



Noise 101

Module 3 Effects of Aircraft Noise on People

Boom! Blast! Boost!
Aviation and Aerospace Takes Off with a Bang
UC Davis Noise & Air Quality Symposium
February 27th – March 2nd 2011
Tucson Marriot University Park



Effects of Aircraft Noise on People

- Health Effects
 - Hearing loss
 - Cardiovascular
 - Other physiological effects
- Annoyance
- Activity Interference
 - Speech interference
 - Sleep interference
 - Children's learning
- Ongoing research
 - FAA Noise Research Roadmap
 - ACRP



Noise-Induced Hearing Loss

- Temporary threshold shift (TTS)
 - Caused by prolonged high exposure
 - Ear will usually recover overnight
- Noise-induced permanent threshold shift (NIPTS)
 - Repeated prolonged exposure can result in permanent damage
- OSHA standards: 90 dB for 8 hours
 - Would require thousands of loud overflights per hour
- Risk of hearing loss due to *community exposure* to aircraft noise is very low



Hearing Loss in Children

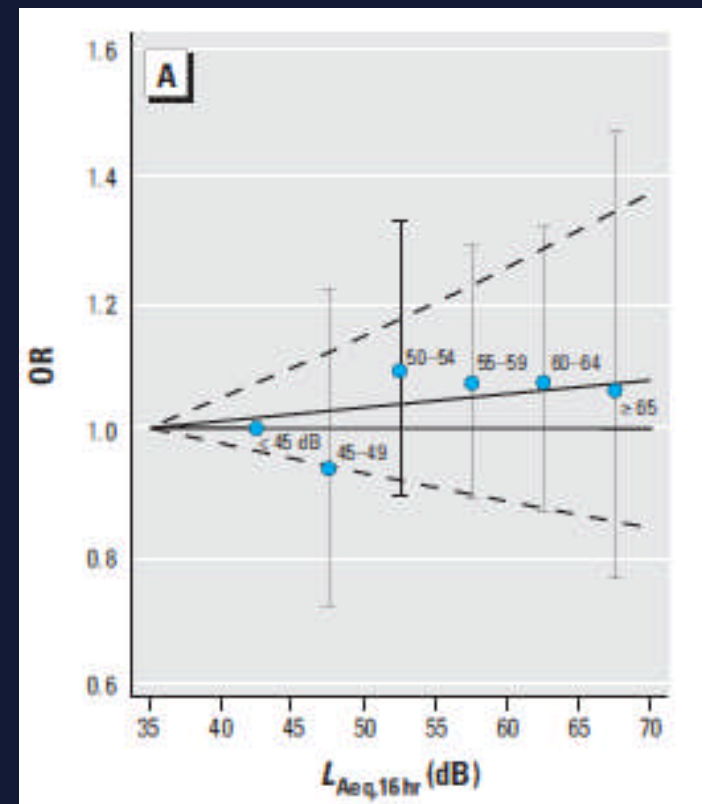
- Centers for Disease Control, National Center for Health Statistics, Third National Health and Nutrition Examination Survey (NHANES), 1988-1994, included questions related to hearing loss
- Prevalence of hearing loss in children as high as 15%,
 - Generally in frequency range of 3- to 6 KHz
 - Generally only one ear
- Potential causes:
 - Personal audio devices
 - Noisy toys





Non-Auditory Health Effects

- Non-auditory health effects claims are difficult to prove or disprove:
 - Cardio-vascular
 - Hypertension
 - Mental health
- Recent studies:
 - HYENA
 - Cologne-Bonn Airport Study

