FICAN
San Diego 2001

SINGLE EVENT NOISE METRICS

Definitions

and

Examples of Use

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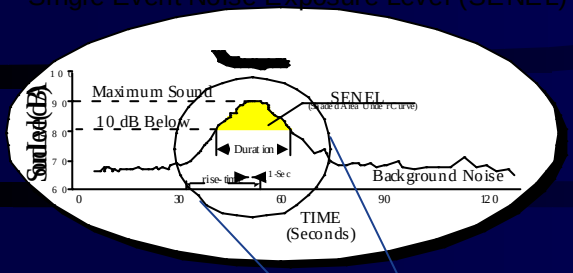
Outline

- FICON - Use of Supplemental Metrics
- Definitions of Some Useful Metrics
- Presenting Single Event/Time Above Data
- Summary - Uses For Supplemental Metrics

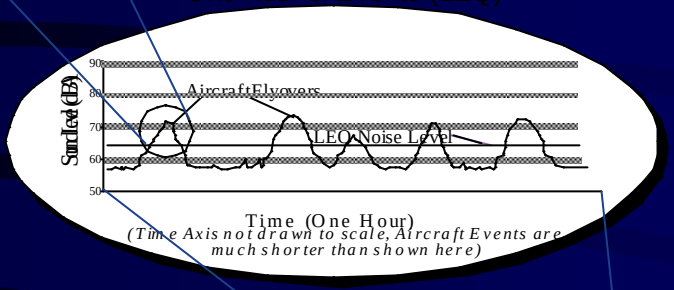
FICON and Single Events

- "After reviewing all noise exposure metrics, the FICON technical subgroup concluded that no other metrics are of sufficient scientific standing to replace DNL."
- "Continue agency discretion in the use of supplemental noise analysis."
  - "Supplemental analyses are most often used to determine aircraft noise impacts at specific noise sensitive locations, particularly in analyses of of speech interference and sleep disturbance."
    - SENEL (SEL), Lmax, TA

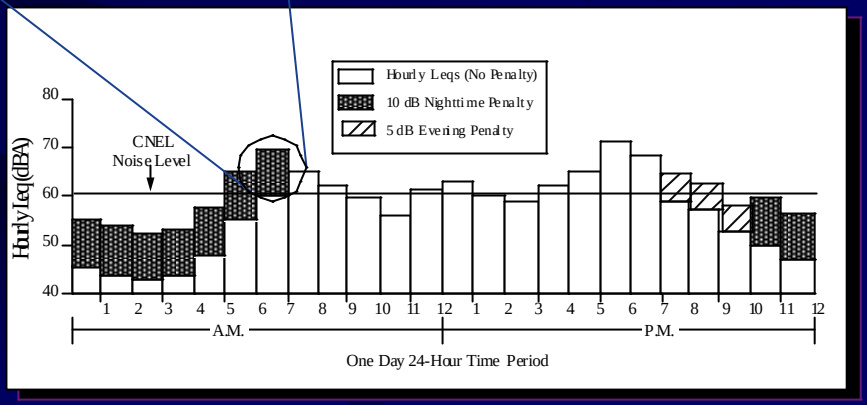
Single Event Noise Exposure Level (SENEL)



One Hour of Events (LEQ)



24-Hour Noise Level (CNEL)



