Federal Aviation Administration

NOISE POLICY REVIEW

The Foundational Elements of the Federal Aviation Administration Civil Aviation Noise Policy:

The Noise Measurement System, its Component Noise Metrics, and Noise Thresholds

Office of Environment and Energy

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Contents

Executive Summary

One of the primary environmental issues that significantly influences the capacity and flexibility of the national aviation system is aircraft[1] and vehicle[2] noise (collectively, "aircraft noise").[3] The Federal Aviation Administration (FAA) maintains a robust program of activities related to aviation noise. The FAA's approach is multi-pronged, including research and development, regulatory control, and public and stakeholder outreach programs relating to the public's experience of aviation noise.[4] The FAA strives to reduce noise in ways within its purview, but its ability to control the change in aircraft noise exposure is limited.

The FAA is conducting a noise policy review (review or NPR) of its civil aviation noise policy (policy) because the current policy is based on research conducted many decades ago. On January 13, 2021, the FAA published in the Federal Register a notice entitled, *Overview of FAA Aircraft Noise Policy and Research Efforts: Request for Input on Research Activities to Inform Aircraft Noise Policy*, and sought public and other stakeholder input on its noise research portfolio.[5] The FAA's January 2021 notice synthesized research into the effects of aircraft noise on individuals and communities—including with respect to community annoyance, children's learning, speech interference,[6] sleep disturbance,[7] and human health impacts such as

[1] Aircraft are machines that can fly by gaining support from the air and are affected by the density of air and the speed of the machine. Examples include fixed-wing airplanes, helicopters, blimps, gliders, and hot air balloons.
[2] Vehicles are machines that rely on thrust for lift. Examples include commercial space launch vehicles or rockets.
[3] FAA, "Aviation Environmental and Energy Policy Statement," 77 FR 43137, 43137 (July 23, 2012).
[4] In this framing paper, the terms aircraft noise and aviation noise are synonymous. The terms refer to the noise produced by aircraft and vehicles during takeoff, en route operations, and landing. In some circumstances, this definition may also include noise on the ground produced by aircraft and vehicles before takeoff.
[5] FAA, *Overview of FAA Aircraft Noise Policy and Research Efforts: Request for Input on Research Activities to Inform Aircraft Noise Policy*, 86 FR 2722 (Jan. 13, 2021).
[6] Speech interference occurs when aircraft noise drowns out or masks speech, making it difficult to carry on a conversation.
[7] Sleep interference refers to two types of sleep disruptions: those that result in awakening as well as those that do not result in awakening but cause some level of arousal.

cardiovascular health. The FAA received more than 4,100 comments on the notice. Overwhelmingly, commenters encouraged the FAA to revise its policy rather than waiting for the results of the FAA's ongoing research.

In response to that feedback, the FAA initiated a review of its policy. The FAA policy is set forth in various agency regulations, orders, guidance, and policy statements. This review is focused on how the FAA analyzes, explains, and publicly presents changes in noise exposure from aviation activity: recreational and commercial fixed wing airplanes, helicopters, commercial space transportation vehicles, unmanned aircraft systems, as well as emerging technology vehicles (newer types of vehicles that will operate in U.S. airspace). Its core focus is on the noise metrics and noise thresholds that communicate the level of aircraft noise experienced by communities and individuals. As the FAA explains in its May 1, 2023 *Request for Comments on the Federal Aviation Administration's Review of the Civil Aviation Noise Policy, Notice of Public Meeting*, 88 FR 26641 (May 1, 2023) (Request for Comments), when the FAA refers to "noise thresholds" collectively, it means both the definition of the level of significant noise exposure for actions subject to environmental review requirements set out in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1F) as well as the definitions of the levels of noise exposure that are deemed to be "normally compatible" with airport operations, as set forth in Title 14 Code of Federal Regulations (CFR) part 150 , Appendix A, Table 1. The way people and other receptors on the ground experience noise resulting from aircraft and vehicles operating in airport environments or elsewhere is described in the Request for Comments and this framing paper as "aircraft noise exposure."

Because the FAA's review addresses the technical elements of the policy, any resulting policy recommendations once adopted will not themselves immediately reduce noise associated

with aviation. A downward adjustment to the definition of adverse noise exposure will not change the actual noise environment. Nor will real-world noise experienced by individuals and communities be changed if the FAA changes its criteria for identifying significant new noise exposure associated with proposed actions being examined in a review pursuant to the National Environmental Policy Act of 1969 (NEPA) or the thresholds for determining land use compatibility. No policy change on its own will reduce the levels of aviation noise on the ground. Only the adoption of quieter technology, a reduction in aircraft operations, voluntary changes to the way aircraft operate to and from an airport through the use of informal noise abatement procedures that Air Traffic Control can utilize when feasible or appropriate[8], or a combination of these measures could reduce the amount of noise experienced by communities.

The FAA is committed to improving the way in which it analyzes, describes, and discloses the potential change in the noise environment to help the public better understand how their experience of aviation noise will change over time as a consequence of the FAA taking, authorizing, or funding a proposed action. The intent of this review is to develop policies that will assist all stakeholders with responsibility for addressing aviation noise — the FAA; air carriers; airports; aircraft and vehicle manufacturers; providers of commercial space transportation, unmanned aircraft systems (UAS or drone), urban air mobility/advanced air mobility (UAM/AAM), and other emerging technology services; other stakeholders and industry members; local communities; and elected officials —with understanding and communicating more effectively regarding expected changes in aircraft noise exposure.

[8] Noise abatement procedures are typically formalized by airport sponsors in the voluntary process under FAA's 14 CFR part 150 regulations. They are dependent on air traffic needs and aircraft capability. See FAA Joint Order 7400.2P, *Procedures for Handling Airspace Matters* at Ch. 32-1-5.f.5 (Mar. 17, 2023), https://www.faa.gov/documentLibrary/media/Order/7400.2P_Basic_dtd_4-20-23--COPY_FINAL.pdf. "The airport sponsor (operator) is solely responsible for the recommendation of noise abatement procedures."

In this framing paper, the FAA explains the rationale for issuing the Request for Comments and provides supporting and background information as well as context for the public to consider when reviewing and commenting on the questions set forth in the Request for Comments.

Introduction

The FAA is committed to informing and involving the public in the development of revisions to its policy, and to giving meaningful consideration to community concerns and views as the FAA makes aviation decisions. Accordingly, on May 1, 2023, in its Request for Comments the FAA announced that it is reviewing four elements of its policy and solicited public input to supplement and augment the FAA's technical consideration of four key considerations.[9]

First, the FAA is reviewing research on the effects of exposure to aviation noise, including the correlation of exposure to aviation noise with adverse health impacts, economic impacts, and annoyance. Community response to noise (annoyance) has historically been a primary factor underlying the FAA's noise-related policies. In this review, the FAA will consider whether to continue to describe noise impacts based on community response to noise, or if other effects of noise should be described.

