Aviation Noise 101

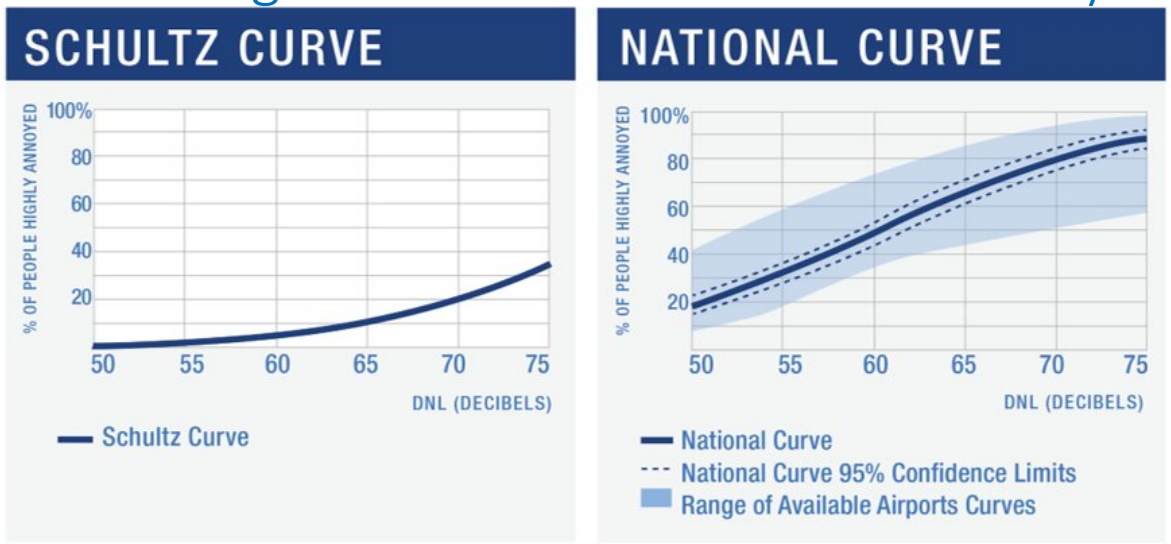
November 2021

CELEBRATING 40 YEARS

Topics

- Federal Regulations
- California Noise Standards
- Noise Metrics
- Modeling v. Measurements

FAA Neighborhood Environmental Survey



The new Survey was designed to use a consistent approach across each airport community surveyed. This has allowed for an enhanced ability to provide additional statistical information about the new results, such as the 95% Confidence Limits and range of results from each of the 20 airports, as shown on the plot above. This was not possible with the older Schultz Curve.

