



# LAX/Community Noise Roundtable

Work Program B1:  
Briefing on Low Frequency Noise

January 9, 2019

# Review of Roundtable Work Program Item B1: Low Frequency Noise

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Low Frequency Noise (LFN) has been on the Roundtable's Work Program since the early 2000s

- The Work Program Impact Description for Item B1 states that LFN “. . . affects numerous communities, including ones located miles away from LAX. LFN travels far distances and is invisible to structures, so is very difficult to mitigate via sound insulation.”
- LFN is considered by the Roundtable to be a “Global issue affecting all sectors”
- The Roundtable assigned Item B1 a high priority (5 on a scale from 1 to 5)

The purpose of this presentation is to provide a brief review and update on this Work Program Item

# Review of Roundtable Activity on Work Program Item B1

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Over the past 19 years, the Roundtable has received several presentations on LFN, which is typically associated with the start-of-takeoff-roll noise (aka “back blast” noise) and thrust-reverser noise

- In the summer of 2004, the full Roundtable and the Noise Subcommittee received two technical presentations from Mr. Sanford Fidell of Fidell & Associates on LFN
- In 2004, the LAX Roundtable sent letters to the FAA’s Center for Excellence for Aircraft Noise and Aviation Emissions Mitigation and the Transportation Research Board requesting that both entities conduct further research on the topic of LFN; suggesting that noise metrics and thresholds of significance be developed to address the LFN issue
- On February 18, 2010, LAWA initiated LFN data collection using its Airport Noise and Operations Management System (ANOMS)

# Review of Roundtable Activity on Work Program Item B1 (cont.)

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- In September 2010, HMMH provided a presentation on LFN including a summary report on the Partnership for Air Transportation Noise and Emissions Reduction's (PARTNER) 2007 LFN Study
- Also in September 2010, LAWA presented the LFN data received from LAWA's ANOMS
  - Initial review of those data indicated that noise monitors that were closer to the aircraft register more LFN events than those that were farther away

# Research Efforts into LFN at Other Airports and Other Entities

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Communities near other airports share similar LFN concerns, which resulted in research, suggested noise metrics, and recommended mitigation measures

- In 1998, the Maryland Aviation Administration conducted LFN measurements and conducted resident surveys near Baltimore-Washington International Airport (BWI)
- Since the 2000s, San Francisco International Airport (SFO) and the SFO Airport/Community Roundtable have funded several LFN studies
- In 2000, the Metropolitan Airports Commission (MAC) in Minneapolis-St. Paul funded work by an “expert panel” to examine LFN and make mitigation recommendations
- As described above, PARTNER concluded its LFN Study in April 2007

