Aircraft Noise: Recommendations to Improve FAA Outreach Through Enhanced Noise Metrics and Communication

Aviation Noise & Emissions Symposium 2022

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Work on Aircraft Noise

- AVIATION NOISE: FAA Could Improve Outreach through Enhanced Noise Metrics, Communication, and Support to Communities (GAO-21-103933)
- The report focuses on:
  1. FAA's approach to assessing potential community noise impacts from proposed Performance-Based Navigation (PBN) changes,
  2. the extent to which FAA's noise impact analysis conveys expected changes in the noise created by flights overhead, and
  3. how FAA has conducted community outreach on potential noise impacts of PBN implementation and actions FAA could take to improve its outreach.

GAO's Analysis

- For our report—in addition to FAA and industry stakeholders—we spoke to members of communities and airport officials at 13 airports across the country
- To better understand how DNL is affected by changes in the noise level of aircraft overhead, the number of flights overhead, and the timing of those flights (nighttime versus daytime flights), we used the formula for "partial DNL" (DNL when the aircraft and flight path are held constant) to calculate the DNL for a variety of scenarios at a hypothetical location
- For additional information about our methodology and this analysis, see GAO-21-103933, particularly Appendix II

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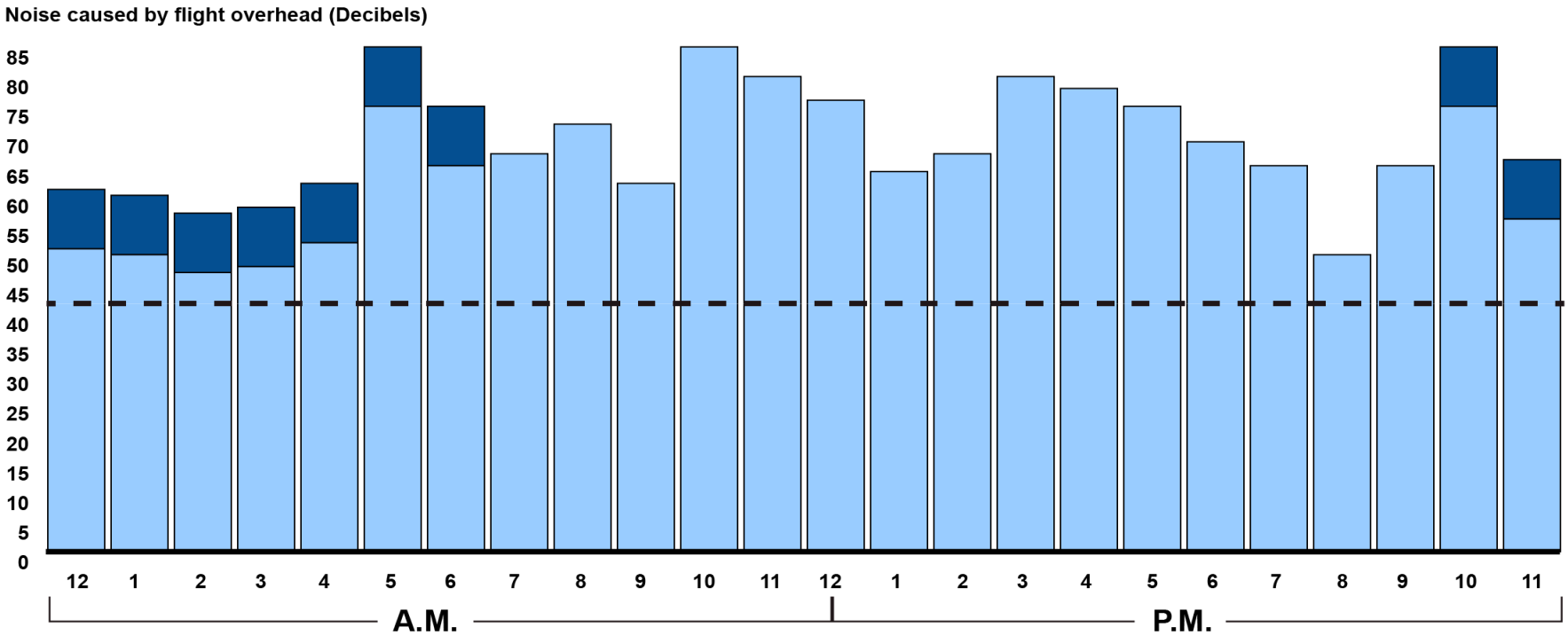
FAA use of the Day-Night Average Sound Level (DNL)

- The DNL metric was adopted in regulation in 1981 in response to a requirement in the Aviation Safety and Noise Abatement Act of 1979 to establish “a single system of measuring noise” and “a single system for determining the exposure of individuals to noise which results from the operations of an airport and which includes, but is not limited to, noise intensity, duration, frequency, and time of occurrence.”
- FAA uses DNL to assess the potential noise impact of proposed flight path changes, including performance-based navigation.
- According to the FAA, DNL is intended to reflect a person’s cumulative exposure to sound over a 24-hour period.

