarithmic calculation, it spectacularly fails when used to compute ambient noise from a physical noise monitor. The shoulders of the overflight events completely dominate the real ambient noise.

To illustrate the problem with this approximation, consider a single overflight event using actual raw data from a Port of Seattle noise monitor obtained through Public Records Requests:



As accurately measuring ambient noise is absolutely central to the new noise metric(s) that will replace DNL, use of this approximation must be explicitly forbidden. By explicitly forbidden I mean don't just remove it from section A150.205(d), but also add language stating that the approximation can no longer be used.

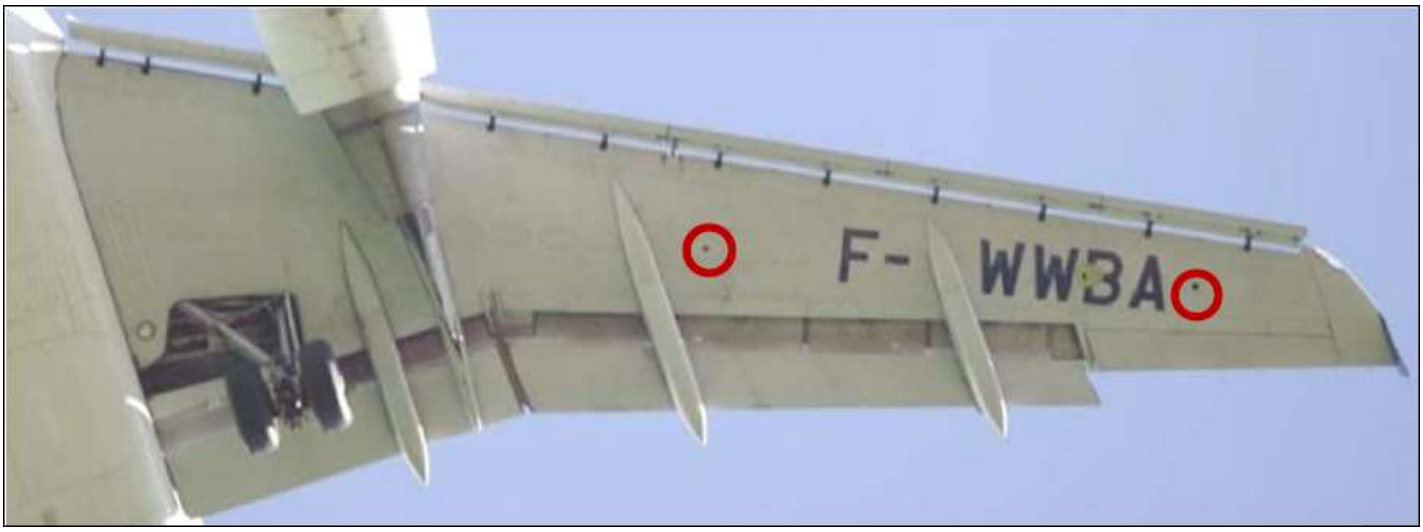
I'll endeavor to add an addition comment before the period ends with a more comprehensive numerical analysis of the impact to the ambient noise calculation as a result of this approximation.

AIRFRAME NOISE

The Aviation Environmental Design Tool (AEDT) relies on Noise Power Distance (NPD) curves generated as part of aircraft certification as its primary source input data for noise generated by aircraft. However, these NPD curves have historically been based on typical procedure stages in direct proximity of the airport and not those of overflight communities newly impacted by NextGen in general and Performance Based Navigation (PBN) in specific. This is especially true when a poor Optimized Profile Descent (OPD) design backfires and results in extended low altitudes level-offs that in the past has been avoided with a conventional arrival that, ironically/tragically, had a more optimized profile descent.