## Research Efforts into LFN at Other Airports and Entities (cont.)

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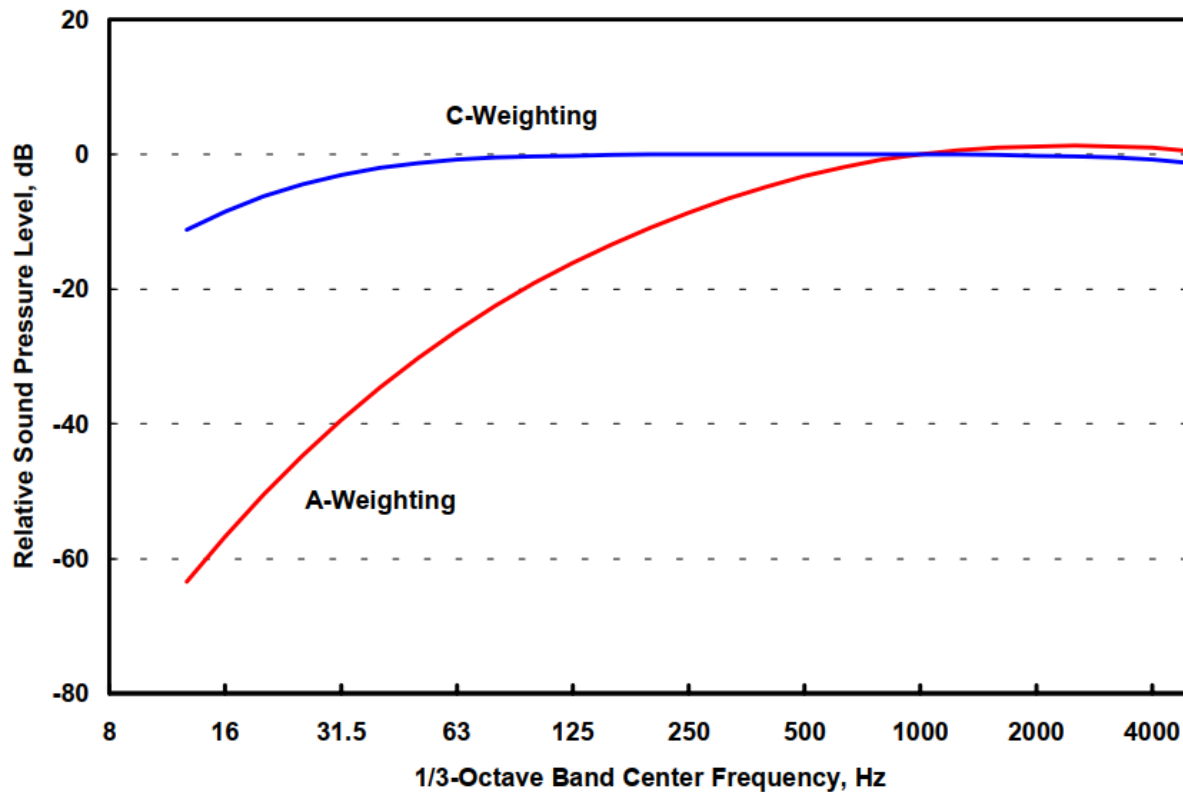


In September of 2001, Wyle Acoustics Group published, “*Status of Low-Frequency Aircraft Noise Research and Mitigation*” for San Francisco International Airport. The objective of the report was:

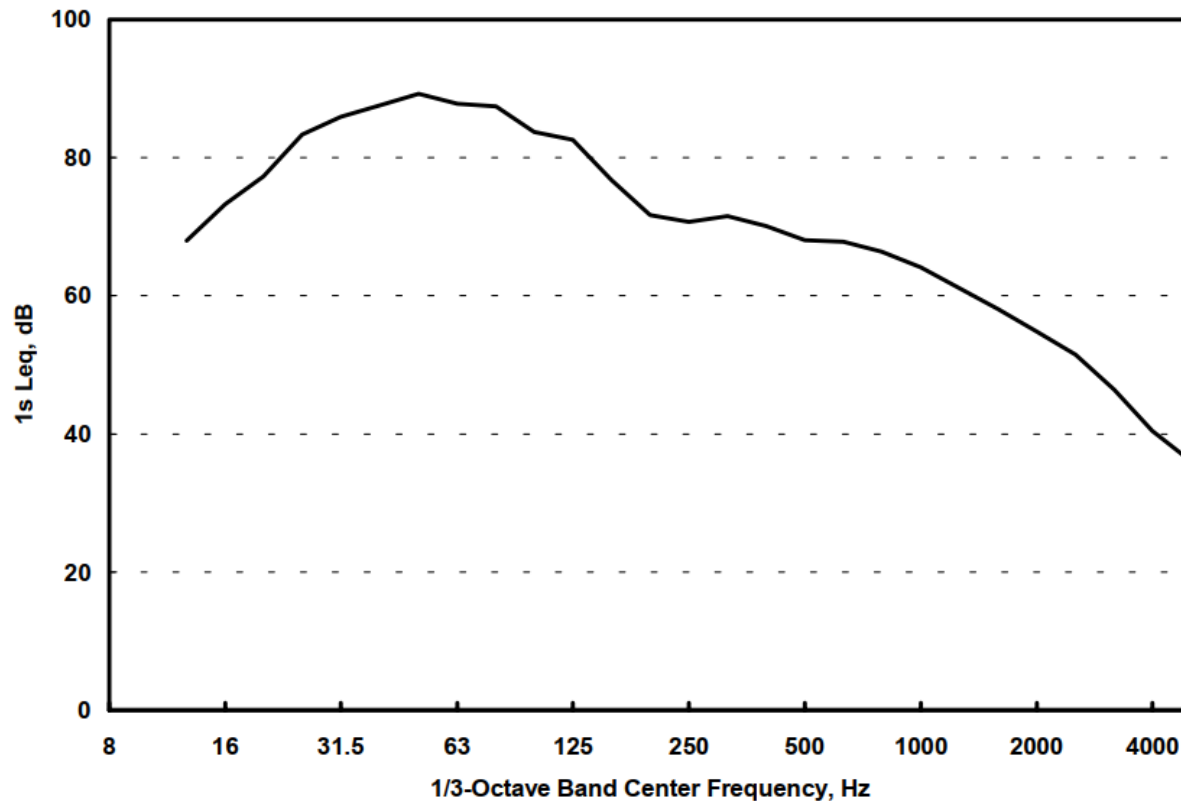
“... to provide a comprehensive review of backblast noise – how it is generated, how it propagates, how it can be mitigated, and where future study efforts and demonstration projects should be directed. The complete process is examined in order to fully understand why certain mitigation measures will work, and why some will not work, so that any current misunderstandings can be put to rest.”

