



LAX Community Noise Roundtable

Aircraft Noise 101

November 12, 2014

Overview



- **Roles and Responsibilities for Aircraft Noise**
- **Relevant Federal Regulations**
- **Relevant California Regulations**
- **Aircraft Noise Metrics**
- **Noise “Rules of Thumb”**

Roles and Responsibilities



- **FAA's 1976 Aviation Noise Abatement Policy states that the primary players in aircraft noise issues are:**
 - **Federal Government**
 - **Airport Proprietors**
 - **State and Local Governments and Planning Agencies**
 - **Aircraft Operators**
 - **Residents and Prospective Residents**

Roles and Responsibilities



- **The Federal Government (i.e., the FAA)**
 - **Sets noise level requirements for aircraft**
 - **Provides funding for, and approval of, noise compatibility planning (when appropriate and/or when funds are available)**
 - **Manages the air traffic control and airspace system**

Roles and Responsibilities



- **Airport Proprietors**

- **Plan and implement actions designed to reduce the adverse effects of noise on residents of the surrounding area including:**

- **Improvements in airport design**
 - **Noise abatement ground procedures**
 - **Promote noise mitigation alternatives**
 - **Restrictions on airport use***

***Severely limited by the 1990 Aircraft Noise and Capacity Act (ANCA)**

Roles and Responsibilities



- **State and Local Governments and Planning Agencies**
 - **Plan the land uses around an airport in a manner that will be compatible with airport and aircraft operations**

Roles and Responsibilities



- **Aircraft Operators**
 - Fly quieter aircraft
 - Fly responsibly
 - Safety first and foremost
 - Use industry recommended noise abatement procedures
 - Use preferred noise abatement runways
 - Follow airport's published noise abatement procedures
 - Follow noise abatement flight tracks
- Pilot in command has sole responsibility for the safe operation of his or her aircraft

Roles and Responsibilities



- **Aviation system users pay for the entire aviation system including the adverse impacts of noise**
 - **Passengers, air cargo operators, general aviation pilots, corporate aviation, and flight schools finance airport development, maintenance, and the cost of noise-reducing measures such as:**
 - **New quieter aircraft**
 - **Research and development into noise reducing technologies**
 - **Planning and land use compatibility studies**
 - **Land acquisition, sound insulation**
 - **Ground runup enclosures**

Roles and Responsibilities



- **Current and Prospective Residents**
 - **Current Residents:**
 - **Seek to understand the noise problem and what can be done to minimize its effects**
 - **Recognize that everybody responds to noise differently; reducing the noise level may not eliminate your annoyance**
 - **Prospective Residents:**
 - **Be aware of the potential effects of aircraft noise on your future quality of life and act accordingly**

Regulatory Framework



- **Federal law sets aircraft noise standards, prescribes operating rules, establishes the federal compatibility planning process, and limits airport proprietor's ability to restrict aircraft operations**
- **State law sets forth state land use compatibility planning guidelines and noise standards, but exempts aircraft in flight***
- **Local noise ordinances set noise standards and provide for compatible land use planning, but exempt aircraft in flight***

***FEDERAL LAW PREEMPTS STATE AND LOCAL REGULATIONS**

Regulatory Framework



- **There are many Federal Aviation Regulations (FARs) related to aircraft noise, including but not limited to:**
 - **FAR Part 36 – Noise Standards: Aircraft Type and Airworthiness Certification**
 - **FAR Part 91 – General Operating and Flight Rules**
 - **FAR Part 150 – Airport Noise Compatibility Planning**
 - **FAR Part 161 – Notice and Approval of Airport Noise and Access Restrictions**

Regulatory Framework



- **There are many FAA Orders that provide guidance on noise analyses and funding for noise-related projects, including but not limited to:**
 - **FAA Order 1050.1E – Environmental Impacts: Policies and Procedures**
 - **FAA Order 5050.4B – National Environmental Policy Act Implementing Instructions for Airport Actions**
 - **FAA Environmental Desk Reference for Airport Actions**
 - **FAA Order 5100.38D – Airport Improvement Handbook**
 - **Incorporates the guidance in PGL 12-09**