Second, the FAA is focusing this review on the noise metrics that describe exposure to aircraft and vehicle noise, and potential revisions to the choice of standard metric(s). The FAA's current policy comprises a system for considering aviation noise (system) with the Yearly Day

[9] Federal Aviation Administration, *Request for Comments on the Federal Aviation Administration's Review of the Civil Aviation Noise Policy, Notice of Public Meeting*, 88 FR 26641 (May 1, 2023).

Night Average Sound Level[10] (DNL) as the core or primary decisionmaking metric. The policy requires that aviation noise analyses determine and express the cumulative noise energy exposure of individuals to noise resulting from aviation activities in terms of DNL. In this review, the FAA will consider whether to retain or modify its system. The FAA will also consider whether to expand its system by including companion[11] or alternative[12] decisionmaking metrics and whether to modify its policy on the use of supplemental[13] noise metrics.

Third, the FAA is reviewing its definition of the threshold of significant new noise exposure for actions the FAA considers taking and that must be analyzed under section 102(2)(C) of NEPA to determine if that threshold remains appropriate or requires revision. Exhibit 4-1 of FAA Order 1050.1F provides the FAA's significance threshold for noise.[14] This NEPA significance determination is calculated mathematically in accordance with the FAA's NEPA implementing policies and procedures and relevant information and guidance contained in 14 CFR part 150 (part 150) at Appendix A. This element of the review will also consider the metric and basis used to identify a reportable noise impact in environmental reviews conducted pursuant to NEPA.

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[10] The Day-Night Average Sound Level (DNL) is the 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m., and between 10 p.m., and midnight, local time. See 14 CFR 150.7.

[11] A companion metric is a noise metric that is used in conjunction with another noise metric, such as DNL, for decisionmaking.

[12] An alternative metric is a noise metric that is used in lieu of another metric, such as DNL, for decisionmaking.

[13] A supplemental metrics is not a decisionmaking metric. Rather, it is a metric used by the FAA to improve the public's understanding of the expected change in aviation noise providing a more complete narrative description of the aviation noise events that contribute to the level of noise experienced by a receptor on the ground. The FAA's NEPA procedures address the use of supplemental noise metrics. *See* FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures,* Appendix B, paragraph B-1.6. See also *1050.1F Desk Reference,* Section 11.4.

[14] The significance threshold for noise requires that the FAA action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB.

Lastly, the FAA is examining the level of aircraft noise exposure below which certain land uses (e.g., residential, educational etc.) are considered "normally compatible" with airport operations, as that term is defined in part 150, the regulations implementing the Aviation Safety and Noise Abatement Act of 1979 (ASNA), Pub. L. No. 96-193 (codified in Title 49 of the U.S. Code (U.S.C.)). The compatibility of existing and planned land uses with aviation activity is usually determined in relation to the noise receptor's[15] level of aviation noise exposure. The FAA established compatible land use guidelines for a variety of land uses in part 150, Appendix A, Table 1 *Land Use Compatibility with Yearly Day-Night Average Sound Levels.* The FAA will also consider the criteria for application of noise mitigation measures to address adverse noise exposure in areas that the FAA currently considers to be "normally compatible" with airport operations.

The FAA is considering how changes to the policy may better inform agency decisionmaking, the types of impacts it considers in making decisions (e.g., community annoyance, certain types of adverse health impacts highly correlated with aviation noise exposure), and potential improvements to how the FAA analyzes, explains, and presents changes in exposure to civil aviation noise. The FAA intentionally designed the Request for Comments to seek written comment from a range of aviation stakeholders with varying levels of familiarity with the FAA, its role in addressing aircraft noise exposure, and the noise metrics the FAA uses to analyze, explain, and publicly present adverse noise exposure. Through the Request for Comments, the FAA invites interested individuals, entities, and other parties to submit written comments on this pivotal quality of life issue to Docket FAA-2023-0855 at regulations.gov.

[15] The FAA collectively refers to the people, animals, and places or areas on the group that experience the effects of aviation noise as "receptors." See, e.g., 1050.1F Desk Reference at Chapter 11 (February 2020).

One of the FAA's key goals in issuing the Request for Comments is to obtain public input on the information the FAA develops and uses to make decisions that affect aviation noise. The FAA recognizes that the assessment of aircraft noise exposure on people, pets, activities, places of natural quiet, etc.[16] is a matter of significant interest to the public. The FAA also recognizes that its review of the relative strengths and benefits of various noise metrics presents several challenging technical issues. As a result, the FAA wrote this companion framing document to assist stakeholders during their review of the questions and issues on which the agency seeks public comment.

The public's participation is essential to the FAA's development of more effective policy. While the FAA does its best to base all policy on science, law, and data, the public is instrumental in identifying unintended consequences or flaws and offering solutions to supplement the agency's technical expertise and craft policies with better outcomes and help the FAA improve the decisions it makes. Public comments addressing potential improvements in how, where, and with whom the FAA communicates regarding changes in aircraft noise exposure will be particularly helpful as the FAA continues to develop a policy that will respond to affected communities' core interests, concerns, and needs.

Commenters need not respond to all questions. In addition, a well-supported comment may be more informative than a generic letter submitted by many raising a problem without supporting data or a proposed solution. Understanding the FAA's regulatory authority can help also support your comment and ensure that the solution that is being proposed is within the FAA's authority to act. Finally, if a prospective commenter needs better clarification of a question than is offered in this framing paper to assist the commenter in formulating a helpful

[16] Id.

comment, the FAA has provided additional resources at www.faa.gov/noisepolicyreview. We also welcome questions at noisepolicyreview@faa.gov.

Authority to Regulate Noise

Addressing aviation noise concerns requires an understanding of the roles and responsibilities of the FAA, air carriers, airports, aircraft manufacturers, other stakeholders and industry members, local communities, and elected officials. For example, the FAA does not make decisions about flight times, number of operations, and aircraft type departing from or landing at airports. These decisions rest with private industry. Airport location and land uses surrounding airports are a function of local zoning and land use planning. Runway alignment is determined by the prevailing winds at that specific location. The FAA strives to reduce noise in ways within its purview, but the FAA's ability to control the change in airport noise exposure is limited.