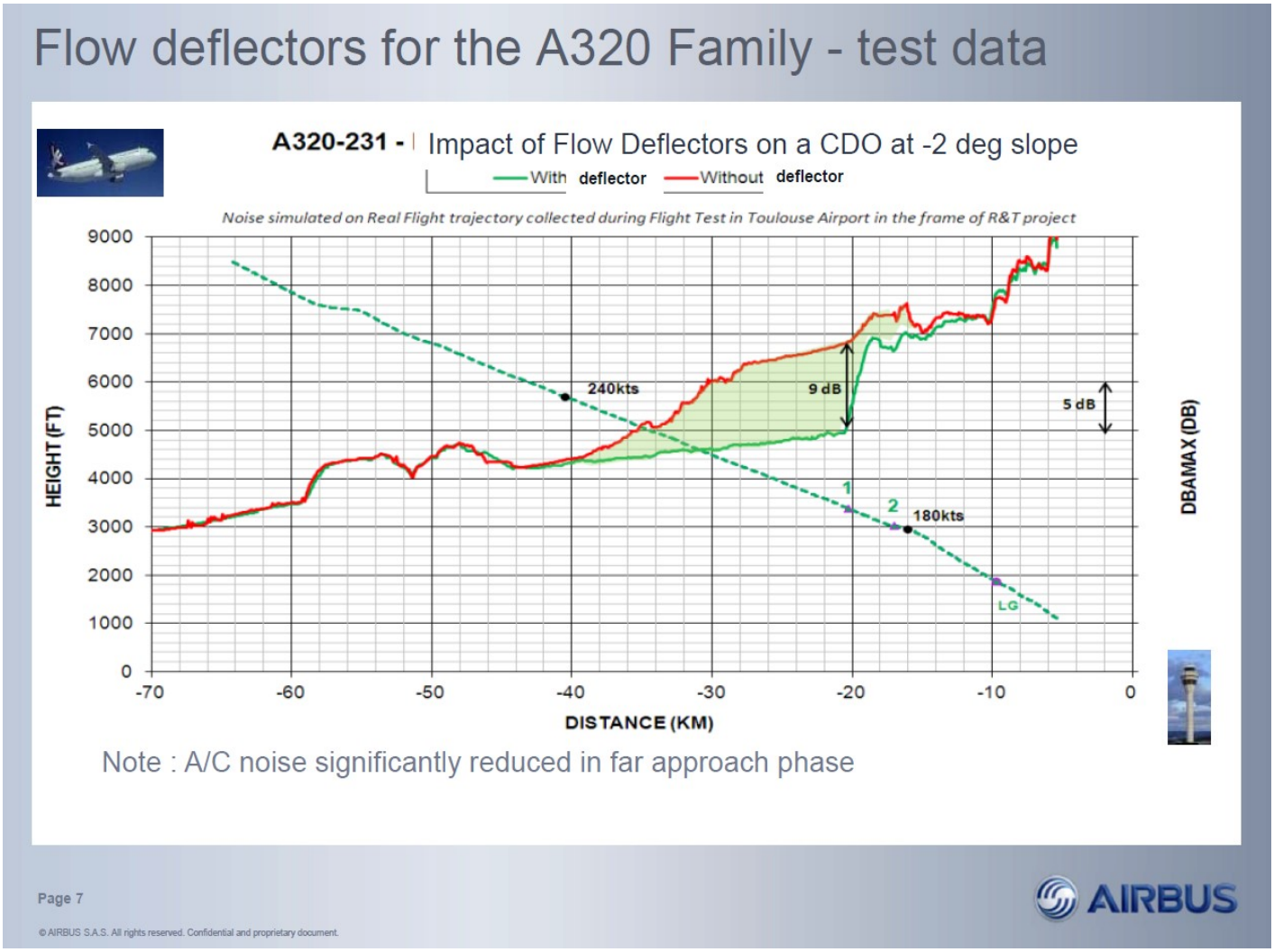
This is an active area of research. For example, ASCENT's NPD Re-evaluation Project[3] and a paper last year from MIT's International Center for Air Transportation: "A Data-Driven Approach to Departure and Arrival Noise Abatement Flight Procedure Development"[4]. It's also a difficult area of research compared to modeling flight stages where engine noise predominates. Further, for historical comparisons when you only have flight track and aircraft type data, it can be anywhere from challenging to impossible to reverse-engineer the control surface configuration changes during an arrival, which are paramount in airframe noise generation.