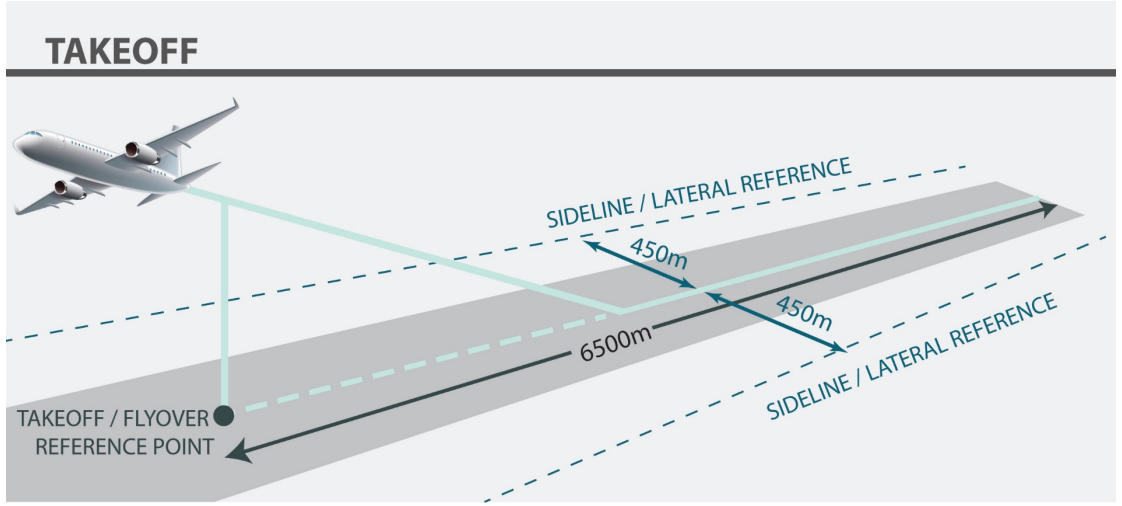
Federal Regulations

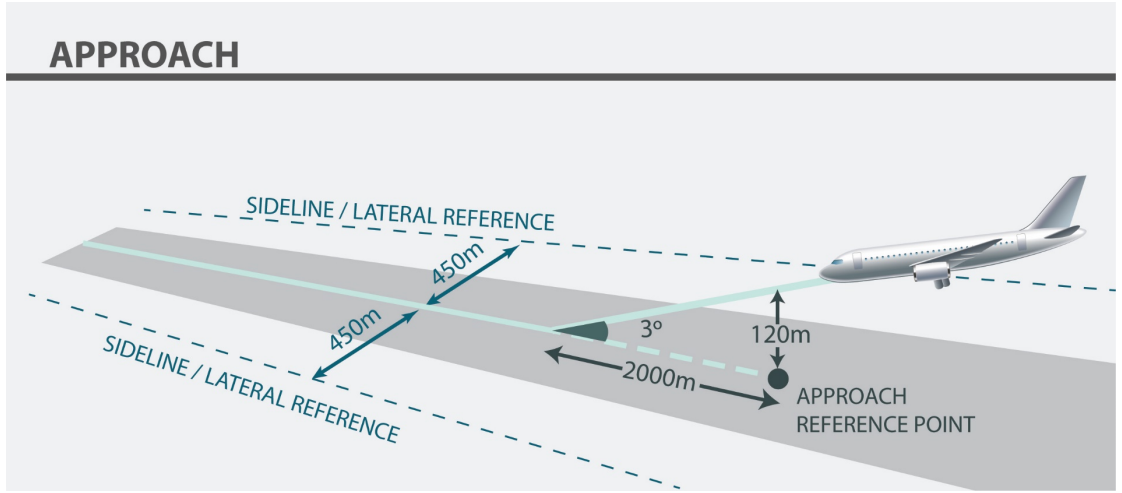
Statute	Aircraft Noise Related Purpose	Most Relevant FAA Regulation(s)
Aircraft Noise and Sonic Boom Act of 1968	Authorizes FAA to prescribe standards for measurement of aircraft noise and establish regulations to abate noise	14 CFR parts 36 and 91
National Environmental Policy Act of 1969 (NEPA)	Directs all federal executive agencies to assess all environmental effects of proposed federal agency actions	FAA Orders 1050.1F, 5050.4B
The Noise Control Act of 1972 (Noise Act)	Amends 1968 act to add consideration of public health and welfare and to add EPA to the rulemaking process for aircraft noise and sonic boom standards	None directly; EPA responsibility
Aviation Safety and Noise Abatement Act of 1979 (ASNA)	Directs FAA to establish single system to measure noise and determine exposure of people to noise, and identify land uses normally compatible with various noise levels	14 CFR part 150
Airport and Airway Improvement Act of 1982	Authorizes FAA funding for noise mitigation/compatibility planning and projects and establishes noise compatibility requirements for FAA-funded airport development	FAA Airport Improvement Program
Airport Noise and Capacity Act of 1990 (ANCA)	Mandates phase out of Stage 2 jet aircraft over 75,000 pounds, and established requirements regarding airport noise and access restrictions for Stage 2 and 3 aircraft	14 CFR part 161
Section 506 of the FAA Modernization and Reform Act of 2012	Prohibition after 12/31/2015 of operation of civil subsonic jet airplanes with maximum weights of 75,000 pounds or less that do not meet stage 3 noise standards	14 CFR part 91
FAA Reauthorization, 2018	Reauthorizes FAA through 2023, which included 14 noise provisions	None yet