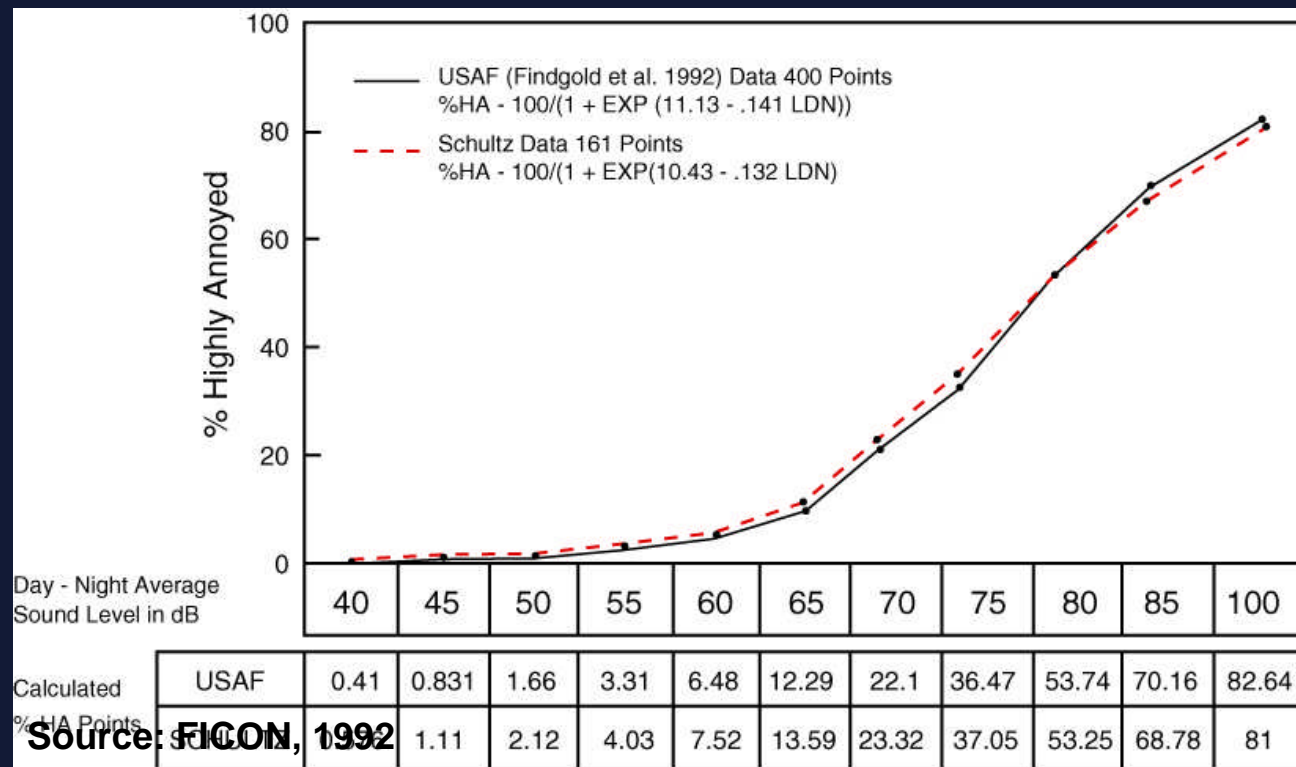


Source: HYENA, 2008



Annoyance

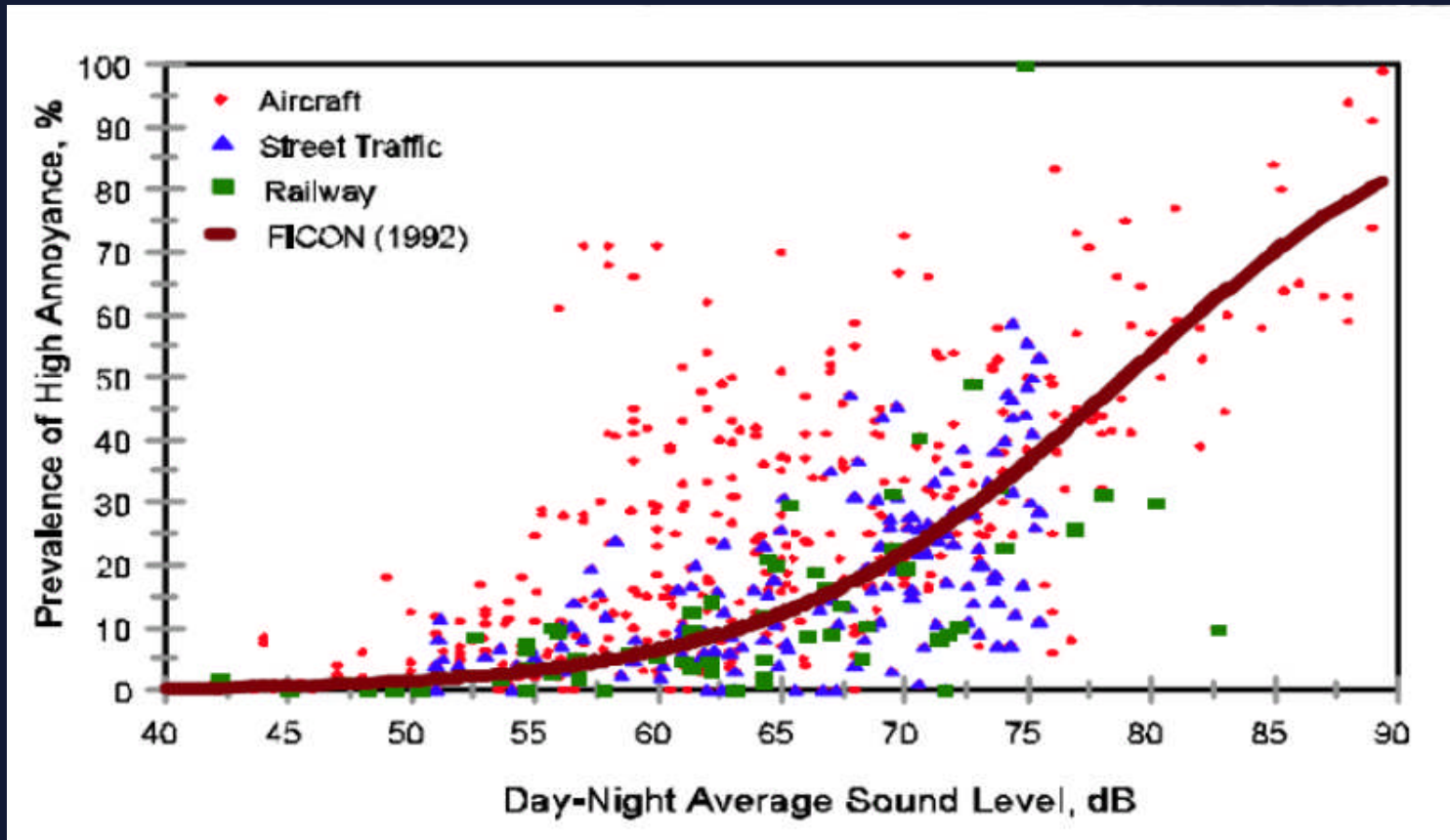
- Schultz developed accepted “dose-response” relationship in 1970s. FICON re-affirmed, 1992





Annoyance

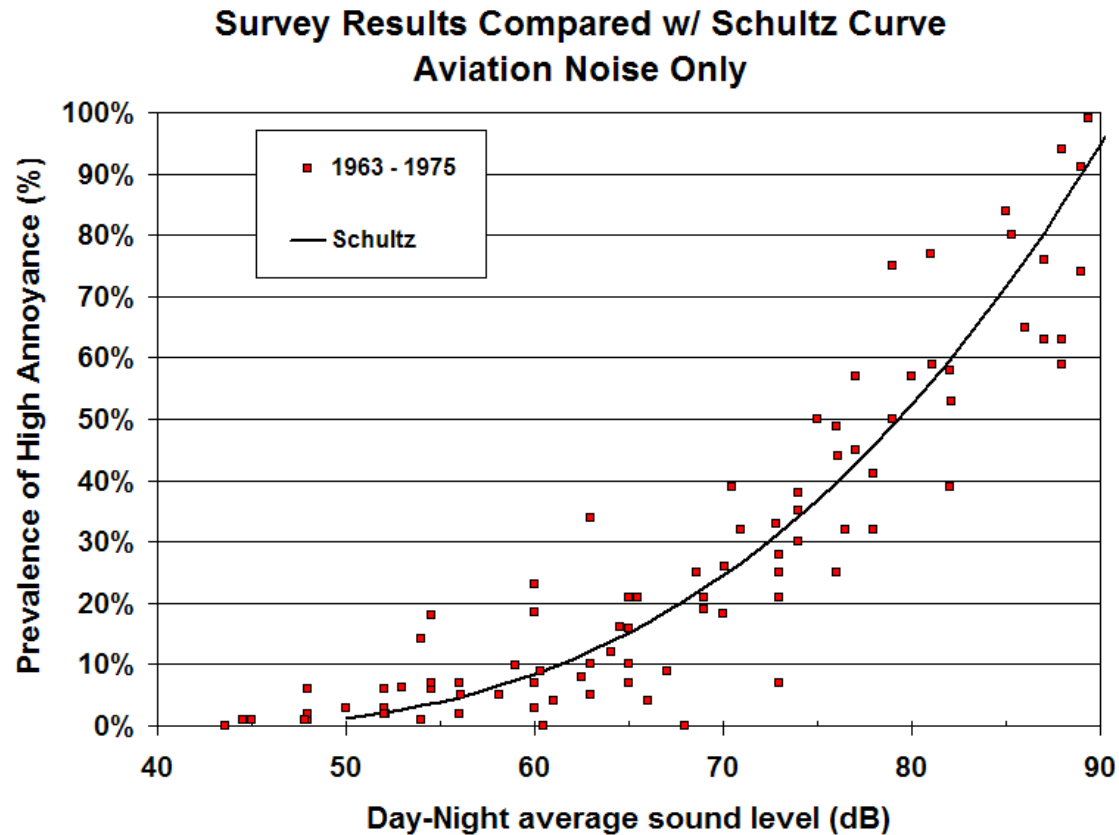
- Recent analysis focused on different sources