Aircraft Noise Metrics - Federal



- **Federal Aviation Regulation (FAR) Part 150 prescribes aircraft noise metrics and methodology to be used in assessing aircraft noise exposure in federally-funded noise studies**
 - Decibel (dB)
 - A-weighting (dBA)
 - Maximum A-weighted sound level (Lmax)
 - Sound Exposure Level (SEL)
 - Day-Night Average Sound Level (DNL)
 - The Integrated Noise Model (INM)
 - Modeling only, no noise measurements

Aircraft Noise Metrics - California

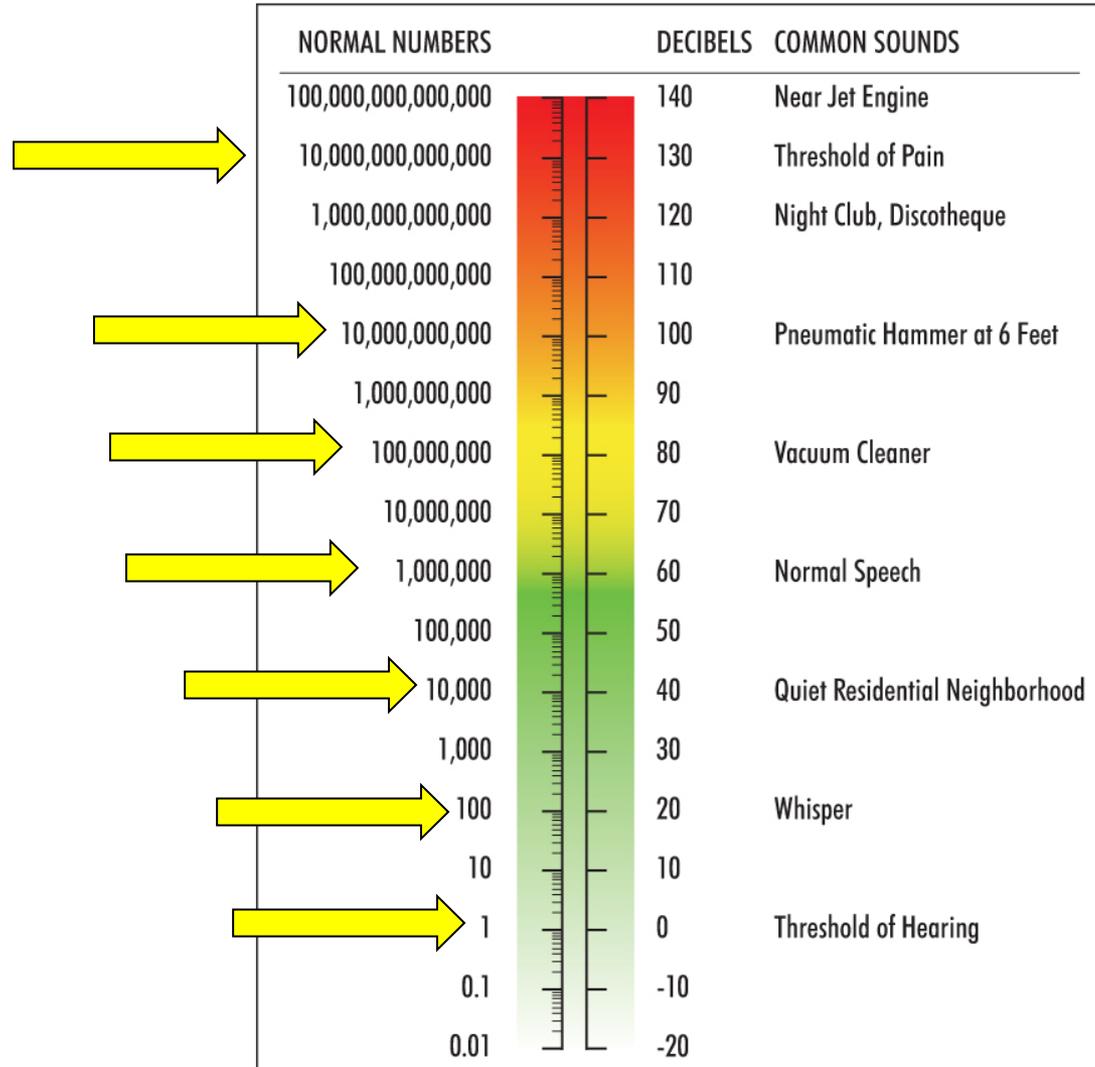


- **California Code of Regulations Title 21 prescribes aircraft noise metrics and methodology to be used in assessing aircraft noise exposure in California**