DNL Accounts for the Number, Timing, and Noise Created by Flights Overhead



Note: Figure shows the Day-Night Average Sound Level (DNL) as represented by the dotted line for a hypothetical annual average day, with each light blue bar representing a single flight and the associated noise level, and the dark blue portion of the bar representing a 10 decibel penalty for flights occurring between the hours of 10 pm and 7 am.

Source: GAO analysis of Federal Aviation Administration information. | GAO-21-103933

Community Response to Noise

- The results of FAA's recent Neighborhood Environmental Survey show a substantial increase in the percentage of people who are highly annoyed by aircraft noise as compared to earlier survey results
  - For example: the survey found that, at a DNL of 60 dB—between 44 and 54 percent of people were highly annoyed in 2015 versus just 6.5 percent of people in a 1992 survey.[1]
- DNL was established as the FAA's decision-making metrics in the 1970's and 1980's, but individual aircraft are much quieter and air traffic levels much higher today.

[1] See Federal Aviation Administration, Analysis of the Neighborhood Environmental Survey (Atlantic City, NJ; Jan. 2021)

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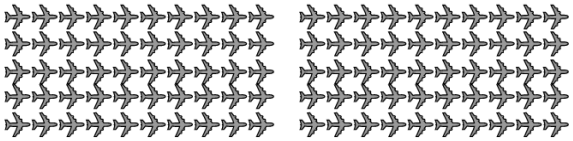
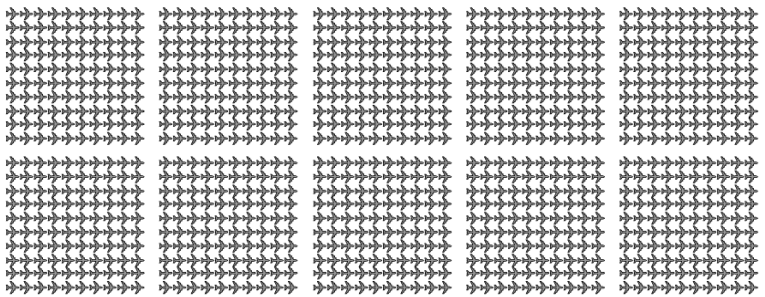
DNL Is Limited in Conveying Expected Changes in the Number and Noise Levels of Flights Overhead

- Communities said information from FAA on potential noise impacts of flight path changes did not help them understand the changes they would experience
- DNL does not provide a clear picture of expected changes in the number of flights overhead or the noise created by each flight.
- FAA's noise analysis and communication are focused on whether potential noise impacts will rise above the regulatory threshold of DNL 65 dB, considered a "significant impact" for purposes of complying with the National Environmental Policy Act
- The DNL metric may be limited in the extent to which it can help FAA understand how communities may experience changes in noise before implementing air traffic changes

Small numbers of relatively loud operations can result in the same DNL as large numbers of quieter operations.

	Number of flights per day and sound exposure level in decibels (dB)[a]		Day-Night Average Sound Level (DNL)[b]
Scenario A:	1 flight per day at 114.4 dB Less loud — Loud 114.4 dB		65 dB
Scenario B:	10 flights per day at 104.4 dB Less loud — Loud 104.4 dB		
Scenario C:	100 flights per day at 94.4 dB Less loud — Loud 94.4 dB		
Scenario D:	1,000 flights per day at 84.4 dB Less loud — Loud 84.4 dB		

Source: GAO analysis of Federal Aviation Administration information. | GAO-21-103933

Alternatives

- Any single metric is likely to obscure the effects of individual components of noise, but using one or more supplemental metrics in concert with DNL analysis may provide FAA and communities with a better understanding of potential noise impacts.

- In a 2020 report, FAA identified a number of alternative metrics that focus on either the noise caused by a single overhead flight or various combinations of information on noise and the number or duration of flights overhead.[2]

[2] *See* Federal Aviation Administration, Report to Congress: FAA Reauthorization Act of 2018 (Pub. L. 115-254) Section 188 and Sec 173, (Washington, D.C.: Apr. 14, 2020).

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Examples of Alternative Metrics

- **Sound exposure level (SEL):** total noise caused by a single flight overhead.
- **Number Above:** number of events above a selected sound level threshold over a given period of time.
- **Time Above:** total time, or percentage of time, that the aircraft noise level exceeds an indicated level.

Our Recommendations to the FAA

1. Identify appropriate supplemental noise metrics, such as the "number above" metric, and circumstances for their use to aid in FAA's internal assessments of noise impacts related to proposed PBN flight path changes.
2. Update guidance to incorporate additional communication tools that more clearly convey expected impacts, such as other noise metrics and visualization tools related to proposed PBN implementation.

FAA agreed with our recommendations, and—as of January 2022—has said they plan to take steps toward implementing them by the end of 2022. The product webpage will have periodic updates: www.gao.gov/products/GAO-21-103933