The FAA's primary responsibility is to establish a safe and secure domestic airspace system and to promote the development of civil aeronautics and air commerce.[17] While the FAA is also charged with controlling aircraft noise, this responsibility is carried out by regulating source emissions,[18] designing flight operational procedures, and managing the air traffic control

[17] The principal aviation responsibilities assigned to the Federal Aviation Administrator and, since 1966, to the Secretary of Transportation, under the Federal Aviation Act of 1958, as amended, 49 U.S.C. § 40101 *et seq.,* concern promoting the development of civil aeronautics and safety of air commerce. These congressionally prescribed responsibilities include assigning, maintaining, and enhancing safety and security as the highest priorities in air commerce; regulating air commerce in a way that best promotes safety and fulfills national defense requirements; encouraging and developing civil aeronautics, including new aviation technology; controlling the use of the navigable airspace and regulating civil and military operations in that airspace in the interest of the safety and efficiency of both of those operations; consolidating research and development for air navigation facilities and the installation and operation of those facilities; and developing and operating a common system of air traffic control and navigation for military and civil aircraft. *Id*. at § 40101(d).

[18] The FAA implements this authority by promulgating aircraft noise regulations, Federal Aviation Regulations Part 36, 14 CFR Part 36, which announced a basic policy on source noise reduction and set a limit on noise emissions of large aircraft of new or modified design. Essentially, Part 36 establishes the quietest uniform standard then possible, after taking into account safety, economic reasonableness, and technological feasibility. In addition, the FAA has

system and navigable airspace[19] in ways that minimize, where appropriate, noise impact on residential areas, consistent with the highest standards of safety.[20] However, the FAA has no authority to require fewer passenger or cargo flights within the U.S. airspace.

The FAA noise emissions control measures have been successful in reducing the amount of noise produced by airplanes operating in U.S. airspace. Over the last six decades, aircraft have gotten much quieter. The noise produced from one flight by a Boeing 707-200 jet, a typical commercial aircraft that began to fly in 1957 is roughly equivalent to the noise produced from 30 flights by a Boeing 737-800 jet that is typical today.[21]

The FAA's Noise Measurement System and Decisionmaking Metrics

In Questions 3-5 in the Request for Comment, the FAA seeks input on the noise metric or metrics that it should consider as part of its system, how the metric(s) should be calculated, and how the metrics in the system should be used together to make decisions or communicate with the public more effectively and efficiently regarding the effects of aircraft noise exposure. The FAA encourages commenters to explain in their comments how the proposed metric would be calculated, how it would function within the noise measurement system, and how the proposal satisfies the requirements of ASNA.

Section 102 of ASNA, codified at 49 U.S.C. 47502, directed the FAA to:

phased out older aircraft to achieve noise reductions consistent with Congressional mandates and international standards. As of January 2016, all civilian transport category aircraft, regardless of weight, are required to meet Stage 3 requirements in order to operate in the continental U.S. and any air carrier aircraft manufactured today must meet Stage 5 requirements.

[19] 49 U.S.C. §§ 40103(b), 44502, and 44721 provide extensive and plenary authority to the FAA concerning use and management of the navigable airspace, air traffic control, and air navigation facilities, which the FAA has implemented by promulgating regulations at 14 CFR parts 71, 73, 75, 91, 93, 95, and 97.

[20] 49 U.S.C. §§ 40103(b), 44502, and 44721.

[21] Based on an average of approach and takeoff certificated noise levels as defined in 14 CFR part 36.

1. establish a single system of measuring noise that – (A) has a highly reliable relationship between projected noise exposure and surveyed reactions of individuals to noise; and (B) is applied uniformly in measuring noise at airports and the surrounding area;

2. establish a single system for determining the exposure of individuals to noise resulting from airport operations, including noise intensity, duration, frequency, and time of occurrence; and

3. identify land uses which are normally compatible with various exposures of individuals to noise.

The FAA implemented Congress' direction by issuing the regulations at part 150 in 1981.[22] To address these requirements, the FAA established a system for measuring how aviation noise is experienced on the ground. The system incorporates one type of calculation to describe community exposure to aircraft noise (metric) as well as to define certain land uses (e.g., residential, educational etc.) as "normally compatible" with airport operations and the threshold for significant new noise exposure.

The FAA's calculation of community noise exposure involves four key elements. First, the FAA's determination of noise impacts is based on a dose-response curve that reflects the portion of the population that self-identifies as highly annoyed at certain levels of aircraft noise exposure. Second, decisions are made based on data derived from a mathematical calculation that quantifies the level of aircraft noise exposure (noise metric). Third and fourth, the noise metric incorporates noise event averaging and weighting (a value given to something based on how important or

[22] FAA, *Establishment of New Part 150 To Govern the Development and Submission of Airport Operator's Noise Compatibility Planning Programs and the FAA's Administrative Process for Evaluating and Determining the Effects of Those Programs*, 46 FR 8319 (Jan. 26, 1981).

consequential it is) by accounting for the intensity of noise, the duration of noise, the frequency of noise, and the time at which noise occurs, represented as an average value over a certain time period.

The FAA is evaluating metrics within the three classes of metrics to determine whether and how to expand its noise measurement system:

Metric Class	Metric	Definition
Cumulative[23]	Day Night Average Sound Level (DNL)	The 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m., and between 10 p.m., and midnight, local time. It is expressed as the noise level for a representative day of the year on the basis of average annual aircraft operations
	Community Noise Equivalent Level (CNEL)	A metric required by California state law that is similar to DNL and is used for the same purposes. CNEL also applies a weighting[24] to operations that occur during the evening hours between 7 p.m. and 10 p.m.
	Equivalent Sound Level (8 hour L_{eq})	The simplest and most flexible of the cumulative metrics. It does not assess a weighting to nighttime operations or time of day and permits operations to be averaged over a duration shorter than 24-hours. For example, an 8-hour duration could assess the effect of aircraft operations on an average school- or work-day. The metric can be adjusted to present information about shorter or longer durations and different times of day to reflect community values or concerns.
Single Event[25] / Operational	Number Above (NA)	A metric that presents the number of noise events that exceeds a specified noise level over a set time interval. For example, a Number Above metric could potentially report the number of noise events that exceed a noise

[23] A cumulative metric expresses noise in the aggregate as a function of total energy experienced over a set period of time.
[24] The evening weighting in CNEL is equivalent to each evening operation having three times the effect of an identical operation occurring during daytime hours.
[25] A single event metric expresses the noise levels experienced during a discrete aircraft operation.

Metric Class	Metric	Definition
		level of 60 dB. Research indicates speech interference begins to occur at a noise level of 60 dB.
	Time Above (TA)	A metric that presents the total duration of noise events above a specified noise level over a set time interval. For example, a Time Above metric could potentially report the duration of noise events that exceed a noise level of 60 dB to correlate with speech interference.
	Maximum Sound Level (L_{max})	The loudest decibel level reached during an aircraft operation.
	Persons Event Index (PEI)	A metric that combines NA with population data over a set time interval. The number of noise events that exceed a specified noise level (NA) are multiplied by the population exposed to the events.
	Average Individual Exposure (AIE)	A metric that uses the PEI to generate an average number of noise events experienced by an individual. It represents a measure of how the number of noise events that exceed a specified noise level are distributed across all populations exposed within a specific geographic area.
Low Frequency or Impulsive	No metrics identified at this time.	