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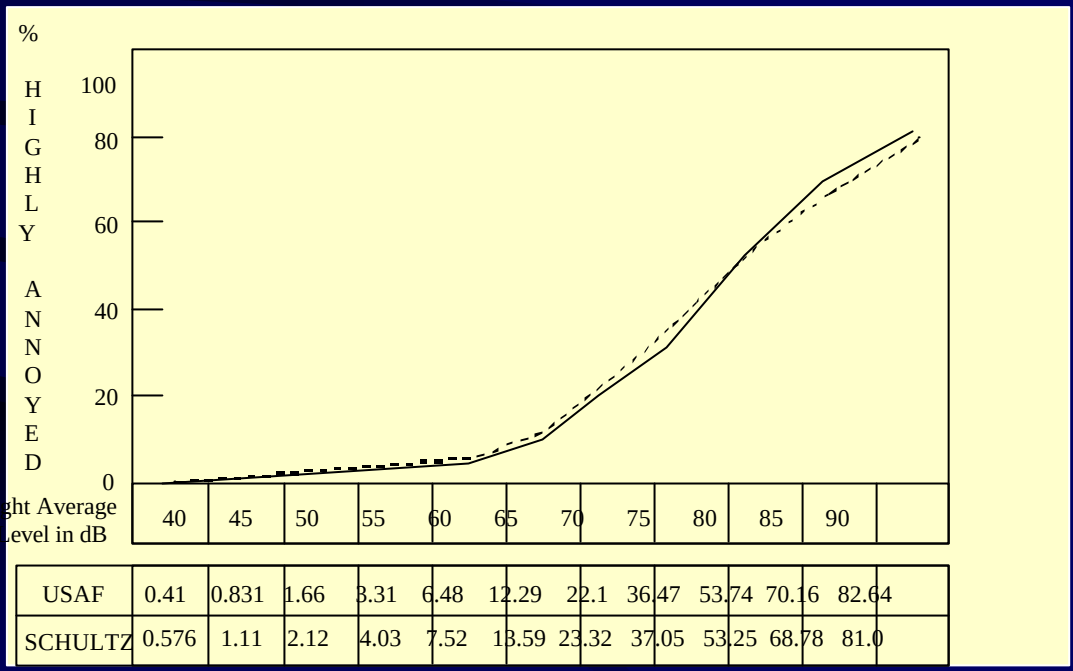
CNEL/Human Response - The Science

- DNL: the only noise metric well correlated to human response, the Dose-Response relationship:



USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81.0

Ficon 1992

Other Noise Metrics

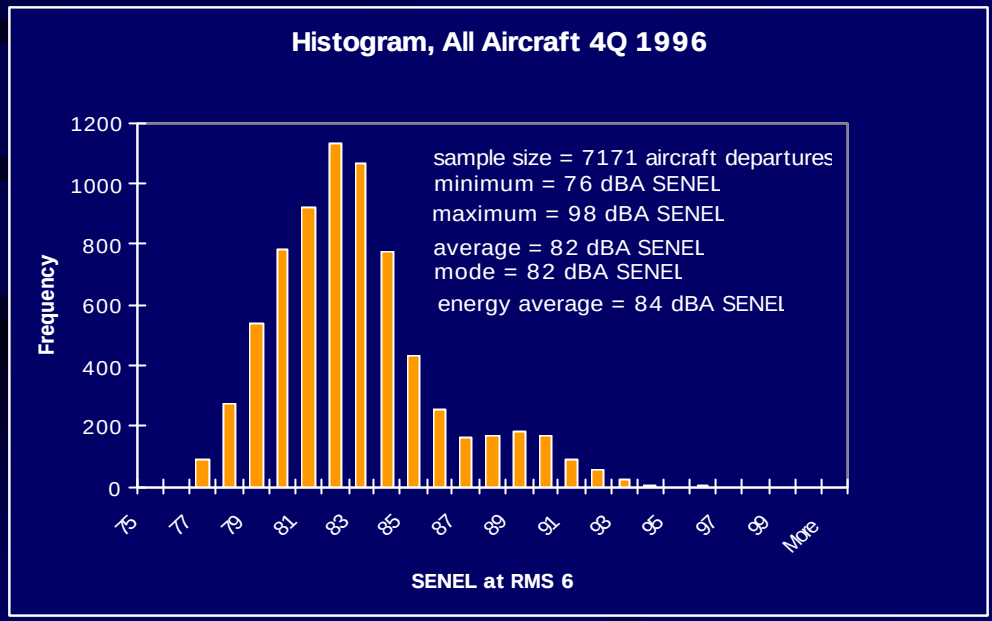
- Single Event Noise Exposure Level/Sound Exposure Level (SEL/SENEL, dBA)
- Maximum Noise Level (Lmax, dBA)
- Time Above (t, minutes)

Single Event Metrics
"The Dark Side"

- "Single" event is defined as the noise associated with one and only one event.
- At any given location there may be hundreds of thousands of noise events in a year, or hundreds per day.
  - Which noise event should be reported as the "single event noise"?