Results of Aircraft Noise and Sonic Boom Act of 1968

14 CFR Part 36

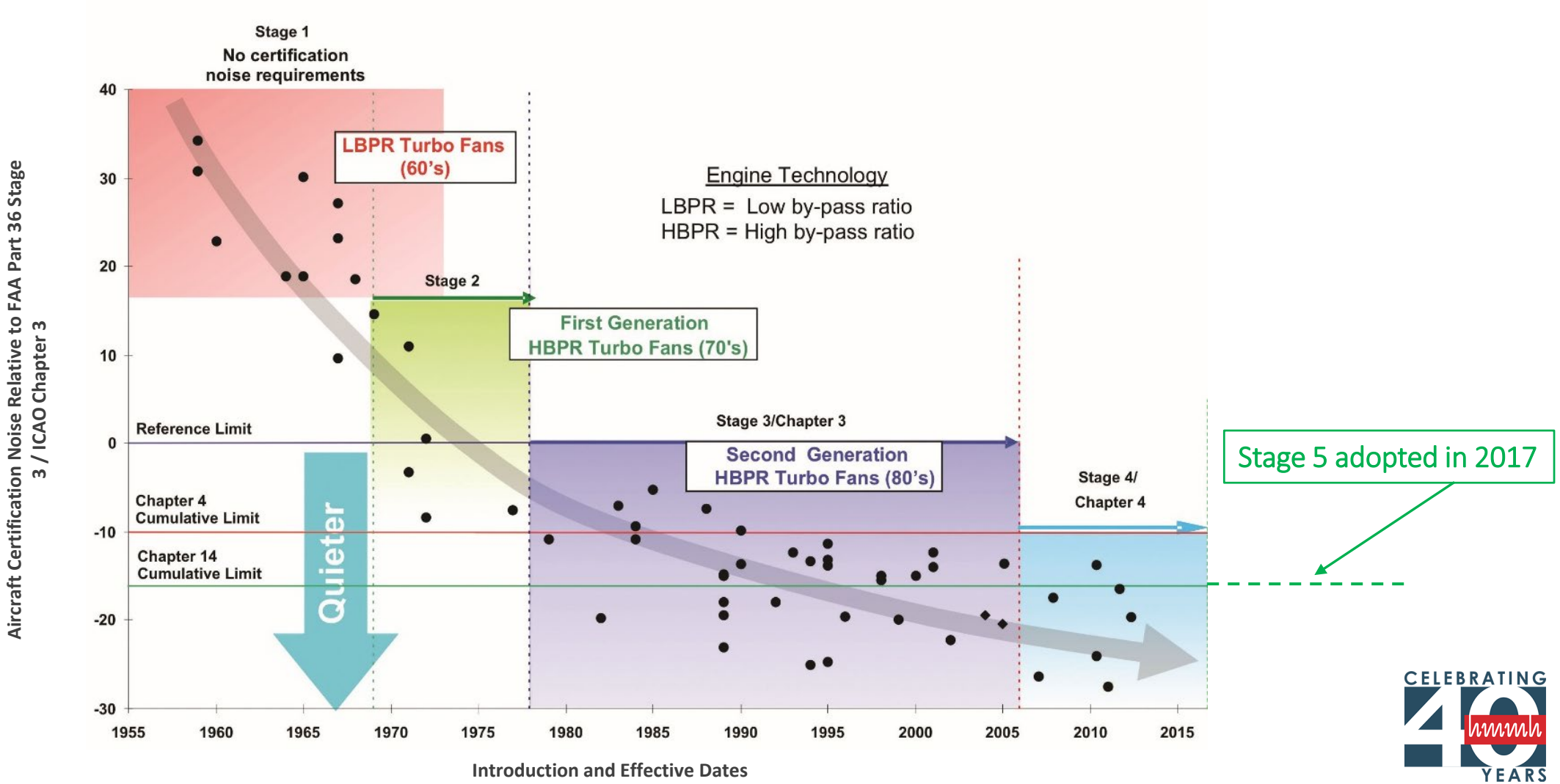
- Noise standards vary by design criteria and are in terms of “stages”
- Aircraft must meet Part 36 standards to obtain new or revised "type" or “airworthiness” certificates to operate in the U.S.
- The standards address noise limitations depending on aircraft type and weight
- Certification for most aircraft is based on three measurements:
  - Landing
  - Sideline
  - Takeoff





Measurement locations can vary with aircraft stage, number of engines, and lift mechanism. Some types are certificated based on level flyover.