Environmental Review and Disclosure of Noise Impacts

In Question 6 in the Request for Comment, the FAA seeks input on how the FAA can improve its communication with the public regarding the noise impacts of its proposed actions. This section of the framing paper explains the FAA's duty to consider and explain to the public when the change in aircraft noise exposure resulting from a proposed FAA action is likely to be significant under the standard established by FAA policy. In addition, Questions 7 through 9 request public input on the standards the FAA should use to determine the significance of noise impacts associated with different types of FAA regulated activities. The FAA requests that commenters explain the reasoning for their recommendation and provides a bibliography of

research the FAA examined regarding the correlation of aircraft noise exposure with various types of impacts. That bibliography of research is available in Appendix 1 of this framing paper. The FAA welcomes input regarding how the commenter views this research to support their recommendation and whether the commenter believes there are other studies or data regarding civil aviation noise not already identified by the FAA in the bibliography that the commenter believes the FAA should evaluate in the context of their recommendation. This input would also be responsive to Question 11.

The National Environmental Policy Act of 1969 (NEPA)[26] applies to actions or decisions made by a Federal agency when the agency has both the option to choose a course of action and has control and responsibility over the action. Examples include when the agency funds, regulates, licenses, conducts, or approves proposed actions.[27] NEPA directs Federal agencies to analyze and, where appropriate or required, disclose the environmental impacts of these proposed actions. Under the NEPA framework, the FAA must make informed decisions based in sound science and, in many circumstances, after considering ideas, information, and preferences identified by the public. The goal is to ensure the FAA's actions occur in a manner that reduces potential harms while enhancing ecological, social, and economic well-being.[28]

NEPA requires agencies to study proposed Federal actions for potentially significant environmental impacts, and should significant environmental impacts be identified, the law requires the proposing agency to prepare an environmental review called an Environmental Impact Statement.[29] To satisfy this requirement, and to provide consistent methods for identifying significant impacts, the FAA issued NEPA implementing instructions, after following

[26] 42 U.S.C. § 4321 *et seq*.
[27] 42 U.S.C. §§ 4321, 4331.
[28] *See*, *e.g.*, 42 U.S.C. §§ 4331, 4332(2)(A).
[29] *See* 42 U.S.C. § 4332(C); 40 CFR § 1502.3

the instructions in the Council on Environmental Quality's NEPA implementing regulations.[30] The FAA's NEPA implementing instructions are contained in FAA Order 1050.1F.[31] In FAA Order 1050.1F, the FAA identifies DNL as the Agency's primary noise metric for evaluating the noise impacts of actions subject to environmental review requirements under NEPA. In addition to identifying the FAA's approved noise metric, DNL, the instructions also identify those circumstances where a project will be considered to cause significant noise impacts.

The FAA's significant noise impact analysis has three components. First, the FAA determines whether any noise sensitive areas are present in the study area by identifying any non-compatible land uses in accordance with the FAA's land use compatibility guidelines in part 150, Appendix A, Table 1 (discussed in the next section). Second, the FAA determines the location and number of noise sensitive areas (e.g., schools, hospitals, parks, recreation areas) located in an area exposed to DNL 65 dBA. Third, the FAA determines whether the noise-sensitive areas will experience an incremental increase in aviation noise of 1.5 dBA when comparing the future conditions under the proposed action to the future conditions without the action for the same time period.[32] A significant noise impact for NEPA purposes would also occur when certain noise-sensitive land areas are newly exposed to DNL 65 dBA by a 1.5 dBA increase in noise exposure that is caused by the proposed project.[33] The FAA adopted this NEPA significance threshold based on the adverse impact of aviation noise exposure at or above the DNL 65 dBA level, as described in the "general guidelines for noise compatibility" set forth in the FAA's land use compatibility guidelines at part 150, Appendix A, Table 1.

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[30] 40 CFR 1507.3
[31] FAA, *Final Order 1050.1F Environmental Impact: Policies and Procedures*, 80 FR 44208 (July 24, 2015). FAA Order 1050.1F is available at https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf
[32] FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures,* Exhibit 4-1.
[33] *Id*.

Compatible or Non-compatible Land Uses

In Question 6 in the Request for Comment, the FAA seeks input on how the FAA can improve its communication with the public regarding the noise impacts of its actions. This section of the framing paper explains the FAA's land use compatibility guidelines established in part 150, Appendix A and their effect. In addition, Questions 7 through 9 request public input on the FAA's land use compatibility guidelines. The FAA requests that commenters explain the reasoning for their recommendation and provides a bibliography of research the FAA examined regarding the correlation of aircraft noise exposure with various types of impacts. That bibliography of research is available in Appendix 1 of this framing paper. The FAA welcomes input regarding how the commenter views this research to support their recommendation and whether the commenter believes there are other studies or data regarding civil aviation noise not already identified by the FAA in the bibliography that the commenter believes the FAA should evaluate in the context of their recommendation. This input would also be responsive to Question 11.

In response to ASNA,[34], the FAA issued regulations (part 150) to establish the Airport Noise Compatibility Planning Program,[35] which set out the requirements and the process and procedures for airport noise compatibility planning. [36] These regulations also identify land uses that are "normally compatible" with various noise exposure levels.

[34] 49 U.S.C. 47501 *et seq.*
[35] 49 U.S.C. § 47501, *et seq.*, and part 150.
[36] This included procedures, standards, and methodology for airport noise exposure map development and submission, and FAA review of airport noise exposure maps and airport noise compatibility programs. This also included the provision for using a single system to measure noise at airports and surrounding areas and determine exposure of individuals to noise that results from the operations of an airport when preparing these documents. *See* 14 CFR 150.1

The FAA provides funding and guidance to airports that choose to voluntarily initiate this collaborative process to consider and recommend measures that will reduce existing noncompatible land uses[37] and prevent new noncompatible land uses in areas exposed to adverse levels of aircraft noise. These goals are accomplished through preventative measures such as changes to local land use planning and zoning, noise abatement measures such as modifying existing or developing new aircraft flight paths, corrective measures such as installation of sound insulation in eligible homes, acquisition of homes and other noise-sensitive property, and other appropriate noise mitigation measures recommended by airport sponsors and reviewed and approved by the FAA. The FAA complies with statutory criteria set forth in 49 U.S.C. 47504(b)(1)(A),(B) when it approves an airport sponsor's proposed noise compatibility program that "does not place an unreasonable burden on interstate or foreign commerce" and is "reasonably consistent with achieving the goal of reducing noncompatible uses and preventing the introduction of additional noncompatible uses."