Relationship of DNL to %HA

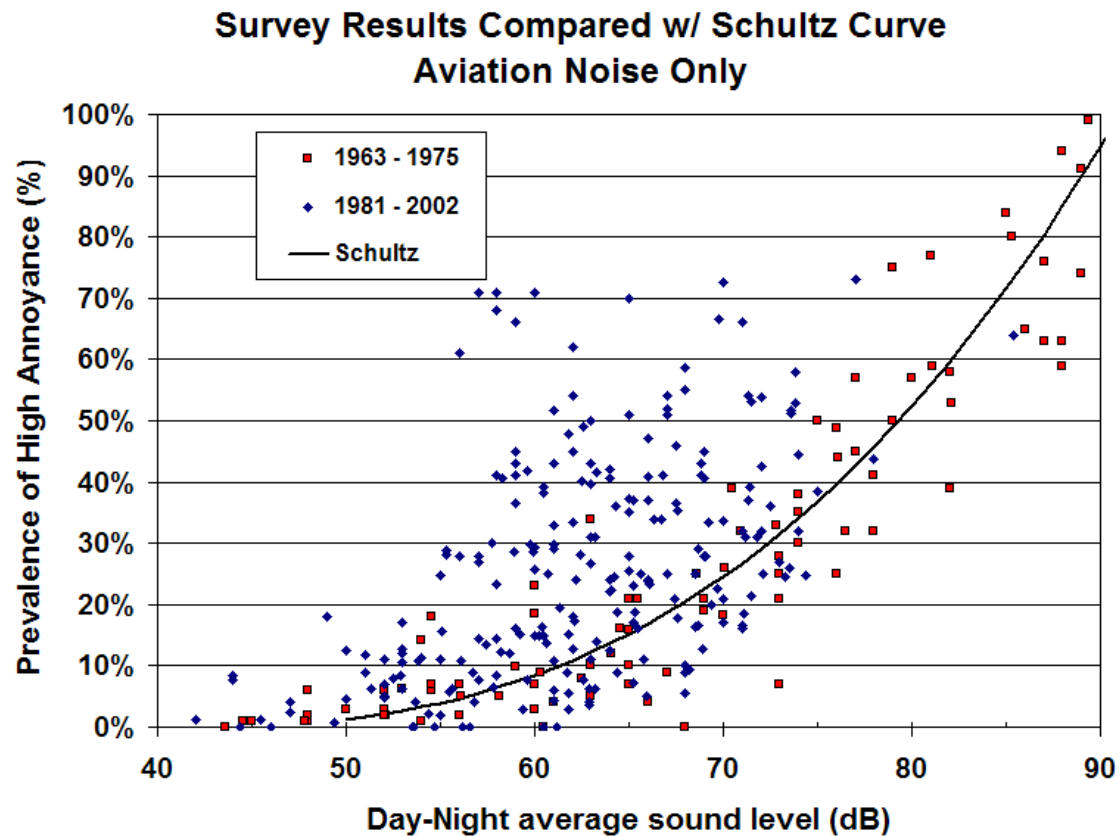
- Are people becoming more noise-sensitive?