Aircraft Noise Certification Stages



Results of the National Environmental Policy Act of 1969 (NEPA)

NEPA (1969)

- Governs federal actions with possible environmental impacts
  - President's Council on Environmental Quality (CEQ) provides oversight
  - Defined procedures for all federal agencies to prepare environmental assessments (EAs) and environmental impact statements (EISs)
- FAA Order 1050.1F, "Policies and Procedures for Considering Environmental Impacts"
  - Applies to all FAA "lines of business"
- FAA Order 5050.4B, "Airport Environmental Handbook"
  - Airports Division guidelines
- Draft FAA Order 7490, "Air Traffic Environmental Order"
  - Air Traffic Division guidelines
- Compliance with NEPA is responsibility of FAA – not airports
  - Airports should participate as fully as feasible to monitor their interests

NEPA
Three Levels of Environmental Analyses

- Categorical Exclusion – CatEx
- Environmental Assessment – EA
- Environmental Impact Statement – EIS

CatEx List

The FAA has determined that the following actions do not individually or cumulatively have a significant effect on the human environment (FAA Order 1050.1F, Section 5-6)

- **Administrative/General -** Actions that are administrative or general in nature
- **Certification -** Actions concerning issuance of certificates or compliance with certification programs
- **Equipment and Instrumentation -** Actions involving installation, repair, or upgrade of equipment or instruments necessary for operations and safety
- **Facility Siting, Construction, and Maintenance -** Actions involving acquisition, repair, replacement, maintenance, or upgrading of grounds, infrastructure, buildings, structures, or facilities that generally are minor in nature
- **Procedural -** Actions involving establishment, modification, or application of airspace and air traffic procedures
- **Regulatory -** Actions involving establishment of, compliance with, or exemptions to, regulatory programs or requirements

Noise Thresholds for Aviation Projects (NEPA)

- Significant Impact
  - 1.5 dB increase within 65 DNL
- Less than significant impact
  - 3 dB increase between 60 and 65 DNL
  - 5 dB increase between 45 and 60 DNL triggers additional analyses for air traffic actions

Table 5-5 – Color Coding Based on Change in DNL

Baseline DNL	Change in Noise Level from Baseline to Alternative	
	Increase	Decrease
< 45 dB	No color	No color
45-<50 dB	+ 5 dB (yellow)	- 5 dB (purple)
50-<55 dB		
55-<60 dB		
60-<65 dB	+ 3 dB (orange)	- 3 dB (blue)
> 65 dB	+ 1.5 dB (red)	- 1.5 dB (green)

Historical Background

Federal Interagency Committee on Noise ("FICON"), 1992

- 1.5 dB increase in DNL within 65 dB DNL
- 3 dB increase in DNL between 60 and 65 dB DNL

Expanded East Coast Plan ("EECP") EIS, 1992-3

FAA Order 7400.2M (Policies and Procedures for Air Traffic Environmental Actions)

Order 1050.1F "Desk Reference" provides detailed guidance

Results of the Aviation Safety and Noise Abatement Act of 1979 (ASNA)

Airport Noise Compatibility Planning (14 CFR Part 150)

The Aviation Safety and Noise Abatement Act of 1979 ("ASNA") required FAA to:

- Establish a single, uniform, repeatable system for considering aviation noise around airport communities.
- Establish a single system for determining noise exposure from aircraft, which takes into account noise intensity, duration of exposure, frequency of operations, and time of occurrence.
- Identify land uses which are normally compatible with various exposures of individuals to noise

14 CFR Part 150 prescribes standards and systems for:

- Measuring noise
- Estimating cumulative noise exposure using computer modeling
- Describing noise exposure
- Coordinating with local land use agencies
- Documenting the analytical process
- Submitting the documentation to FAA
- FAA and public review processes
- FAA approval/disapproval process

FAA Noise Abatement Policy, November 1976

Established roles and responsibilities for:

- *Federal government* – source emissions, air traffic control, funding, and safety oversight
- *State and local governments* – compatible land use planning and control
- *Aircraft operators* – noise-sensitive schedules, cockpit procedures, and fleet improvements
- *Air travelers and shippers* – bear the costs
- *Current and prospective residents* – seek to understand and act accordingly
- *Airport operators* – primary responsibility for planning and implementing all noise abatement and compatible land use measures

Results of the Airport Noise and Capacity Act of 1990 (ANCA)