FAA Land Use Compatibility Guidelines

Generally, local governments establish and enforce land use through property zoning, such as residential, mixed-use, industrial, or commercial.[38] The FAA's land use compatibility guidelines set forth in Table A-1 of Appendix A at part 150 do not control land use. Airport sponsors also do not control land use. Rather, by following the FAA's regulations, airport sponsors can prepare noise contours that can then be adopted by local planning jurisdictions to inform zoning decisions or to establish an airport noise overlay district. However, Federal

[37] Noncompatible land use is described in part 150. Appendix A, Table 1 lists several general land use categories and corresponding compatibility with yearly DNL levels of 65 dB and above.

[38] While states could also assume zoning powers or require that local governments zone to a specific standard to ensure airport compatible land use in the vicinity of public use airports to permit airport development and safeguard the general welfare of residences in the vicinity of airports, FAA is not aware of many states that are actively involved in regulating airport compatible land use.

agencies have adopted certain advisory guidelines,[39] and the FAA's land use compatibility guidelines are an example, for land uses that are "normally compatible" with airport operations. We note that the FAA's land use classifications were based on the FAA's evaluation of the Federal land use compatibility guidelines established during the 1970s by a Federal interagency committee comprised of research agencies and agencies with expertise in aviation-related noise.[40] To the extent practicable, the FAA's definitions of "normally compatible" and "noncompatible" land uses are comparable to and consistent with, although separate from, other Federal programs directed towards similar considerations of noise exposure.

The advisory Federal land use compatibility guidelines were informed by expert Federal interagency committee consideration of, among other things, the level of noise exposure associated with adverse auditory and health effects and the Schultz Curve.[41] While the Federal government review did not conclude that exposure to aircraft noise exposure resulted in a statistically significant correlation with adverse auditory and health effects, the agencies did consider community annoyance. The Schultz Curve refers to the curve generated from a meta-analysis of social surveys published in 1978 by Thomas Schultz which set forth a widely accepted relationship between DNL and the percentage of the population who are highly annoyed by transportation noise based on 453 surveys conducted worldwide. This meta-analysis was later validated by expert Federal government interagency committees focused on aircraft

[39] *Guidelines for Considering Noise in Land Use Planning and Control*, Federal Interagency Committee on Urban Noise (FICUN), June 1980.

[40] The Federal agencies that are responsible for Federal programs in which noise exposure is a factor and which comprised the interagency committee that developed the Federal land use compatibility guidelines include, among others, the U.S. Department of Defense, U.S. Department of Housing and Urban Development, and the National Park Service.

[41] *Id.*; *Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, U.S. Environmental Protection Agency, March 1974; Schultz, T.J. 1978, "Synthesis of Social Surveys on Noise Annoyance," *Journal of the Acoustical Society of America* 64(2): 377-405. *See, e.g.*, *Federal Agency Review of Selected Airport Noise Analysis Issues*, Federal Interagency Committee on Noise (FICON), August 1992 for report summarizing the validation analysis and FICON's conclusions.

noise issues. The guidelines considered the Schultz Curve in determining which land uses are or are not normally compatible with airport operations.

While the FAA's Airport Noise Compatibility Program[42] provides that most land uses are compatible with aviation noise exposure levels below DNL 65 dB, communities must decide for themselves based on local conditions what is considered a compatible land use. The airport can provide the information, but it is up to the local planning jurisdictions to decide what to do with it.

These guidelines generally identify land exposed to aviation noise levels below DNL 65 dB as "normally compatible" with residential use. Residential land that is exposed to aviation noise levels above DNL 65 dB is generally identified as experiencing adverse noise exposure. This is one criterion that may determine whether FAA noise mitigation funding may be made available to address aviation noise at the property.

Community Response to Noise (Annoyance)

In response to Question 11 of the Request for Comments, the FAA welcomes public comments that identify any research studies or data regarding civil aviation noise and its effects not already identified by the FAA in the bibliography at Appendix 1 to this framing paper.

Community response to noise has historically been a primary factor underlying the FAA's noise-related policies, including in FAA Order 1050.1F and the FAA's Airport Noise Compatibility Planning Program (i.e., part 150). Annoyance is a summary measure of the general, adverse reactions of people to noises which disrupt daily activities such as telephone

[42] See part 150, Appendix A, Table 1. The designations contained in Table 1 are not a federal determination that any use of land is acceptable under federal, state, or local law. The FAA recognizes that the responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities.

conversations, watching TV or listening to music, sleep, or tranquility. Community response to noise is described as the percentage of people who self-identify as "highly annoyed" by long-term exposure to their noise environments. The FAA uses a DNL of 65 dB as the basis for setting the FAA's policy goal of reducing the number of people exposed to this level of aircraft noise;[43] and the level of aircraft noise exposure below which residential land use is "normally compatible."[44]

Despite significant success in supporting technological advancements and regulatory changes that have controlled aircraft noise at the source and reduced the number of Americans exposed to aviation noise at or above DNL 65 dB, exposure to aviation noise across all levels, including levels below DNL 65 dB, continues to be a pivotal quality-of-life issue for the public.

Working with statisticians and noise experts, the FAA conducted a nationwide survey (Neighborhood Environmental Survey (NES))[45] to update the scientific evidence on the relationship between aircraft noise exposure and its annoyance effects on communities around airports, taking into account modern aircraft fleet and operations. It collected a nationally representative dataset of more than 10,000 responses on community annoyance in response to aircraft noise around 20 statistically representative airports across the Nation, and provided a contemporary update to the Schultz Curve, including refinements to improve its reliability.

Like the Schultz Curve, the NES describes community annoyance in terms of the percentage of people who are "highly annoyed" and describes aircraft noise exposure in terms of

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[43] *See* FAA, *Aviation Environmental and Energy Policy Statement*, 77 FR 43137, 43138 (July 23, 2012).
[44] As defined in Table 1, Appendix A to part 150 implementing the ASNA. See also Advisory Circular 150/5020-1, Appendix 1. Compatible land uses may coexist with airport uses without being adversely impacted by them. Table 1 sets forth the sound level at which certain land uses become generally incompatible with aircraft operations. These include residences, schools, churches, nursing homes, hospitals, outdoor amphitheaters, or parks where aircraft activity may substantially impact the conduct of normal activity.
[45] https://www.faa.gov/regulations_policies/policy_guidance/noise/survey

the DNL noise metric. Compared to the Schultz Curve representing transportation noise, the NES results show a substantially higher percentage of people highly annoyed over the entire range of aircraft noise levels (i.e., from DNL 50 to 75 dB) at which the NES was conducted. The NES results also show that annoyance at lower noise levels is proportionally higher than what was observed from the Schultz Curve. This information is presented at Figure 1, below, which depicts the percentage of the U.S. population that is highly annoyed at noise levels between DNL 50-75 dB based on the results of two curves: the Schultz Curve and the National Curve developed from the results of the NES.