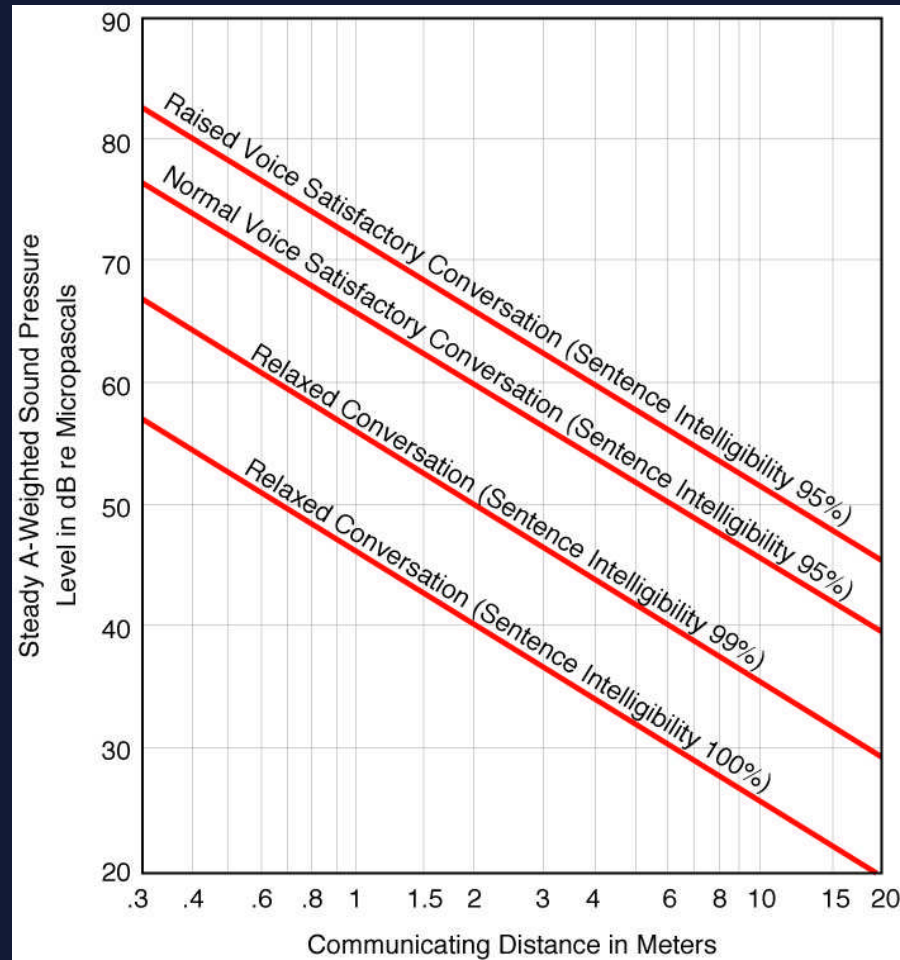
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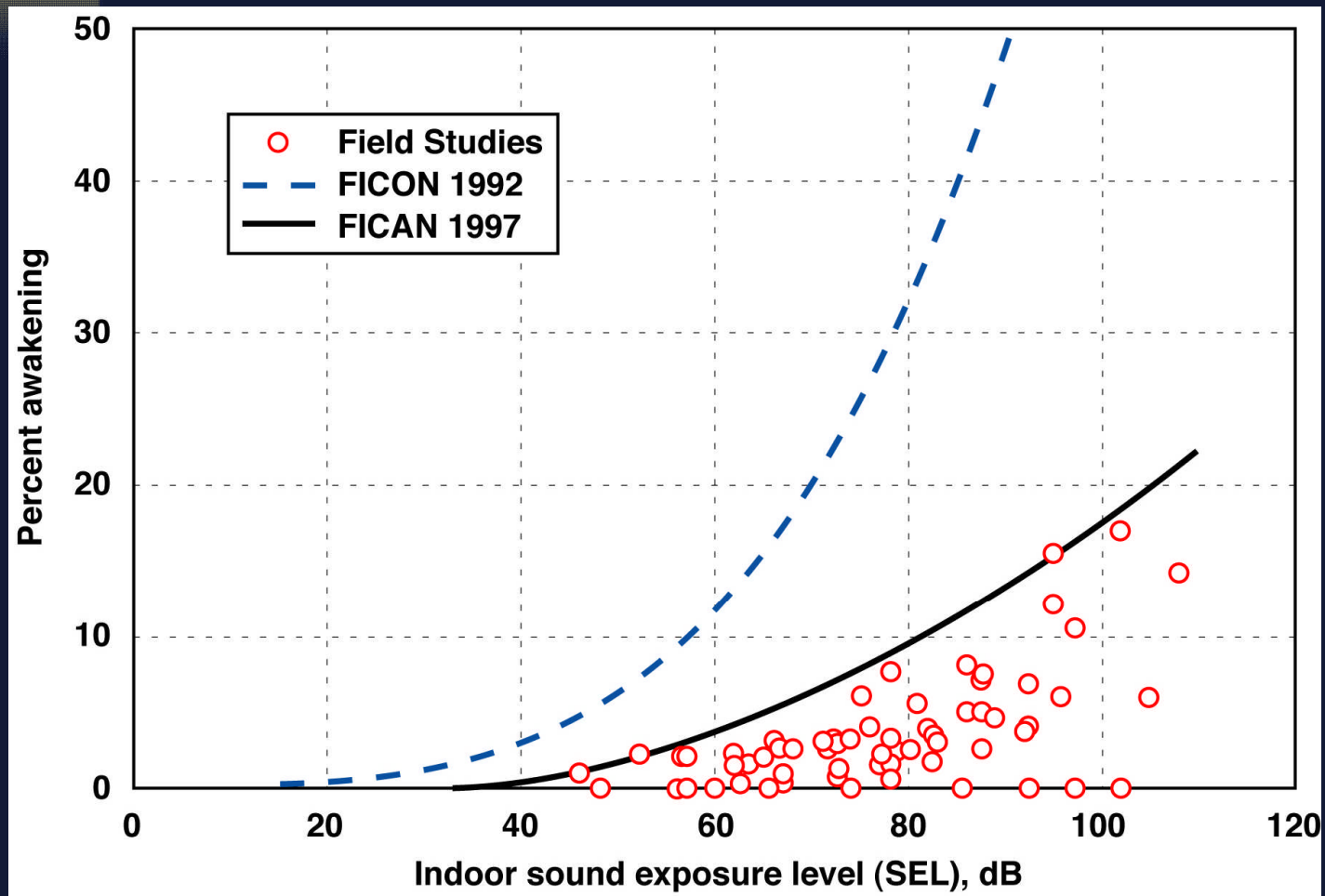
Speech Interference