Airport Noise and Capacity Act of 1990, ANCA

Act requirement	FAA Action
Required FAA to establish phase-out of Stage 2 aircraft over 75,000 pounds	FAA promulgated Part 91 amendment (1991)
Required FAA to establish regulations regarding analysis, notice, and approval of airport noise and access restrictions	FAA implemented through FAR Part 161 (1991)
Required FAA to develop "national aviation noise policy" by July 1, 1991	FAA published draft "Aviation Noise Abatement Policy 2000" on July 14, 2000 to replace the 1976 Federal Noise Abatement Policy

14 CFR Part 161: Notice and Approval of Airport Noise and Access Restrictions

Establishes the federal program for reviewing noise and access restrictions on the use of Stage 2 and 3 aircraft (and beyond – though not written)

- Requires extensive benefit cost analyses
- Requires extensive notice process
- Requires different level of analysis for Stage 2 and 3 aircraft
- Requires separate analysis of effects on aircraft less than 75,000 pounds
- Encourages voluntary agreements

14 CFR Part 161 – in practice

- Stage 2 restrictions are moot as of January 1, 2016
- Restricting noisier Stage 3 aircraft types unlikely
- Many potential roadblocks
- Study of last resort
- Two restrictions since ANCA:
  - Naples Airport Stage 2 ban (via Part 161)
  - Van Nuys Airport Stage 2 phaseout (grandfathered)

Boeing 727 (Stage 2) Aircraft

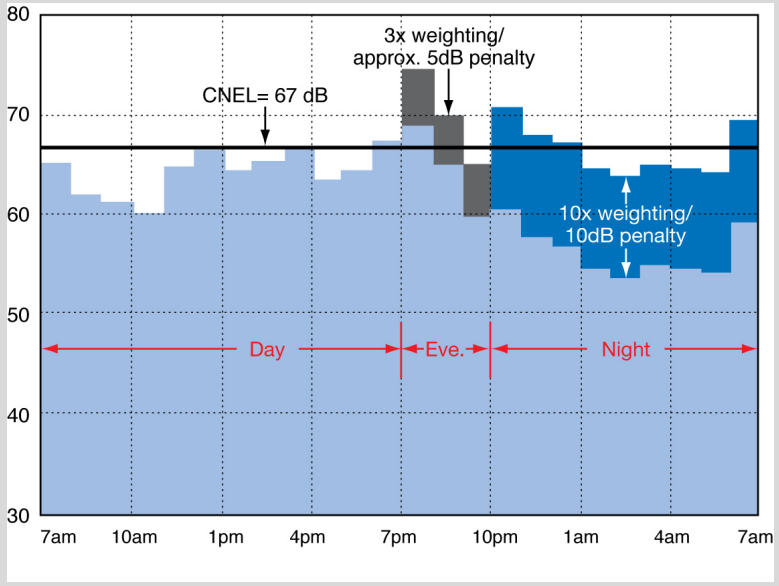
- In Service beginning in 1964
- Certificated for noise in 1968