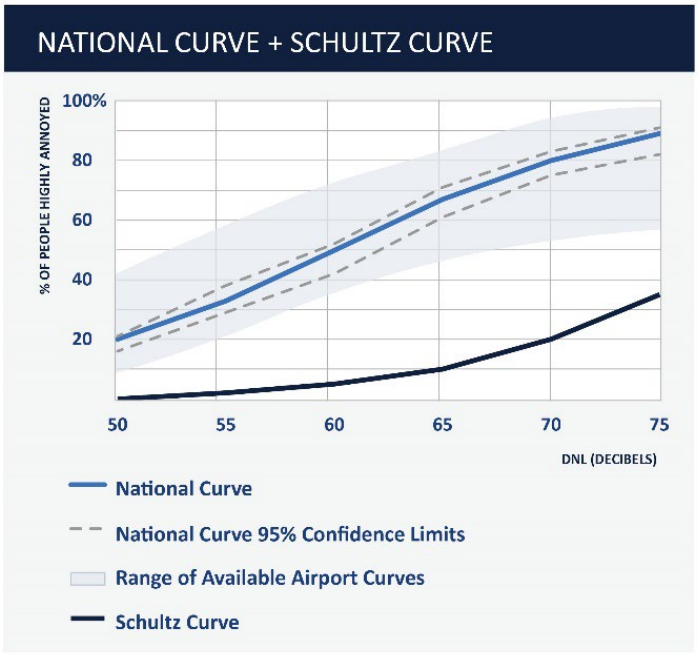

Figure 1 Percentage of the U.S. population who self-identify as "highly annoyed" due to aircraft noise exposure. The graph compares the results of the historic Schultz curve against the updated national curve derived from the FAA's Neighborhood Environmental Survey

Aviation Noise Abatement Policy and Modern Aviation Operations in the National Airspace System

Questions 1 and 2 of the Request for Comments seek public comment on how the policy should be revised to account for the changes in users of the airspace, the types of aircraft and vehicles that are operating in the airspace, the locations of aircraft operations, and their frequency.

In 1976, when the Secretary of Transportation and the Administrator of the FAA published the Aviation Noise Abatement Policy (ANAP),[46] six to seven million Americans residing near airports were exposed to significant levels[47] of existing aircraft noise. The ANAP set forth a national and cooperative effort by the FAA, the aviation industry, as well as State and local governments to reduce exposure to adverse aircraft noise. The principles and guidelines set forth in the ANAP generated measurable and lasting success, due in large part to FAA and industry's efforts to reduce aircraft noise at the source,[48] which in turn led to a dramatic reduction[49] in the number of Americans adversely exposed to aviation noise. The ANAP

[46] November 18, 1976 (ANAP) available at *https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/*
[47] Exposure to noise levels which met or exceeded DNL 65 dBA.
[48] Improved aircraft design and other technological advances have led to significant reductions of aircraft noise. Tools such as Global Positioning System (GPS) technology, are used for greater safety and efficiency of air transportation and can help mitigate noise by keeping aircraft tightly within their designated noise corridors. Noise abatement flight procedures are evolving with advances in technology, improved aircraft design, and more refined airspace management procedures. State-of-the-art navigational technology enables FAA to define flight tracks with increased precision in the vicinity of noise sensitive areas. That same navigational technology allows pilots to fly with greater precision to avoid noise sensitive areas. Phaseouts of Stage 1 and Stage 2 aircraft were responsible for the larger component of the considerable success in reducing noise levels around the airports. With all civil turbojet aircraft heavier than 75,000 pounds now Stage 3 compliant, the most severe aircraft noise is now limited to within or very near airport boundaries. The FAA continues to pursue a variety of approaches, including source noise abatement technologies, with the goal of substantially reducing community noise exposure. Finally, the FAA continues to promote the development of international certification noise standards for turbojet airplanes that will be more stringent than the current Stage 5 standards and develop models to assess new noise abatement technologies that will encourage introduction of quieter planes.
[49] Since the mid-1970's, the number of people exposed to significant aviation noise exposure in the U.S. has declined from roughly 7 million to just over 400,000 today. For example, in 1975, one person on the ground experienced significant noise exposure for every 30 enplanements (each enplanement equals one person flying on a single commercial flight), compared to 2022, where more than 2,100 enplanements are flown for every person on the ground experiencing significant noise exposure. This is significant improvement in environmental outcomes

recognized that aircraft noise had become a growing problem in the 1960s due to the introduction of jet aircraft and the rapidly increasing number of commercial aircraft operations in the United States. The FAA also recognized that aircraft noise, and its adverse impacts on residential and other noise sensitive land uses, was a major constraint on the further development of the aviation system, threatening to limit the expansion of airports.

As the aviation sector evolves, airports may no longer be the only or main hubs of aviation activity. New technologies are being integrated into the U.S. airspace including commercial space transportation vehicles such as rockets,[50] unmanned aircraft systems (UAS or drones),[51] and urban air mobility/advanced air mobility (UAM/AAM).[52] Many of these vehicles will operate in a fundamentally different way from traditional piloted, fixed wing aircraft and will change the way communities interact with aircraft or vehicles and experience their environment.

In addition, communities are not experiencing the benefits from newer, quieter technology and operations by these quieter aircraft because of the substantial increase in aircraft operations in U.S. airspace over the last five decades. The number of enplanements has increased from approximately 200 million in 1975 to over 656 million in 2021 and will grow, on average,

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because the U.S. Census Bureau indicates that between 1970 and 2010, the percentage of the population living in urban areas has increased from 73.6 percent to 80.7 percent.

[50] While commercial space activity is still a highly dynamic and rapidly evolving industry, FAA expects that launch and re-entry activity will increase from a low-high range of 45-68 launch or re-entries in FY2022 to a low-high range of 59-186 by FY2026. This increase is attributable, in large part, to the expanded lineup of reusable vehicles and the expectation for increased human space exploration. *Id*. at 41-42.

[51] The FAA currently estimates that there are approximately 1.58 million recreational small UAS and forecasts that the recreational small UAS market will saturate at around 1.81 million units over the next five years. Id at 53-54. In addition, the FAA forecasts that the commercial small UAS fleet will likely be at around 858,000 by 2026. *Id*. at 63.

[52] Large UAS and AAM operators are not yet active in the NAS in any significant sense. Annually, these combined operations include less than 10,000 flights and these numbers are decreasing. However, these operations are expected to change as the technology advances and the regulatory environment becomes more favorable to them. *Id*. at 78-82.

by 4.7 percent annually over the next twenty years.[53] Furthermore, Americans are stimulating aviation growth by their increased reliance on air cargo transportation logistics.[54] See Figure 2[55], below, which depicts the rise in passenger enplanements (in millions) between 1975 and 2021 as well as the decrease in the number of Americans (in millions) exposed to aircraft noise at DNL 65 dBA.