The Wyle report covered many of the key LFN concepts that still apply today

# Comparison of the A- and C-Weighting Frequency Networks



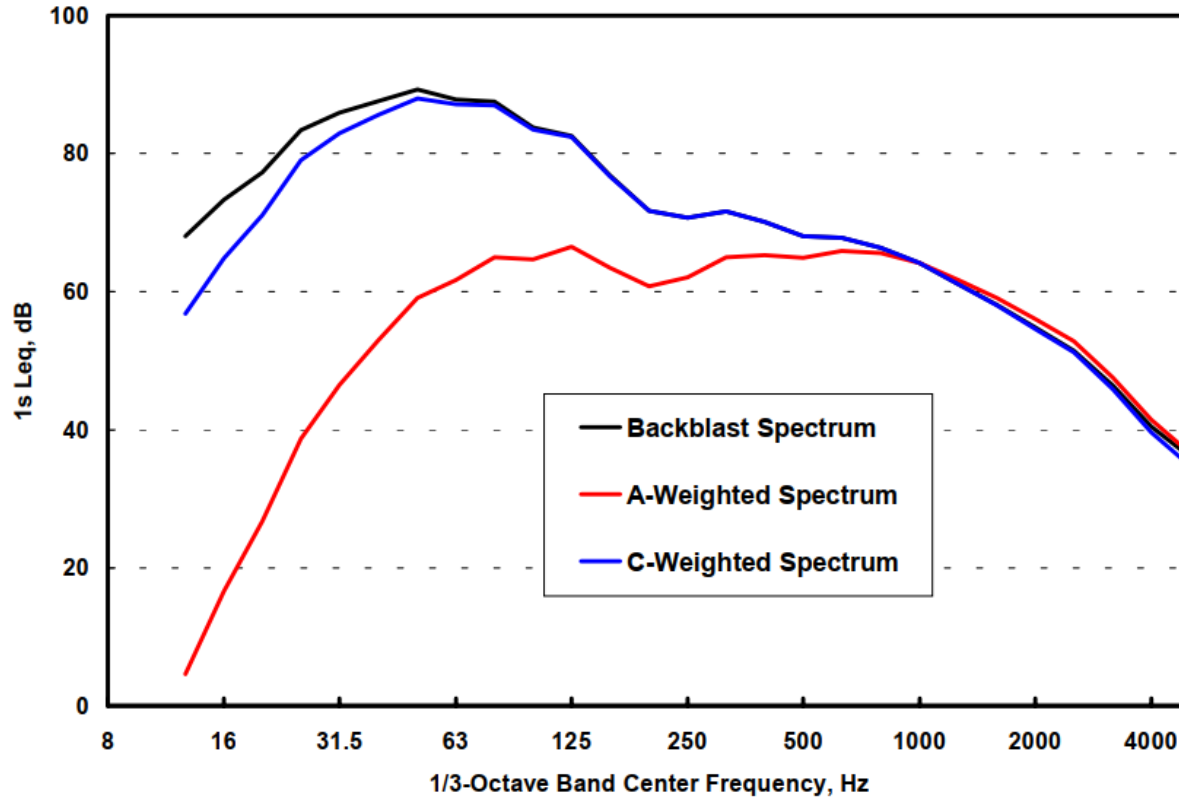
# Example of a Typical Backblast Noise Spectrum