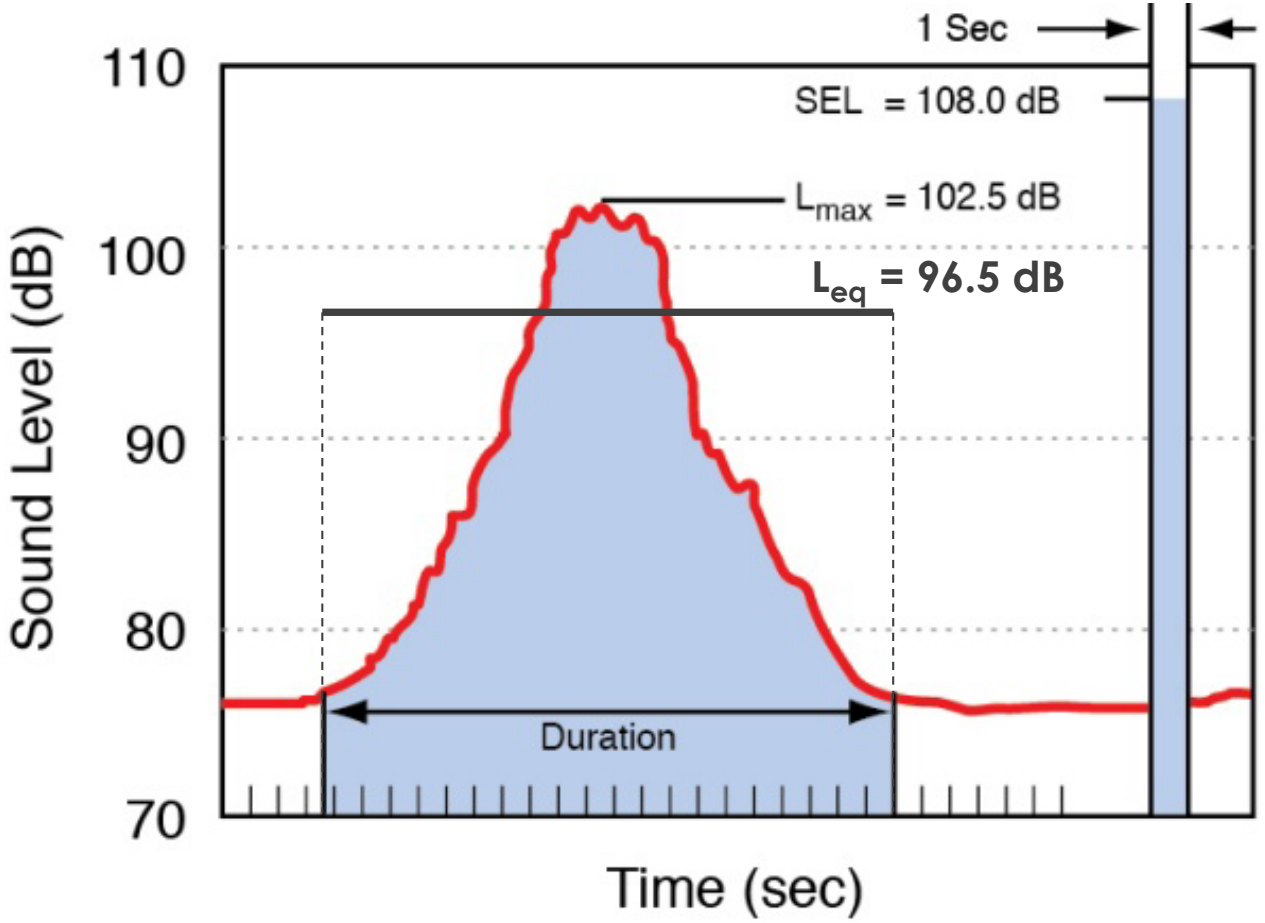
California Noise Standards
Title 21

- *Purpose*: To resolve existing noise problems and prevent new noise problems
- *Standard*: 65 CNEL as the acceptable level for persons residing near an airport
  - No airport shall operate with a noise impact area without a variance
- *Noise impact area*: Area within the noise impact boundary (65 CNEL) that is composed of incompatible land use
- *Noise problem airport*: Counties may designate an airport as having a noise problem based on existence of a noise impact area, noise complaints, and/or litigation among other criteria
- *Requirements*: Noise monitoring to validate the noise impact boundary, quarterly reporting and operating variance (for airports with a noise impact area)

Noise Metrics

- Maximum Noise Level (L_{max})
- Single-Event Noise Exposure Level (SENEL)
- Equivalent Sound Level (L_{eq})
- Hourly Noise Level (HNL or L_{eq1h})
- Community Noise Equivalent Level (CNEL)





Additional Noise Metrics

Metric	Description
Time Above (TA)	Time above a pre-determined noise level over the duration of the analysis period
Number Above (NA)	Number of aircraft events above a pre-determined noise level over the duration of the analysis period
Effective Perceived Noise Level (EPNL or EPNdB)	Similar to SENEL but includes a weighting for pure tones; and is used for aircraft noise certification
Day Evening Night Sound Level (Lden)	Similar to CNEL but allows the time periods to be adjusted
Noise Exposure Forecast (NEF)	Similar to CNEL only no weighting for evening and 16.7 multiplier for nighttime

Noise Modeling vs. Noise Measurements

- Modeling
  - Required by FAA to determine:
    - Land use compatibility
    - Change due to a federal action
  - Provides for consistent means for preparing airport noise contours
  - Noise estimates of future scenarios
  - Noise levels throughout study area
  - Model includes only aircraft noise in the results

- Measurements
  - Required by Caltrans to determine and validate the location of the noise impact boundary
  - Federal funding of fixed monitoring sites only allowed within the 65 CNEL noise contour
  - Provides historical record of noise levels
  - Measures at discrete locations
  - May be difficult to measure only aircraft noise

Questions