 - Decibel (dB)
 - A-weighting (dBA)
 - Noise Exposure Level (NEL)
 - Single Event Noise Exposure Level (SENEL)
 - Hourly Noise Level (HNL)
 - Community Noise Equivalent Level (CNEL)
 - “. . . an approved computer model and the data reported by the noise monitoring system.”

Aircraft Noise Metrics



The Decibel Scale



Aircraft Noise Metrics

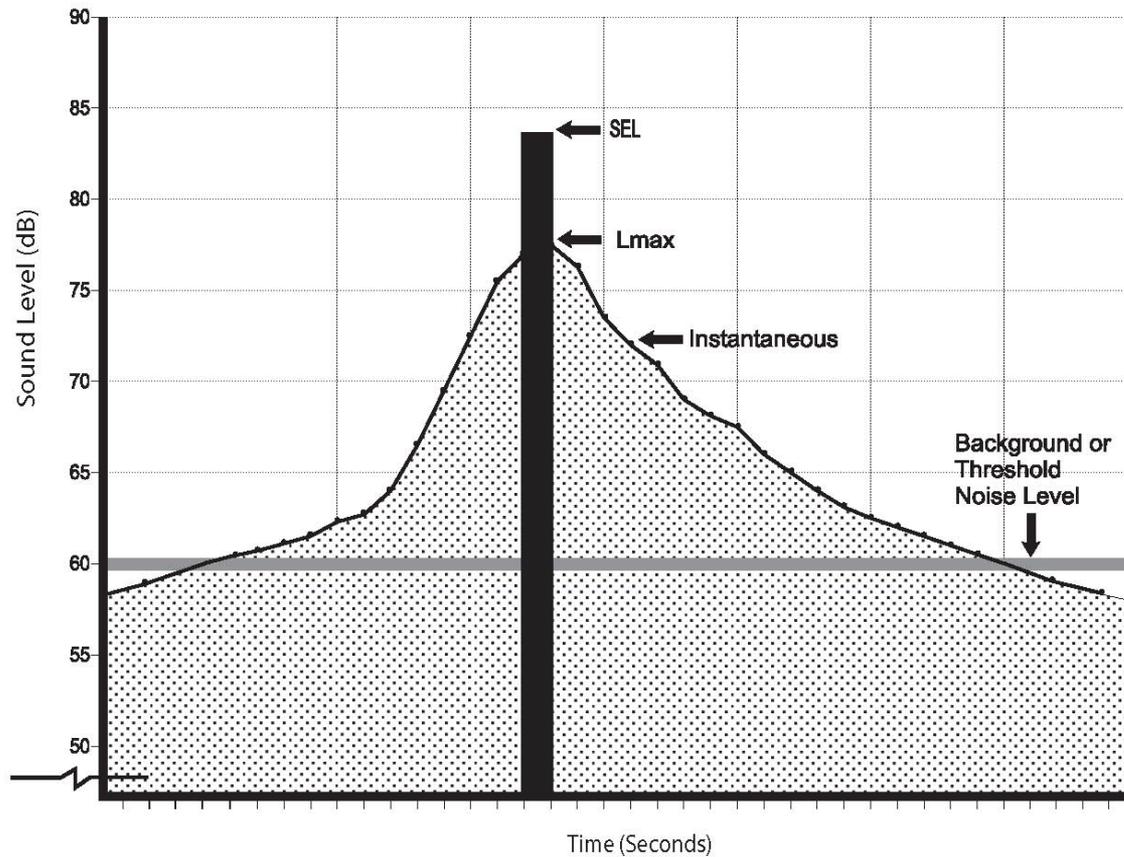


- **Frequency-Weighted Metrics (dBA)**
- **Maximum Noise Level (Lmax)**
- **Sound Exposure Level (SEL) or Single Event Noise Exposure Level (SENEL)**