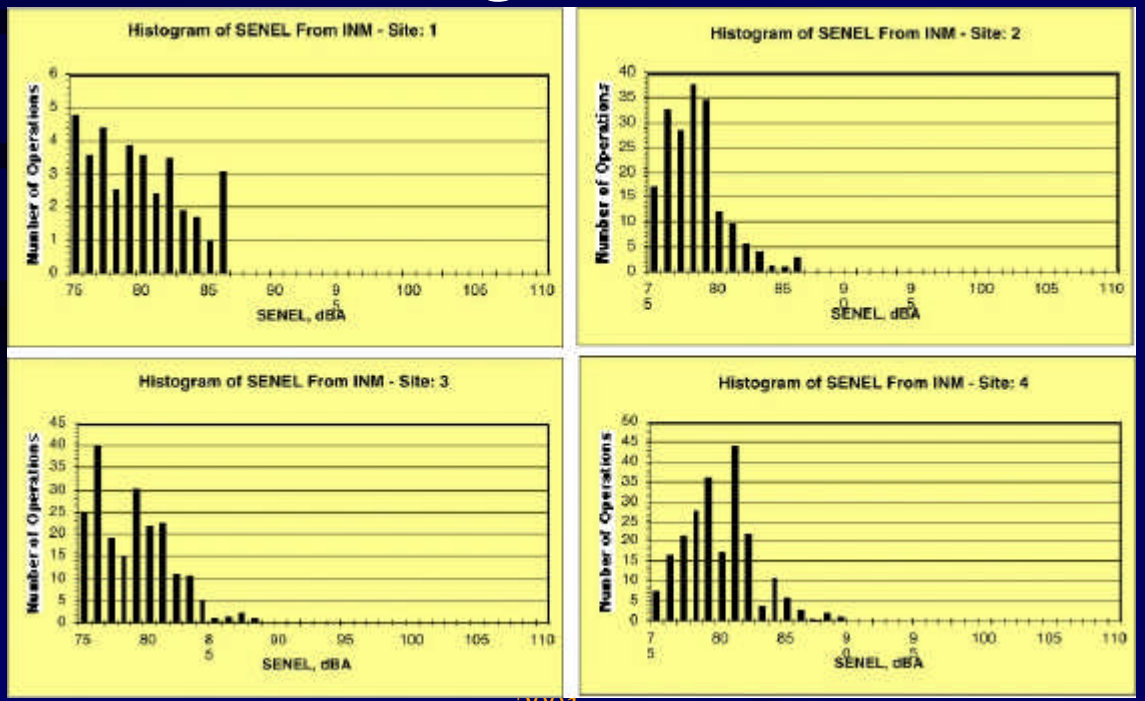
Best Answer: All of Them!

- Measured Data Is Best Source For Single Events
- INM estimates the Energy Average SENEL/SEL
- Most probable is mode



INM and Single Event Noise

- With sufficient detail in fleet mix and flight track conversion, INM can simulate the measurement histogram:

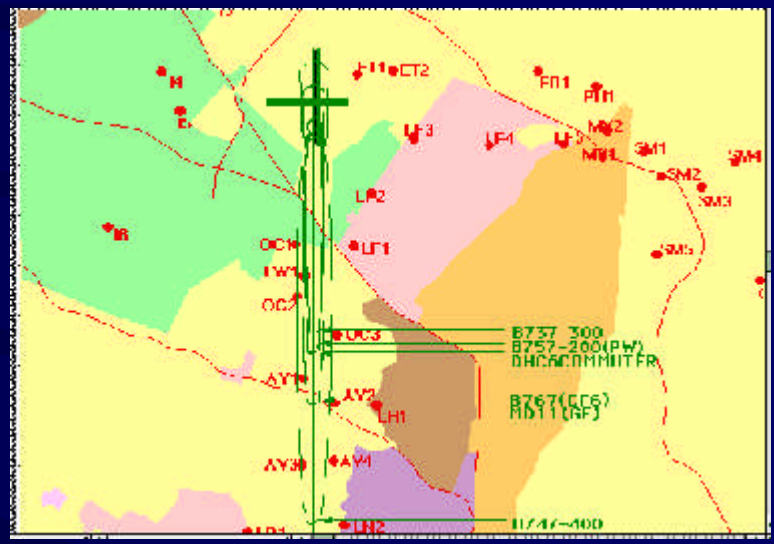


Why Single Event Metrics?