A more stark example, even when you have access to all the Flight Data Recorder telemetry in addition to the flight track data, is the arrival of an A320 series aircraft not knowing if it has Vortex Generators installed or not. For background, A320 series aircraft have small Fuel tank Over Pressure equalization Ports (FOPP) under the wings:



These holes create a whistling tone, analogous to blowing over the top of a bottle, which can add up to 9dB additional noise at certain sweet spots of elevation and speed, according to a study by Airbus:

[3] https://ascent.aero/project/noise-power-distance-re-evaluation
[4] https://dspace.mit.edu/handle/1721.1/144311



Vortex Generators are small palm size pieces of metal installed forward of the ports which deflect the airflow and eliminate the extra noise. Due to the repetitive nature of a PBN, the exact same location on the ground will get the brunt of this extra noise for every single arrival of such an A320 series aircraft. As AEDT knows nothing about Vortex Generators, it cannot model the above expression of noise.

For these reasons, it is critical that actual real noise measurements be used when possible. Modeling instead of measurement should be used as a last resort, not the first choice. Even when using modeling to evaluate the impact of a procedure change, AEDT should first be used against the existing procedure together with actual noise measurement to understand the errors involved in the tool for that specific application.

2. Operations of Air Vehicles.

a. What elements of aircraft operations (e.g., en-route, takeoff, landing) should the noise metric evaluate and disclose? Should the FAA use this information to make decisions or disclose to the public noise impacts? Please explain your reasoning.

Quite simply, following the current controlling law that governs aviation noise, ASNA, for all phases of aircraft procedures that lead to public annoyance, the most appropriate noise metrics, as-per ASNA, must be both disclosed and used to make decision.

While not all locations have had the benefit of formal surveys like the NES, as a rule when community members form groups and set aside/sacrifice their careers, families, relationships, and health in a fight to get back their lives that NextGen stole, that is a strong indication of annoyance.

c. What interests or concerns do overflight communities (28) have? How can these concerns be addressed using noise metrics? What noise metrics would address these concerns? Please explain your reasoning.

Overflight communities have been directly impacted by NextGen procedure changes. Unlike a community near an airport where its members moved next to a runway, NextGen/PBN does the opposite: it effectively brings a runway directly over a community. As has been the practice with the FAA over the past decade, this is typically done with no outreach to the community which had the runway placed above them.

It's not a coincidence that virtually all the aviation noise litigation filed against the FAA in the last decade has been from overflight communities and not from direct airport fence line communities. When you move next to an airport you expect plane noise. When you move to a rural Island accessible only by ferry, and further do so explicitly because of the protection a multi-mile wide moat affords you from manmade noise, it is extremely jarring – to say the least – when a PBN runway is placed on top of you with no notice.

The detailed discussion of superior noise metrics will be in response to question 5 below.

3. DNL.

What views or comments do you have about the FAA's core decisionmaking 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.

Human annoyance, especially in an environment otherwise devoid of any manmade noise, is not due to the aggregate sound energy making it to the ground, but rather the number, and duration, of times per-day that one's focus, concentration, and train of thought is interrupted by an overflight that, for 60 to 90 seconds, steals that focus, concentration, and train of thought. When this happens ~250 times a day, and not perfectly regular, it actually creates a heightened and persistent level of anxiety/anticipation/dread for the next interruption event that is coming, but you don't exactly when.

DNL does not measure this.

Given the choice between the noise nightmare described above, and a once per day five minute dose of noise resulting in the same DNL, especially at a regular and documented time of day, the choice would immediate. In short, I would happily relocate Big Ben next to my house if it meant removing the ~250 interruptions randomly dispersed through the day.

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.

I believe this is a nuanced issue that requires some thought. For at least some overflight communities, the problem is that the representative "Average Annual Day" resembles no actual day. Many/most airports will have a different airport flow depending (mainly) on the wind, and these different flows can have very different flight patterns. This means that the overflight impact ends up depending, often with extreme contrast, on the wind direction. Having a separate set of metric results depending on flow does add complexity, but it also adds valuable information.