Aircraft Noise Metrics



Instantaneous Level, Lmax, SEL, Background Level

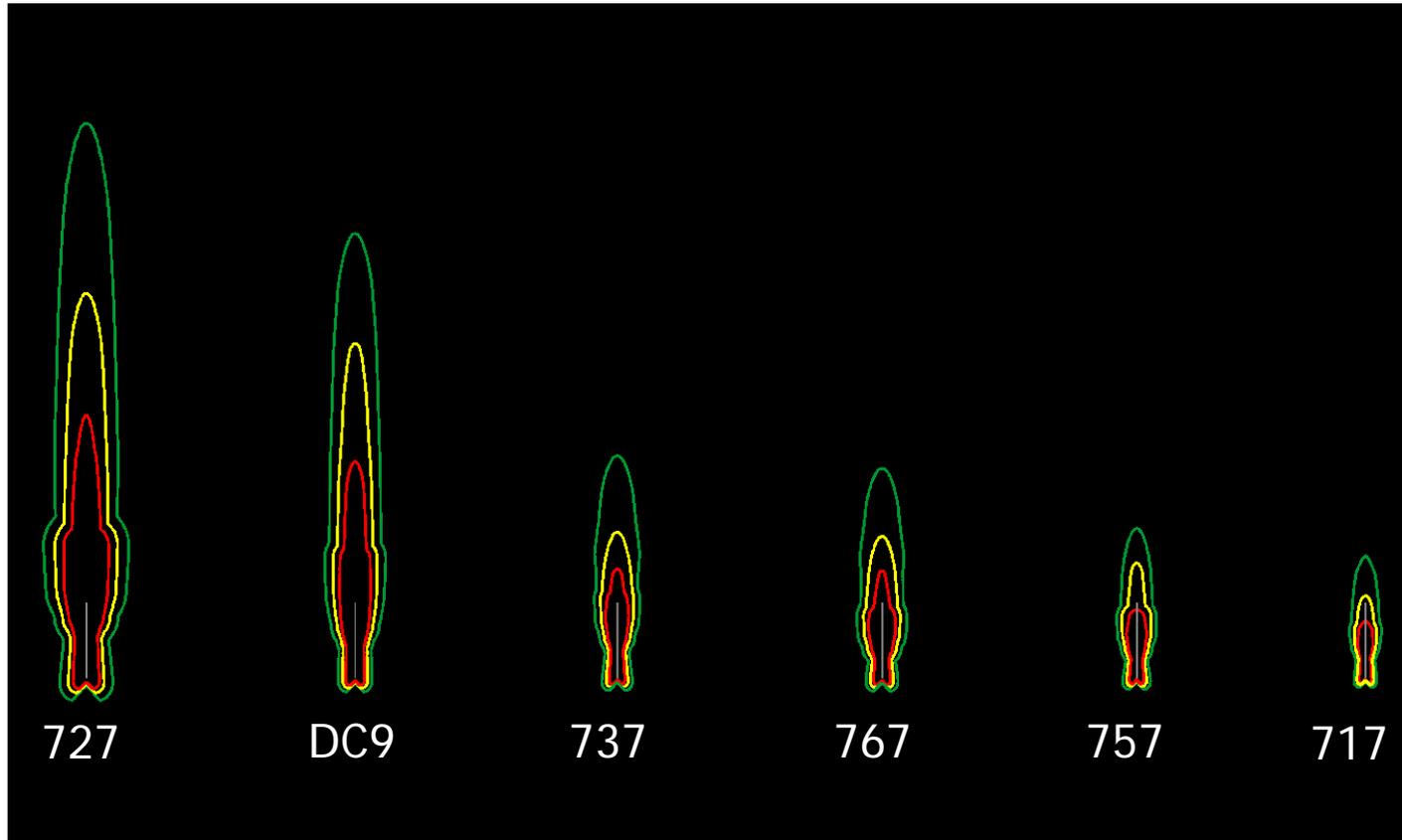


Aircraft Noise Metrics



- **Supplemental metrics, such as Sound Exposure Level (SEL) and Maximum Sound Level (Lmax), can be used for evaluation purposes; however, there are no federal or California standards for their use in quantifying aircraft noise impacts**