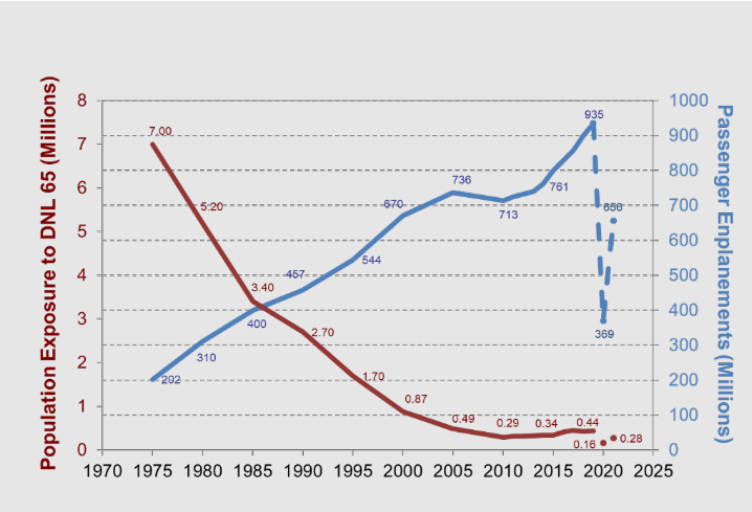

Figure 2 Historical Population Exposure to DNL 65 and Passenger Enplanements

Figure 3, below, demonstrates the relationship between noise events of varying intensity and the number of aircraft operations that may cause cumulative noise exposure of DNL 65 dBA.

[53] This growth rate was developed by FAA as part of its 2022-2042 commercial aviation forecast, which incorporates assumptions from statistical (econometric) models to explain and account for emerging trends for different segments of the aviation industry. *See* FAA, *FAA Aerospace Forecast Fiscal Years 2022-2042* at 2 *available at:* https://www.faa.gov/sites/faa.gov/files/2022-06/FY2022_42_FAA_Aerospace_Forecast.pdf

[54] Air cargo traffic includes both domestic and international freight/express and mail. The demand for air cargo is a derived demand resulting from economic activity Between 2022 and 2042, domestic cargo revenue ton miles are forecast to increase at an average annual rate of 2.6 percent. *Id*. at 25.

[55] Calendar year 2020 and 2021 enplanements are presented as blue dashed lines and the population exposure data for the same period are presented as red dots to reflect the impact of the Coronavirus disease 2019 (COVID-19) pandemic, which caused domestic and international air travel and flight operations to decrease substantially.

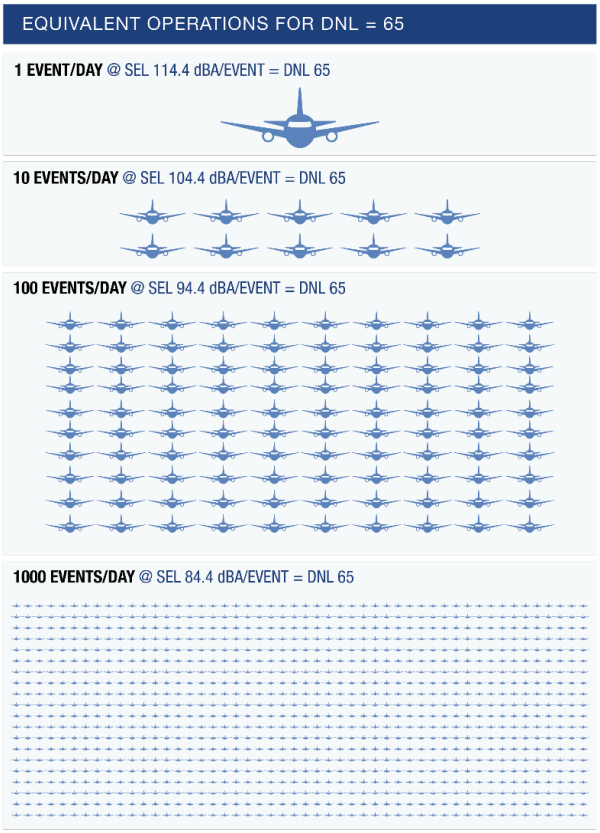

Figure 3 Frequency of Operations Equivalent to DNL 65

Overflight Communities, Environmental Review, and Public Disclosure

Questions 2.c and 6 in the Request for Comment are intended to solicit public comment from individuals and communities who reside in areas with lower noise exposure, but who in recent years have been the predominant source of noise complaints to the FAA's Noise Portal. En route aircraft (aircraft flying between its origination and destination) follow air traffic routes and procedures that normally do not significantly influence the noise environment of underlying land uses beyond the vicinity of an airport. However, the FAA recognizes that the advent of Performance Based Navigation (PBN) has concentrated flight tracks and caused concern for

some community members.[56] Figure 4, below, depicts the concentration of noise complaints due to overflights at Boston Logan Airport (BOS), in Boston, Massachusetts, after FAA implemented PBN procedures which concentrated flight tracks. Figure 4 depicts arriving flights in green, departing flights in red, and unique noise complaint locations via blue circular markers. Boston is emblematic of the modern noise problem in U.S. airspace in that changes to air traffic procedures outside of the immediate airport environment are generating a substantial amount of community concern. Overflight communities -- those located under the flight paths and well outside of the DNL 65 dB contour – are distressed by aircraft noise.

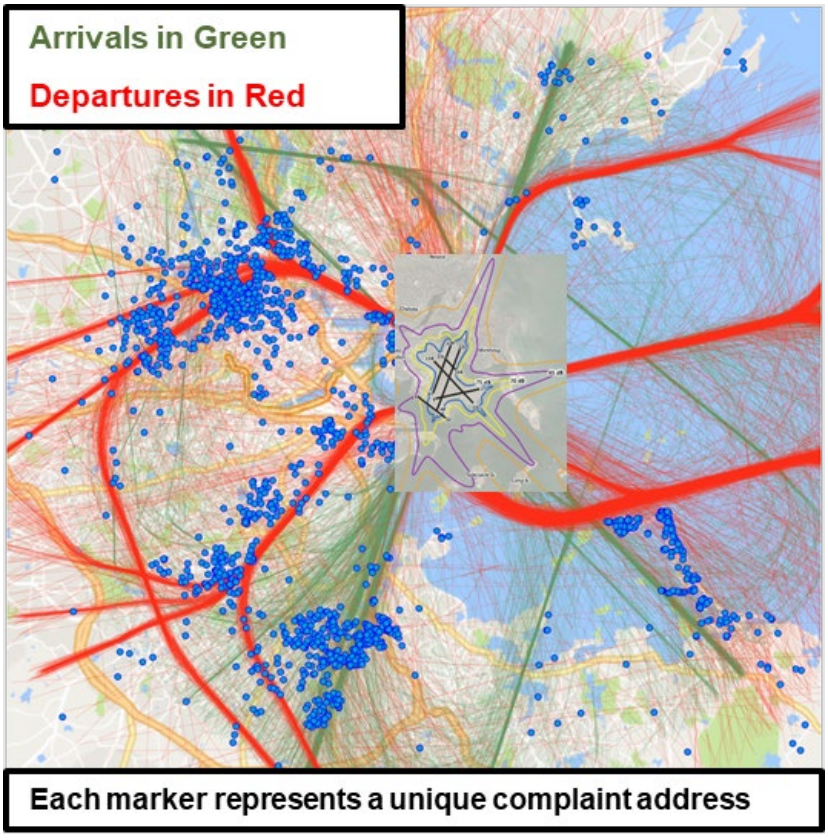

Figure 4 Location of noise complaints submitted in the vicinity of Boston Logan Airport

