COMMUNITY NOISE FORUM Noise 101

Introduction to Airport Noise Compatibility

June 2020





Airport Noise Compatibility

Noise Basics

Measurement vs. Modeling

Part 150 Airport Noise Compatibility Planning



What is Noise?

- Unwanted sound
- Affects different people in different ways



Decibels

- Unit of measurement on the loudness scale
- The decibel scale is logarithmic, not linear
 - Smallest detectable change = 1 dB
 - 3 dB is readily detectable
 - 10 dB seems twice as loud
 - Adding two like sounds is a 3 dB increase
 - Double or half the distance from the source equals a 6 dB change



A-Weighting

- A way to measure sound on a scale that approximates the way it is heard by people
- More weight given to the frequencies that people hear more easily
- A-weighting is recommended by EPA to describe environmental noise
- The A weighted noise level has been adopted by the FAA as the accepted measure to consider aircraft noise

Typical A-Weighted Sound Levels



- Different tools for different jobs
- Provide the basis for evaluating a broad range of noise situations
 - Maximum Level (Lmax)
 - Sound Exposure Level (SEL)
 - Equivalent Sound Level (Leq)
 - Day Night Average Sound Level (DNL)



- Maximum Level (Lmax)
 - Measures the maximum sound level of a single noise event
 - Does not account for the duration of the event



- Sound Exposure Level (SEL)
 - Measures the magnitude and duration of a noise event
 - Squeezes all noise energy from an event into one second
 - Uniform way to compare noise events of various durations



- Equivalent Sound Level (Leq)
 - Assess the cumulative effect of several events occurring over a period of time
 - Time period can be any length but is usually a meaningful block of time such as 8-hour work day or 1hour class time



Metrics

- Day Night Average Sound Level (DNL)
 - Captures the heightened annoyance of nighttime noise
 - Represents the noise energy present during a daily period
 - Normally calculated from data over a longer period of time (1 year)
 - Calculated in two parts: 15 hour daytime and 9 hour nighttime (nighttime treated as if it were 10 decibels higher)



9nm 10nm 11nm 12am 1am 2am 3am

9am 10am 11am 12pm 1pm

DNL Is The Primary Metric

MONITORING AND MODELING

Monitoring: Taking actual noise readings

- Aircraft certification process
- Carefully controlled noise levels by aircraft type and model
- Basis of noise information utilized by noise models

Modeling

- Generates noise results at single locations, or over a grid of locations
- Validated against certification data to ensure accuracy
- Only practical way to accurately and reliably determine geospatial noise effects in the surrounding community when analyzing proposals related to aviation noise

MONITORING AND MODELING

- Non-aircraft sound can have a large influence on noise monitoring data, which can be difficult to separate from aircraft noise during data post-processing.
- Long-term (e.g., year-long) noise monitoring requires regular maintenance and calibration of the individual noise monitors on a continuous, year-round basis, which has considerable costs.
- To ensure the same accuracy and fidelity of data generated by noise models, an extremely large number of noise monitoring locations is required. (e.g. tens of thousands of noise monitors, collecting year-round data in the vicinity of an airport would be needed to match the fidelity and accuracy of noise modeling).
- Noise monitoring data is not capable of analyzing either "what if" scenarios or proposed future action airport and air space scenarios.

14 CFR PART 150 - AIRPORT NOISE COMPATIBILITY PLANNING

- CFR Code of Federal Regulations
- Title 14 Aeronautics and Space
- Part 150 Airport Noise Compatibility Planning

Part 150 Provides for the following:

- Establishes standard noise methodologies and units
- Aviation Environmental Design Tool (AEDT) as the standard noise modeling methodology
- Identifies land uses compatible or noncompatible with various levels of airport noise.
- Provides for voluntary development of Noise Exposure Maps (NEMs) and Noise Compatibility Programs (NCPs) by airport operators.
- Establishes procedures and criteria for making projects eligible for funding as noise projects through the Airport Improvement Program (AIP)

Standard Noise Methodologies and Units:

- A-weighted Sound Level
 - A-weighting is a way to measure sound on a scale that approximates the way it is heard by people
 - more weight must be given to the frequencies that people hear more easily
 - A-weighting is recommended by EPA to describe environmental noise
- Day-Night Average Sound Level
 - DNL is a 24-hour time-averaged sound exposure level with a 10 dB nighttime (10 PM 7 AM) penalty.
 - DNL = Total Daytime Sound Energy + 10 times Total Nighttime Sound Energy divided by Time
 - DNL is used to define noise contours of equal exposure.
 - All Federal agencies have adopted DNL as the metric for airport noise analysis. (court tested)
 - DNL 65 is level of significant noise exposure for airport analysis

Aviation Environmental Design Tool (AEDT):

- Standard noise forecasting methodology
 - Assures uniformity and comparability of Noise Exposure Maps (NEM's)
 - Adopted as the program's standard for noise modeling
- AEDT inputs
 - Airport Layout: Location, length and orientation of all runways.
 - Aircraft Operations: Numbers of departures, arrivals and pattern operations by each type of aircraft during an "annual average day"
 - Runway Use: Percentage of operations on each runway by each type of aircraft.
 - Flight Tracks: Paths followed by aircraft departing from, or arriving to, each runway.
 - Flight Track Use: Percentage of operations by each aircraft type that use each flight track.
 - Aircraft Altitude Profiles: Height of the aircraft from the ground along the flight tracks.
 - Aircraft Stage Lengths: How far the aircraft will travel (longer distance = heavier aircraft)