Departure Lmax Contours



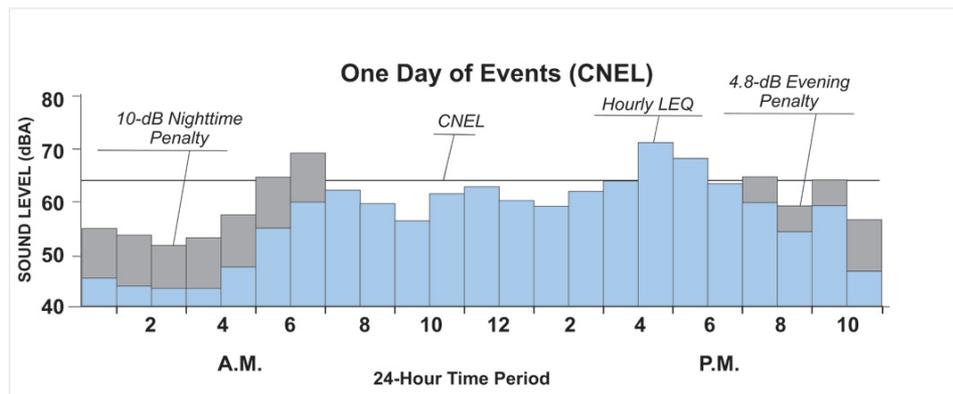
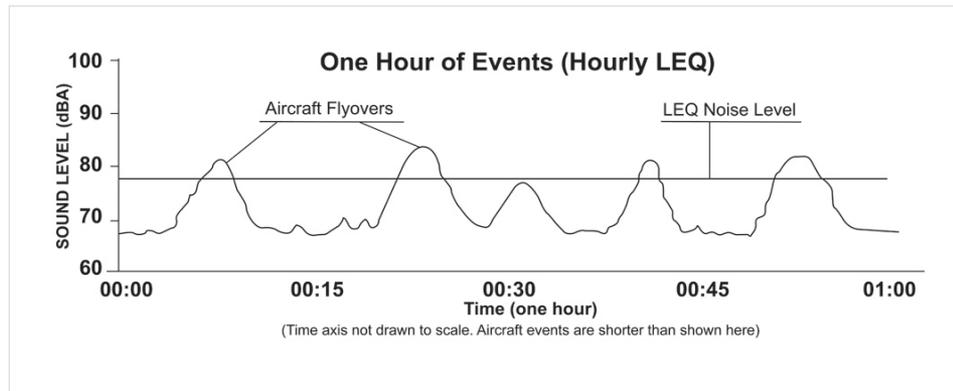
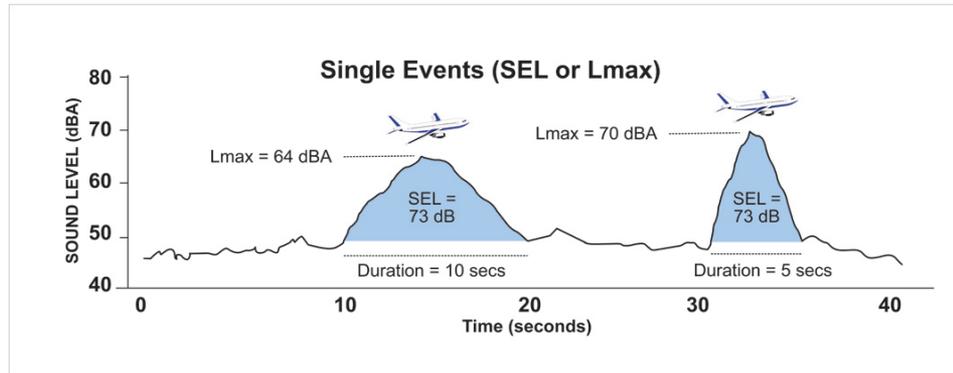