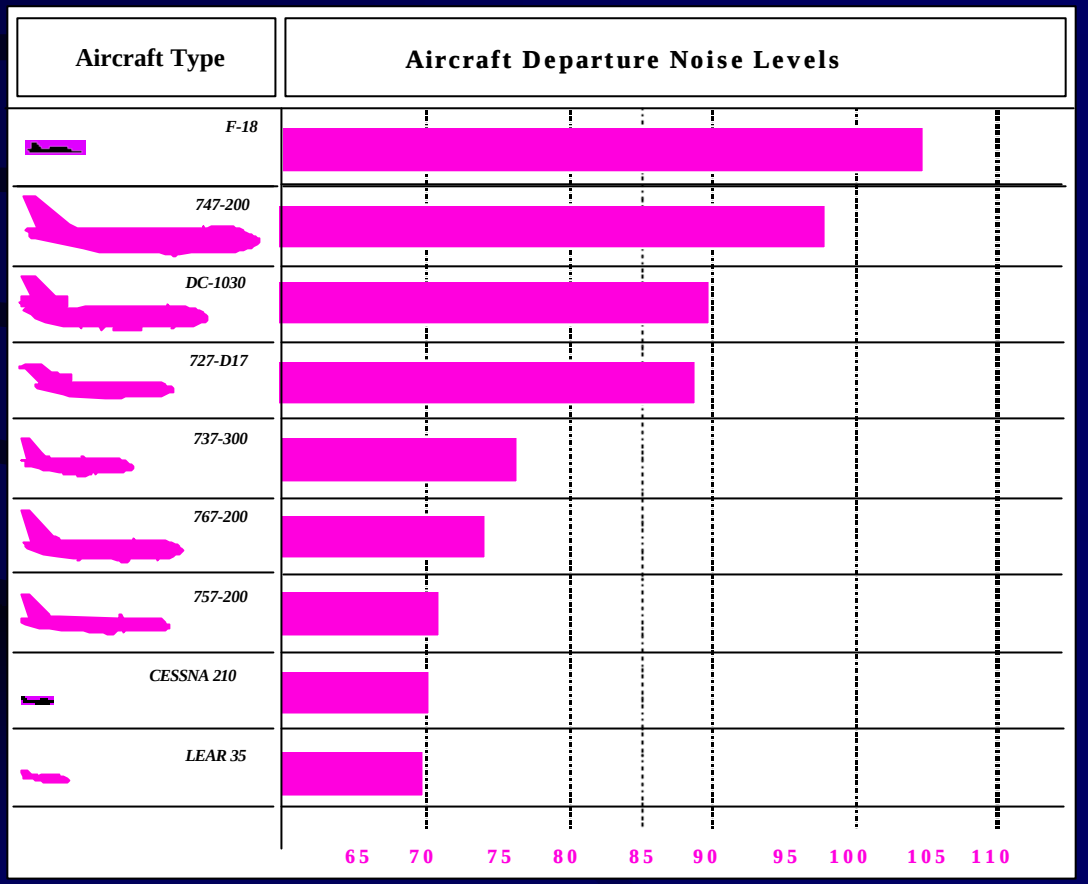
- Compare Aircraft Source Noise
- Compare Operational Mitigation Measures
- Inform Public About Event Noise
- Evaluate Sleep Disturbance
- Evaluate Speech Interference

Single Event Noise Contours

- Compare Aircraft
- Single Event Noise Exposure Level (SENEL), Sound Exposure Level (SEL)
- INM produces ‘energy average’ SENEL/SEL