Land Use and Noise Compatibility:

- Table 1, "Land Use Compatibility With Yearly Day-Night Average Sound Levels,"
 - Standard reference for land uses compatible with various levels of airport noise
 - Basic criteria used in preparing Part 150 programs
 - Only noise and land use compatibility table currently in the Code of Federal Regulations

Land Use	Yearl Decib	Yearly Day-Night Average Sound Level, DNL, in Decibels					
	<65	65-70	70-75	75-80	80-85	>85	
Residential Use							
Residential other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N	
Mobile home park	Y	N	N	N	N	N	
Transient lodgings	Y	N(1)	N(1)	N(1)	Ν	Ν	
Public Use							
Schools	Y	N(1)	N(1)	Ν	Ν	Ν	
Hospitals and nursing homes	Y	25	30	Ν	Ν	Ν	
Churches, auditoriums, and concert halls	Y	25	30	Ν	Ν	Ν	
Governmental services	Y	Y	25	30	Ν	N	
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)	
Parking	Y	Y	Y(2)	Y(3)	Y(4)	Ν	

Source: 14 CFR Part 150, Appendix A, Table 1

NOISE CONTOUR MAP

Noise Exposure Map:

PART 150

- Clearly identify the airport's present and future noise patterns
 - Identifies local land uses
 - Standard reference for proposed noise sensitive development in the airport vicinity
 - DNL 65, 70, and 75 noise contours required (Locally, DNL 60 contour shown for reference)
 - First map shows current conditions
 - <u>Second map</u> shows noise exposure which can reasonably be predicted five years in the future
 - Known changes in land use
 - Known changes in airport operations
 - Prepared in consultation with stakeholders

- Measures the airport has taken or proposes to take to reduce noncompatibile land uses
- Measures for preventing the introduction of additional noncompatible land uses
 - Noise abatement measures
 - Measures intended to reduce noise exposure by addressing the factors contributing to noise impact
 - Noise mitigation measures
 - Measures intended to reduce the adverse effects of noise exposure that cannot be eliminated through noise abatement
 - Program management measures
 - Measures to enhance the effectiveness of both noise abatement and mitigation measures through continuing stakeholder coordination, research and development, data collection, and dissemination of program information.

Noise Compatibility Program Goals

Work with the community & all interested parties to:

- Reduce impact of aircraft noise
- Reduce the number of people exposed to incompatible noise levels
- Focus noise toward less populated, non-urbanized areas of the community
- Reduce impact of nighttime noise for the urbanized part of the community

- Noise abatement measures
- Contraflow
 - During late night hours (10:00 PM – 7:00 AM) Conditions Permitting
 - Arrive from the south; depart to the south
 - Arrivals first (10:00 PM 2:00 AM) (approximately)
 - Departures second (3:00 AM -7:00 AM) (approximately)
 - Concentrates nighttime jet operations to area of least residential density





Noise Compatibility Program:

Noise abatement

<u>measures</u>

- Defined Flight Paths
 - Arrivals
 - Departures
 - Minimizes aircraft overflights of noncompatible land uses





- Noise Mitigation
- Relocation Program Louisville
 Airport Improvement Program
 - 150 Businesses
 - 1,581 Families
- Voluntary Residential Relocation Program
 - 2,159 Families
- QuieterHome Sound Insulation Program
 - 542 Families Completed
 - Additional 552 Families In Progress
- University of Louisville Sound Insulation
 - 24 Residential/Academic Buildings





- Program Management
- Full-time airport staff dedicated to noise/environmental issues
- Near real time <u>flight tracking</u>
- Direct line for noise complaints
 - **502-363-8516**
- Community Noise Forum



- Community Noise Forum
 - FAA approved measure in Noise Compatibility Program
 - <u>Chartered by the Louisville Regional Airport Authority</u>
 - Serves as primary means of communicating with public on noise and environmental issues
 - Responsible for monitoring implementation of Noise Compatibility Program by...
 - Assessing the effectiveness of its component measures
 - Formulating proposed changes and refinements
 - Collecting necessary knowledge and materials to facilitate future Program updates
 - Members include:
 - LRAA Board of Directors and Management
 - Louisville Air Traffic Control staff
 - Louisville Airport Affairs Committee
 - <u>UPS</u>
 - Kentucky Air National Guard
 - General Aviation community at SDF
 - Airport Neighbors' Alliance (ANA)
 - <u>University of Louisville</u>
 - Louisville Metro Government
 - Representatives from quadrants surrounding the airport

Program Funding Through the Airport Improvement Program:

- Approved NCP measures may be eligible for Federal funding
 - Sound Insulation
 - Relocation
- Provided in the form of matching grants from the Aviation Trust Fund
- Trust Fund sustained by taxes on tickets, fuel, air cargo, and other expendables (tires) used by general aviation
- Federal funding level is 75% to 90% dependent upon size of the airport and number of passengers



Community Noise Forum (CNF)

<u>Airport Website www.flylouisville.com</u>

Airport Authority Noise Office (502) 363-8516

Questions?