Using peak annual day, or even peak weekly day could have an unintended impact on the eventuality of re-introducing pre-NextGen dispersion – depending on how it's implemented. If truly replicating the outcome of equitable noise distribution used successfully for over half a century before NextGen, but wanting to do so using NextGen technology since the FAA and airlines spent a lot of money on it, then having each operation randomly assigned one of perhaps dozens of different diffuse PBN procedures, then it would be fine. However, if the more simple approach of picking a "PBN du jour" is taken, then a peak day approach would make it look like there was no improvement to the NextGen sacrificed community, and all the communities that once again have some overflights would look to have the same impact as the sacrificed community before dispersion was re-introduced. It would not look like an improvement – for anyone.

There needs to be some way for the metric to express that bad days are really bad, but, for example, about a quarter of days are not as bad.

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?
method of calculating them, the establishment of noise thresholds, [37] or FAA's method of communicating the change in noise exposure?

In terms of reporting, as with many questions of distributional statistics, what I would really want to see is a histogram of metric value range buckets vs. number of days in each of those buckets.

In terms of decisionmaking, I'm thinking *some* kind of averaging would have to happen, with maybe a weighting penalty for extra bad days. Perhaps the Root Mean Square of each day's metric value.

5. Decisionmaking Noise Metrics.

The FAA currently uses DNL as its primary decisionmaking 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 decisionmaking?

Yes

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?

In a National Park or rural area, I believe Time-Above-Ambient (TAA) is the metric that will best comply with ASNA's "highly reliable relationship" requirement. If every overflight event had the same duration, again noting that the A150.205(d) simplification has been proscribed so that we are talking about the real event duration, then TAA becomes equivalent to N-Above-Ambient (NAA). NAA is a popular potential replacement for DNL as it better measures the number of unique interruptions during a given time period, and indeed that is the largest component of the annoyance factor. The number of times per-day that one's focus, concentration, and train of thought is interrupted by an overflight that, for 60 to 90 seconds, steals that focus, concentration, and train of thought. This being said, for any given overflight event, the louder it is the more marginally annoying it is. NAA does not incorporate this aspect, but TAA does – organically – as louder planes (larger/older, lower altitude, dirty configuration, etc) will generate longer duration overflight events, thereby adding an appropriate penalty for louder events.

I note that AICA in their submission, FAA-2023-0855-2206, created a new metric TNI (Total Noise Impact/Index), that included a manual penalty for incrementally louder events. I still believe TAA is better than TNI for National Parks and rural areas. TAA is also natively supported by AEDT. In environments with other man-made noise, TAA can be more challenging to compute in terms of correctly identifying event

duration windows. In these noisier locations when using actual noise monitor data, TNI would be easier to compute.

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

As mentioned in 5b above, TNI may be more practical in more urban areas especially when working with raw noise monitor data.

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

As both the NES Federal Register comments (docket FAA-2021-0037), and the past decade of noise related litigation against the FAA proves, the number of times one is interrupted throughout the day by plane noise is the most important factor in annoyance, and thus by law (i.e. ASNA) the FAA **must** use a metric such as TAA or TNI for decisionmaking.

This will benefit agency decisionmaking as it will result in decisions that won't prompt litigation or germinate a crop of grass-roots anti-NextGen groups forming across the country whose life force is dedicated to reversing bad decisions made on the basis of the invalid metric DNL.

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). Please explain your reasoning.

Yes, the FAA can improve communication with communities by disclosing proposed changes in advance to the communities which will impacted by the changes. In cases in the past, the FAA has only engaged with communities who would not be impacted by the change, while those communities most impacted by the change were in the dark until the change was implemented.

For example, a very simple notification process when proposing a new PBN would be to send a postcard by USPS mail to every residence within 1km of the PBN path below 10,000 indicating for their zipcode, or even better geo-coded street address, the number of overflight within 1 lateral km of their residence before the change and after the change. This will guarantee very strong public interest and eagerness to engage with the FAA before a decision is made.

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. Rather than supplementing the invalid DNL metric with metrics that legally conform to ASNA, the FAA must just use the metrics which satisfy ASNA's "highly reliable" requirement.