Aircraft Single Event Noise



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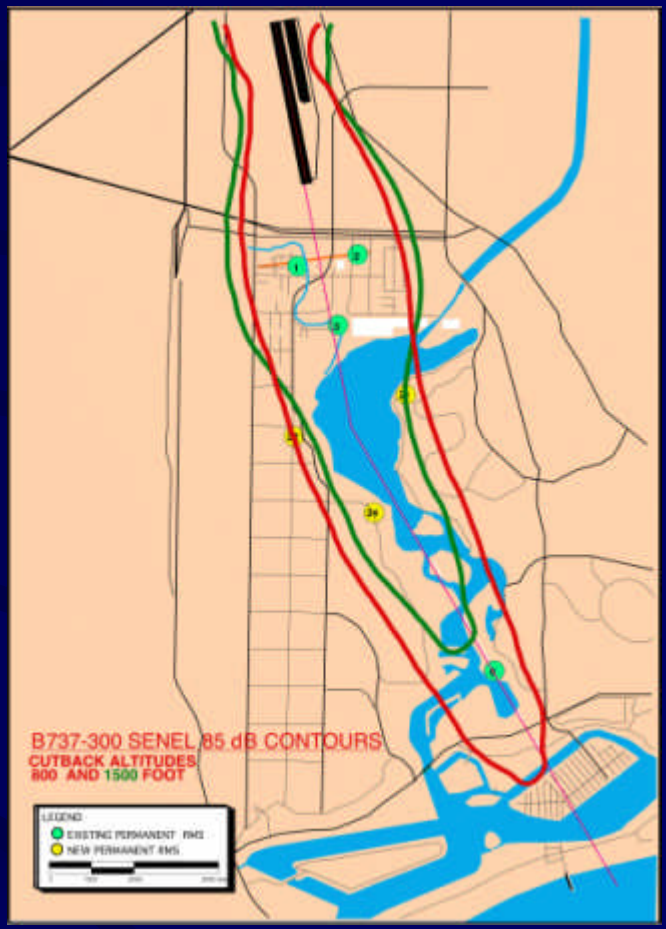
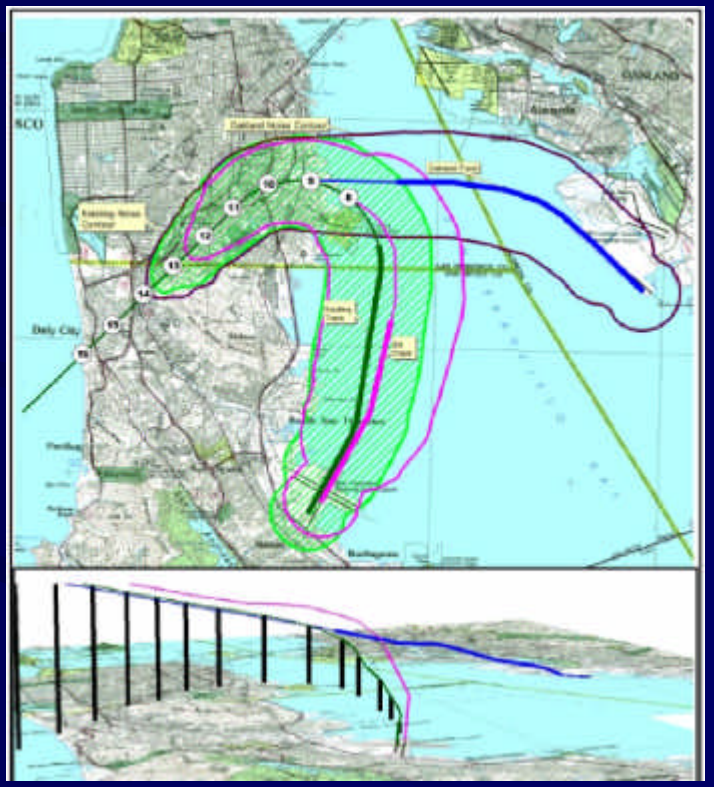
Comparing Operational Changes

- CNEL/DNL may be insensitive to some operational changes
  - Noise Abatement Departure Procedures
  - Examples: JWA B737 close in versus distant departure procedures