Source: US EPA, "Information on Levels of Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety", March 1974, Washington, D.C., 1973, p. D-5



FICON / FICAN Sleep Disturbance Dose-Response Recommendations



Source: FICAN, 1997



FICAN: Awakenings Recommendations

- ANSI Standard S12.9-2008, *Quantities and Procedures for Description and Measurement of Environmental Sound — Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes*
- Predicts % Awakening from an entire night's operation
- Can be derived from INM results



Effects of Aircraft Noise on Children's Learning

- Speech: Potential delays in language acquisition
- Reading: Studies suggest effect on test scores
- Motivation: “Learned helplessness”
- Memory: Some studies suggest memory deficits





FAA Noise Research Roadmap

1. Noise effects on health and welfare

- Update basis for establishing significant impact
- Potential health & welfare impact in areas considered noise-compatible

2. Noise in National Parks and wilderness

- Impacts to national parks and wilderness areas
- Aircraft operations above 18,000 feet AGL



FAA Noise Research Roadmap

3. NextGen noise modeling enhancements

- Other operational regimes
- Unconventional aircraft

4. Overall costs of aircraft noise on society

- in common currency with other environmental costs for informed decision-making



ACRP Projects dealing with Noise Effects

- 02-26: Assessing Aircraft Noise Conditions Affecting Student Learning
- 02-35: Research Methods for Understanding Aircraft Noise Annoyance and Sleep Disturbance



ACRP 02-26 Assessing Aircraft Noise Conditions Affecting Student Learning

- Status:
 - Underway, completion in 2011-2012
- Objectives:
 - Identify and evaluate conditions under which aircraft noise affects student learning
 - Identify and evaluate one or more alternative noise metrics that best define those conditions



ACRP 02-35 Research Methods for Understanding Aircraft Noise Annoyance and Sleep Disturbance

- Status:
 - Request for proposals out; due 3/22
- Objectives:
 - Develop and validate a research protocol for a large-scale study of aircraft noise exposure-annoyance response relationships across the U.S.
 - Propose alternative research methods for field studies to assess the relationship between aircraft noise and sleep disturbance for U.S. airports



Must-have References

- *ACRP Synthesis 9, Effects of Aircraft Noise: Research Update on Selected Topics*
- Federal Interagency Committee on Noise (“FICON”), “Federal Agency Review of Selected Airport Noise Analysis Issues”, August 1992
- US EPA, “Information on Levels of Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety”, March 1974
- www.fican.org