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

The public will benefit by not being surprised by flight path and procedure changes which turns their lives upside down and saved from spending years of their lives fighting to get their sanity back. They will also be spared the collateral damage to family, relationships, careers, and health that results from a stealth deployment of a NextGen PBN on top of them.

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

The FAA has several noise thresholds that are informed by a dose-response curve (Schultz Curve (29)), which historically provided a useful method for representing the community response to aircraft noise. Two of the noise thresholds informed by the Schultz Curve are the FAA's significant noise impact threshold for actions being reviewed under the National Environmental Policy Act and the land use compatibility standards established in 14 CFR part 150, Appendix A. Both of these rely on the cumulative noise metric DNL and are referred to collectively in this question and questions 8–10 as "the FAA noise thresholds." On January 11, 2021, the FAA published the results of the Neighborhood Environmental Survey, (30) a nationally representative dataset on community annoyance in response to aircraft noise. The Neighborhood Environmental Survey results show higher percentage of people who self-identify as "highly annoyed" by aircraft noise across all DNL levels studied in comparison to the Schultz Curve.

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 (31) established using the DNL metric or to establish new FAA noise thresholds using other cumulative noise metrics? Please explain your reasoning.

The NES, and the Federal Register comments in response to it, proved that DNL does not correlate in any reliable way with annoyance. Continuing to use DNL in the NEPA process is frankly illegal at this point due to ASNA. Also, the NES confirmed what we all already knew. People don't upend their lives and devote thousands of volunteer hours to reverting a flight path/procedure change unless they are exceptionally annoyed. Yet that is exactly what has been happened across the country as NextGen in general, and PBN in specific, has been rolled out to community after unsuspecting community.

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.

If the FAA just follows ASNA and obeys the law then DNL will be retired as a decisionmaking metric, as it should have been long ago.

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 (32) 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? Please explain your response.

For recent epidemiological studies that have retained raw noise monitor data, it should be possible re-create study results using a valid noise metric, like TAA.

A conventional risk/reward calculus can then be applied to set policy.

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 (33) either using the DNL metric or another cumulative noise metric? Please explain your response.

Aviation noise impacts on physical health, especially intermittent type noise impacts has been a growing area of research. As the body of work has grown, so has the alarm. Apart from the PTSD-like psychological damage caused by ~250 interruptions in your thought process/focus per day, in an otherwise/peaceful rural community, more recent research shows this kind of intermittent manmade noise, especially transportation noise and most significantly aviation noise, leads to higher levels of cardiovascular disease, stroke, and

premature death. Research by the University of Basel last year, "Transportation noise exposure and cardiovascular mortality: 15-years of follow-up in a nationwide prospective cohort in Switzerland"[5], is among recent research showing this correlation. Perhaps most alarming, the cardiovascular disease and stroke risks don't depend on being annoyed – or even consciously aware – of the noise. It is the result of autonomic hormonal reactions the body has to this kind of intermittent noise, which would historically (in an evolutionary sense) indicate some kind of threat. Having this threat response triggered ~250 a day takes a toll on the human body. A deadly toll.

e. Should the FAA consider using factors other than annoyance to establish FAA noise thresholds (34) 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.

As explained in answers to 7c and 7d, yes health impacts should be considered. Ideally the data still exits in many of these studies to measure risk based on a valid metric like TAA.

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 (35) 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? Please explain your reasoning. If the answer is "no," please explain your reasoning.

Yes, and please see my extensive explanation of why TAA is the best metric, at least in a National Park or rural area, that I presented in response to 5b.

In terms of thresholds for TAA, the FAA has all the data from the NES to generate grid point maps using the TAA metric (which AEDT natively supports), and then generate Shultz type graphs using the TAA metric. The FAA won't share this raw data, so independent groups can't do the work to determine the best metric.

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. Please explain the relevance and significance of the study or evidence and how it should inform FAA decisions regarding the policy.

Throughout this comment, literature has been referenced in footnotes. This collection forms the recommended literature to consult as part of this Noise Policy Review.

Sincerely,

David Goebel
President, Vashon Island Fair Skies, a 501(c)3 Public Charity (EIN 82-5451411)

[5] https://pubmed.ncbi.nlm.nih.gov/34775186