- **Day-Night Average Sound Level (DNL)**
 - 24-hour time weighted energy average noise level based on dBA
 - Noise occurring between 10 p.m. to 7 a.m. is penalized by 10 dB
 - Penalty was selected to account for the higher sensitivity to noise in the nighttime and accounts for the expected decrease in background noise levels that typically occur in the nighttime
 - FAA specifies DNL for airport noise assessment
 - Environmental Protection Agency (EPA) specifies DNL for community noise and airport noise assessment



- **Community Noise Equivalent Level (CNEL)**
 - 24-hour time weighted energy average noise level based on dBA
 - Each noise event occurring between 7 p.m. to 10 p.m. is treated as three events and penalized by 4.77 dB
 - Each noise event occurring between 10 p.m. to 7 a.m. is treated as ten events and penalized by 10 dB
 - Penalties were selected to account for the higher sensitivity to noise during the evening and nighttime periods and account for the expected decrease in background noise levels that typically occur in the evening and nighttime
 - FAA permits the use of CNEL for airport noise assessment in California, Caltrans requires the use of CNEL for determining aircraft noise exposure

Aircraft Noise Metrics



Aircraft Noise Metrics - Federal



- **FAR Part 150:**
 - **Defines 65 DNL as the federal guideline for incompatibility**
 - **Considers all land uses outside the 65 DNL contour line to be compatible with aircraft noise**