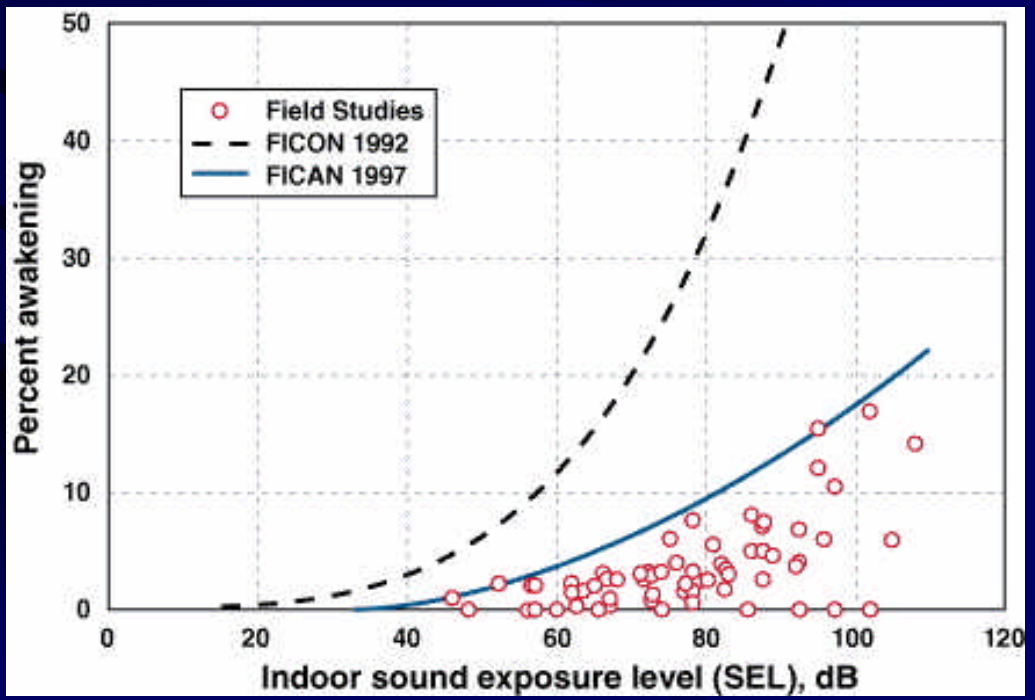
Compare Operations

- Compare Sources of Aircraft Noise
- OAK relationship to SFO noise on peninsula
- (similar effect occurs on east side of bay)



Applications for Single Events

- Sleep Interference (SENEL)
- Speech Interference (Lmax, Time Above)



Time Above

- Measures number of minutes (or seconds) above noise level
  - 85 dBA outdoors, 65 dBA indoors
    - assumes 20 dB building noise reduction windows closed.
  - 77 dBA outdoors, 65 dBA indoors
    - assumes 12 dB building noise reduction windows open.
- Indoor speech interference descriptor
- Not a ‘single event’ metric

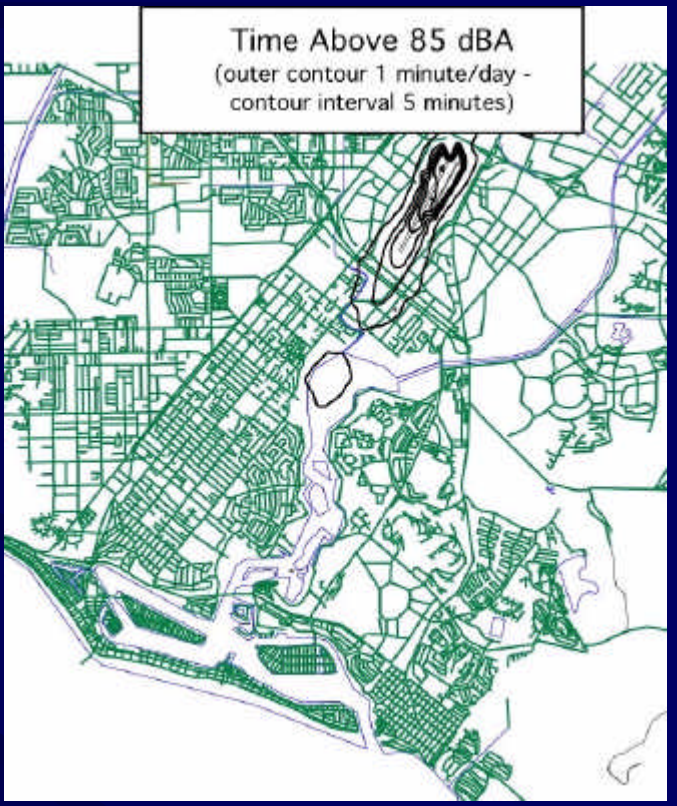
Time Above Data

- Tabular format is most common:

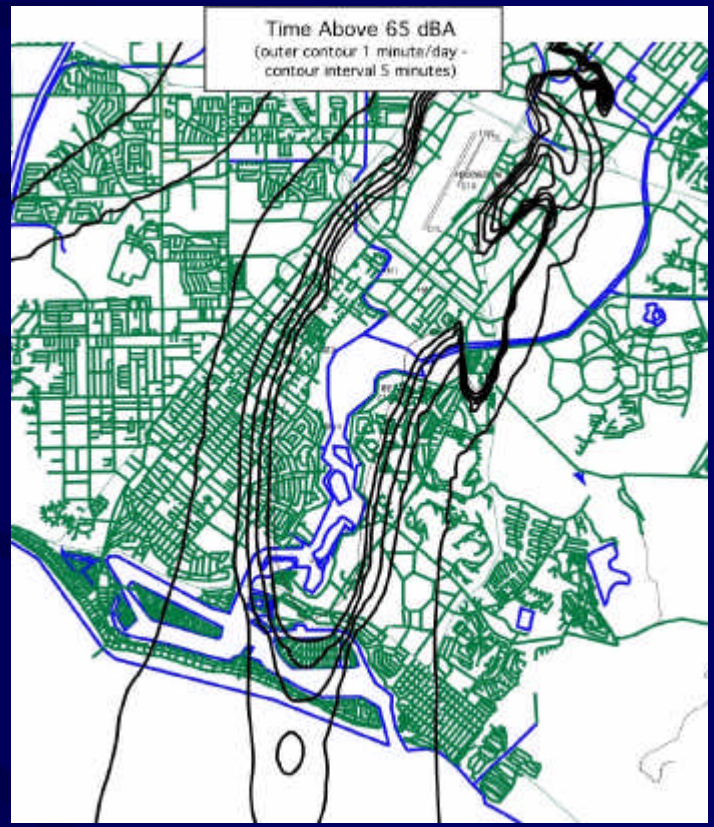
Comparison of Existing and Future Time Above Data (minutes above threshold)			
		Alternative A	
	TA 65	TA 77	TA 85
LOCATION	(minutes per day)	(minutes per day)	(minutes per day)
1	0.1	0.0	0.0
2	15.1	0.1	0.0
3	5.1	0.0	0.0
4	13.7	0.1	0.0
5	13.3	0.0	0.0
6	16.2	0.1	0.0
7	16.4	0.1	0.0
8	41.6	0.6	0.0
9	31.9	0.4	0.0
10	19.4	0.2	0.0
11	6.9	0.0	0.0
12	0.9	0.0	0.0

INM Plots of Time Above

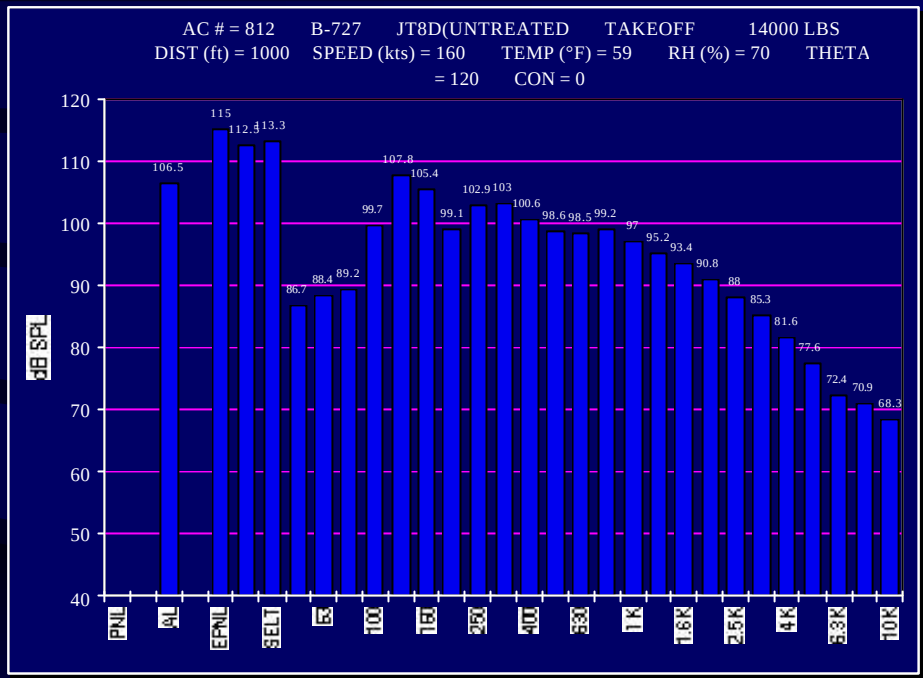
- Geographic map of time contours:
  - not noise contours, time contours



- Compare Time Above 65 and 85 dBA
- Geographic Distribution of Time?
- Potential Confusion of Time Contours and Noise Contours



Spectral Data - Special Cases



Summary

- Uses for Supplemental Metrics:
  - Compare aircraft noise levels
  - Disclosure
  - Investigation of source contribution
  - Evaluate mitigation strategies in detail, i.e., where CNEL/DNL may not be sensitive
  - Limited application to land use planning
    - Time Above for school site evaluation in addition to CNEL/DNL metric
    - Evaluation of potential sleep disturbance