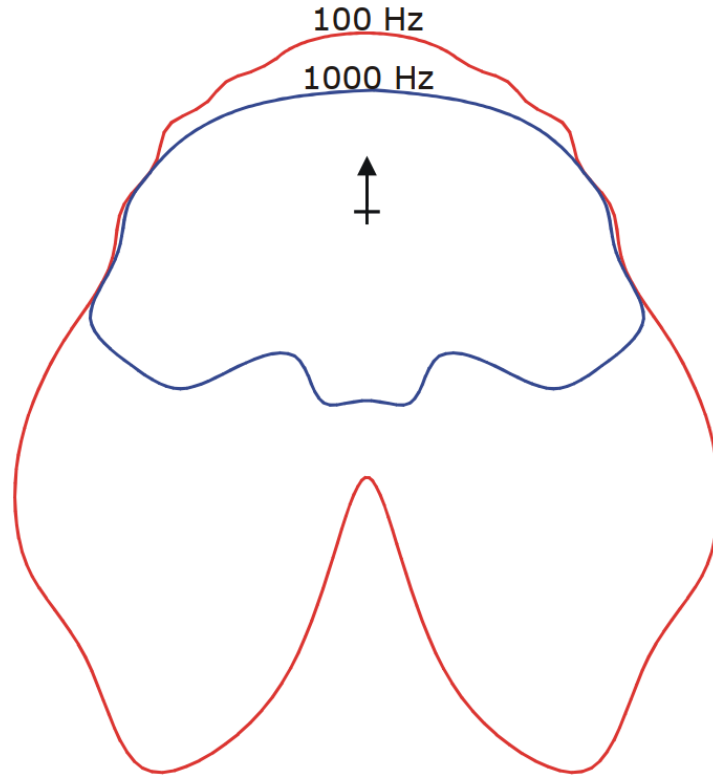
Source: Wyle Report WR 01-21, *Status of Low-Frequency Aircraft Noise Research and Mitigation*, September 2001.



# The Effect of A- and C-Weighting on Backblast Noise Spectrum



# Directivity Patterns for a JT8D Engine at 100 Hz and 1000 Hz



# Research Efforts into LFN at Other Airports and Entities (cont.)

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These independent studies/research efforts reached similar conclusions that are generalized as follows:

- The A-weighting frequency scale does not correlate well to human perception of the effects of LFN
- While specialized metrics such as the Low Frequency Sound Level (LFSL) have been developed to assess LFN from aircraft, C-weighting correlates well with human perception of the effects of LFN and is readily available on most sound level meters
- LFN is very difficult to mitigate in residential structures through conventional sound insulation techniques, but controlling the rattling of objects (dampening the movement of pictures on walls, bric-a-brac on shelves, etc.) reduces the perception of and annoyance with LFN
  - Typical sound insulation treatments (e.g., replacing windows and doors) reduces rattling in those building elements, which reduces community annoyance related to noise-induced vibrations

## Research Efforts into LFN at Other Airports and Entities (cont.)

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There has been no significant LFN research since the last Roundtable update in September of 2010:

- There are no new LFN mitigation measures beyond those identified in earlier studies
- The physics of LFN make it difficult to fully mitigate and make it easy to cause noise-induced vibrations at large distances from the airport
- Atmospheric conditions (i.e., downwind and inversion conditions) further influence the propagation of LFN
- Controlling the rattling of objects (dampening the movement of pictures on walls and bric-a-brac on shelves with felt pads and reducing window rattle) reduces the perception of and annoyance with LFN

# Review of Roundtable Work Program Item B1: Low Frequency Noise

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*Roundtable Member Questions?*