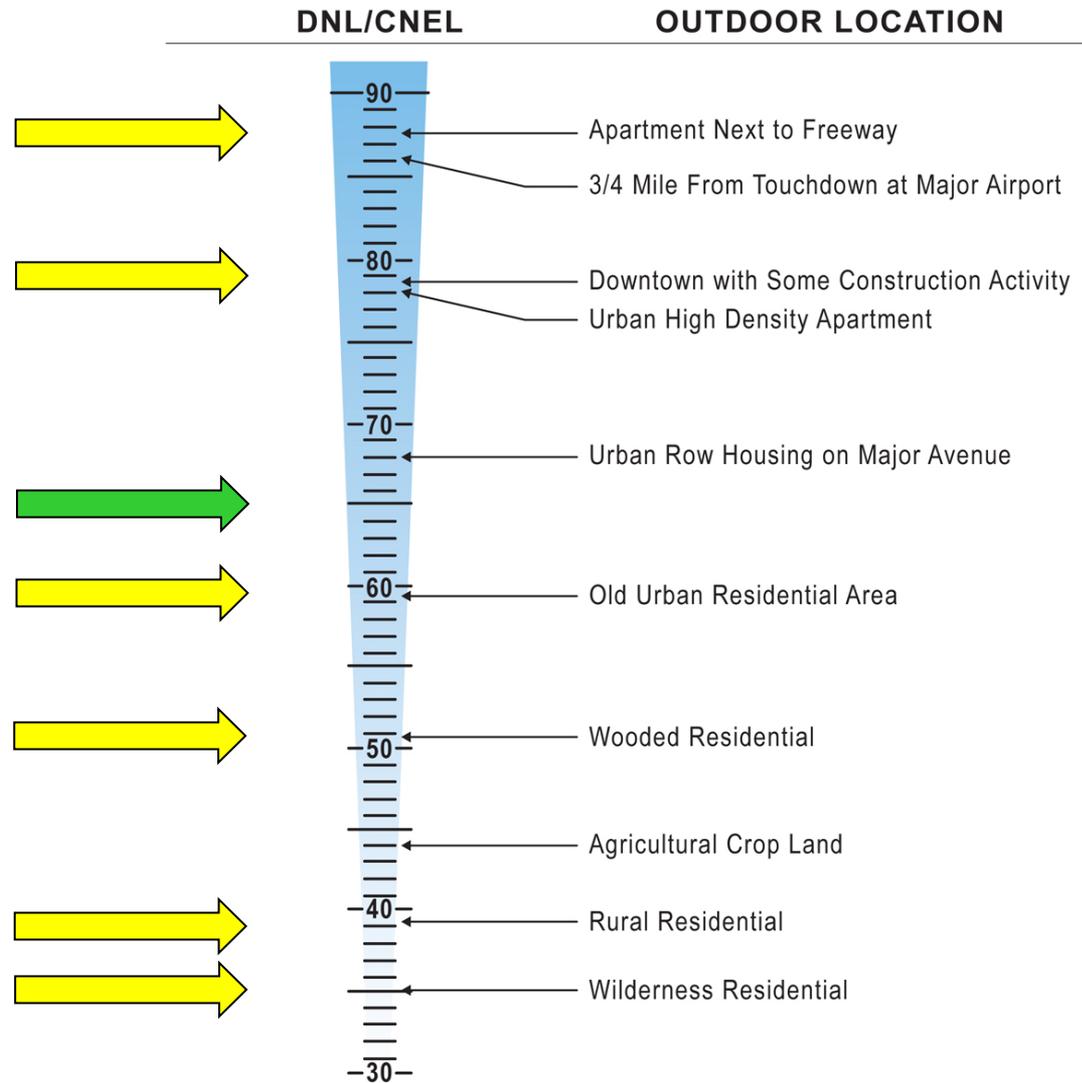


- **Title 21 Noise Standards:**
 - **Defines 65 CNEL as the state guideline for incompatibility**
 - **Considers all land uses outside the 65 CNEL contour line to be compatible with aircraft noise**
 - **“...chosen for reasonable persons residing in urban residential areas where houses are of typical California construction and may have windows partially open. It has been selected with reference to speech, sleep and community reaction.”**

Outdoor Noise Environs



65 CNEL



Aircraft Noise Metrics



IDENTICAL DNL/CNEL LEVELS

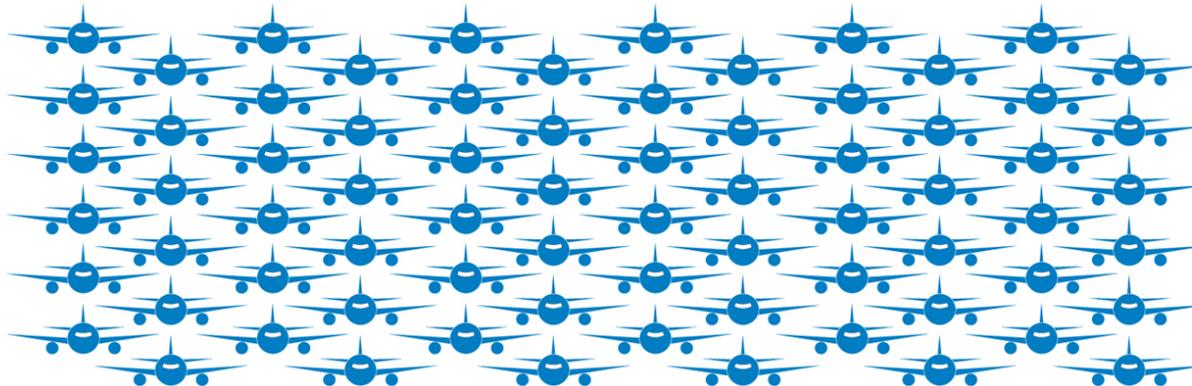
1 Event/Day SEL 114.4 dBA = DNL/CNEL 65



10 Events/Day SEL 104.4 dBA = DNL/CNEL 65



100 Events/Day SEL 94.4 dBA = DNL/CNEL 65



Rules of Thumb – Single Event Noise



- **It takes a 3 dB change in the level of a single noise source for most people to notice a difference**
- **A 10-dB increase or decrease in the level of a single noise source is typically perceived as doubling or halving of the loudness, respectively**
- **Doubling or halving of the distance from the source the receiver equates to +/- 6 dB sound level change**

Rules of Thumb – Cumulative Noise



- **A doubling or halving the airport operations equates to a +/- 3 dB change in CNEL**
- **A 1.5 dB change in noise sensitive areas exposed to 65 CNEL or greater is considered significant**
- **People are more sensitive to changes in exposure than the absolute level**

Aircraft Noise 101



Questions?