[56] The FAA receives roughly 30,000 total noise complaints annually. This figure accounts for all types of noise complaints and is not limited to those related to noise impacts resulting from implementation of PBN procedures. Of the 30,000 total noise complaints, between 2019-2022, approximately 3,000-5,000 complaints per year were unique.

Many of these communities raise concerns about their noise exposure. Because changes to air traffic procedures for operations over 3,000 feet above ground level (AGL) are normally categorically excluded from FAA environmental assessment requirements, the FAA has no specific requirements relating to public involvement for these actions under NEPA, and the agency can determine whether and how to conduct outreach.[57] FAA recognizes, however, that some actions that are normally categorically excluded can be highly controversial on environmental grounds. In such circumstances, the FAA may choose to conduct a higher level of environmental review than required by its policies. Questions 2.c and 6 of the Request for Comment is intended to solicit the public's views regarding the FAA's communication of noise impacts and engagement with communities who do not experience significant levels of new noise exposure.

Directions for Submitting Comments

If you would like to submit written comments, you may provide them by 11:59 p.m. Eastern Time on Monday, July 31, 2023, at Docket FAA-2023-0855 on www.regulations.gov.

[57] Under NEPA and the regulations implementing NEPA issued by the Council on Environmental Quality, federal agencies may identify a range of actions that do not individually or cumulatively have significant effects—including noise impacts—on the human environment and, thus, are categorically excluded from the more in-depth analysis and public outreach required for an environmental assessment or impact statement. Based on its experience implementing NEPA for air traffic procedure actions, FAA established in FAA Order 1050.1F at Paragraph 5-6.5(i) a categorical exclusion for these types of air traffic procedural actions. Similarly, the FAA requirements for public involvement under NEPA do not have specific public involvement requirements, except when preparing an environmental impact statement. FAA Order 1050.1F at Paragraphs 2-5.1 and 7-1.2. Similarly, the Order 1050.1F provides the FAA with discretion on when, and how, to conduct public involvement when preparing an "environmental assessment" or "categorical exclusion". *See* Order 1050.1F at Paragraph 6-2.2.(b). The FAA can, and often does, go beyond minimum requirements when the FAA believes there will be public interest in a proposal.

APPENDIX 1: BIBLIOGRAPHY

Synthesis Research

	Impact Studied	
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Health Impacts Research

	Study Type	Bibliography Citation
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	Study Type	Bibliography Citation
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	Study Type	
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APPENDIX 2: REQUEST FOR INFORMATION AND COMMENT

1. Vehicle Type. When the FAA published the ANAP[58] in 1976, the impacts of aviation noise were related to commercial jet service at or in the immediate vicinity of airports. 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? How should this information be described using noise metrics? Should the FAA use this information to make decisions or for public disclosure only? Please explain your reasoning.

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.

b. What interests or concerns do communities in the vicinity of airports have? How can these concerns be addressed using noise metrics? What noise metrics would address these concerns? Please explain your reasoning.

c. What interests or concerns do overflight communities[59] have? How can these concerns be addressed using noise metrics? What noise metrics would address these concerns? Please explain your reasoning.

[58] The ANAP was issued by the Secretary of Transportation and the FAA Administrator on November 18, 1976. *https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/*

[59] The phrase "overflight communities" in the Request for Comment and this companion framing paper refers to communities located under the flight paths of aircraft and vehicles that are distressed by aircraft noise and are located outside of the DNL 65 dB contour.

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? Please explain your reasoning.

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? Please explain your reasoning.

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.

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.

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?

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?

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?

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

d. If the answer to Question 5.a is “no,” should DNL remain the core decisionmaking metric or should another metric be substituted in all circumstances?

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.

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.

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.

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.

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

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[60]), 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,[61] 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

[60] *See* Schultz, T.J. 1978, "Synthesis of Social Surveys on Noise Annoyance," *Journal of the Acoustical Society of America* 64(2): 377-405. The Schultz Curve in this document refers to the curve generated from a meta-analysis of social surveys which set forth a widely accepted relationship between DNL and the percentage of the population who are highly annoyed by noise. This meta-analysis was later validated by interagency government committees focused on aircraft noise issues. *See, e.g.*, Federal Agency Review of Selected Airport Noise Analysis Issues, 1992.

[61] Miller, Nicholas P., et al. *Analysis of the neighborhood environmental survey*. No. DOT/FAA/TC-21/4. 2021 available at: https://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety-Detail/ArtMID/3682/ArticleID/2845/Analysis-of-NES. *See also* FAA, *Overview of FAA Aircraft Noise Policy and Research Efforts: Request for Input on Research Activities to Inform Aircraft Noise Policy*, 86 FR 2722 (Jan. 13, 2021).

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[62] established using the DNL metric or to establish new FAA noise thresholds using other cumulative noise metrics? Please explain your reasoning.

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.

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[63] 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.

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

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[62] FAA, *Request for Comments on the Federal Aviation Administration’s Review of the Civil Aviation Noise Policy, Notice of Public Meeting*, 88 FR 26641 (May 1, 2023). As FAA explains at footnote 24 in its Request for Comment when FAA refers to “noise thresholds” collectively, it means both the definition of the level of significant noise exposure for actions subject to environmental review requirements set out in FAA Order 1050.1F as well as the definitions of the levels of noise exposure that are deemed to be “normally compatible” with airport operations, as set forth in Table 1 of Appendix A to Part 150.

[63] *Id*.

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[64] either using the DNL metric or another cumulative noise metric? Please explain your response.

e. Should the FAA consider using factors other than annoyance to establish FAA noise thresholds[65] 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.

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[66] 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.

9. FAA Noise Thresholds for Low-Frequency Events. Should FAA establish noise thresholds[67] 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

[64] *Id*.
[65] *Id*.
[66] *Id*.
[67] *Id*.

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.

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 [68], or FAA's method of communicating the change in noise exposure? Please explain your response.

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.

[68] *Id*.