

# Addressing Aircraft Noise in the United States: Part I

## Understanding the Issues

To: 22nd Workshop of the Aeroacoustics Specialists Committee of the CEAS

By: Rebecca Cointin  
Manager, Noise Division  
Federal Aviation Administration  
Office of Environment and Energy

Date: September 6, 2018



Federal Aviation  
Administration



# Outline

- **Background on Community Noise**
- **Research on Aircraft Noise Impacts**
- **Emerging Aircraft Types**
- **Outreach to Communities**
- **Summary**



# Community Noise from Aircraft

## Aircraft Noise

Engine Fan & Jet Exhaust

High lift system

Undercarriage

*All noise sources contribute to acoustic signature – both at takeoff and during landing*

## Landing Takeoff Cycle

Approach: 2,000 m from threshold

Airport Perimeter

Sideline: 450 m from runway edge

Flyover: 6,500 m from brakes off

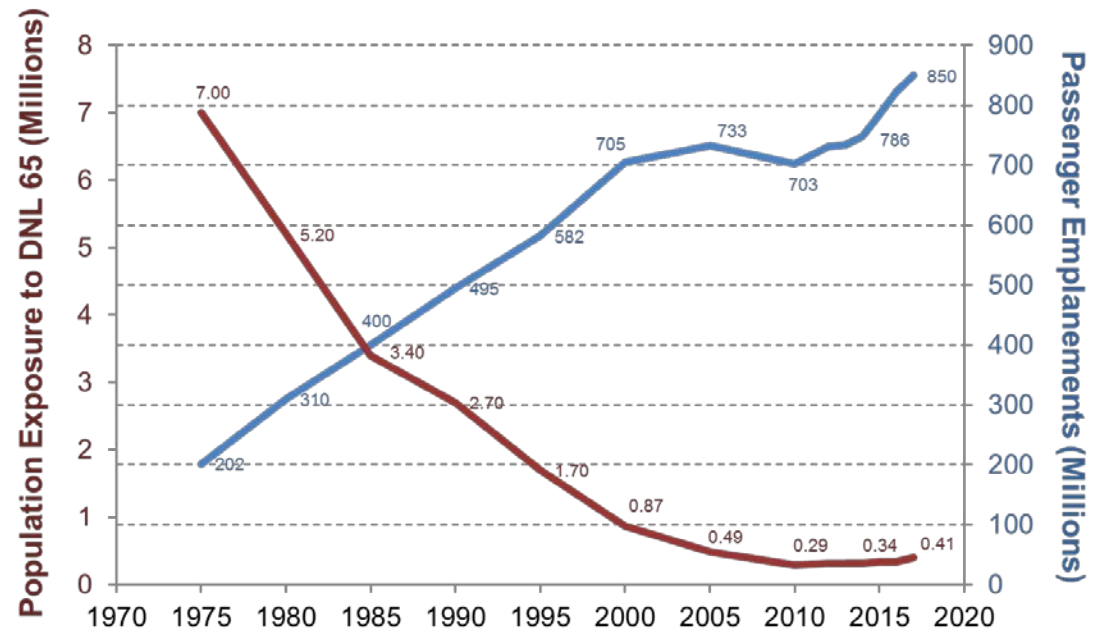
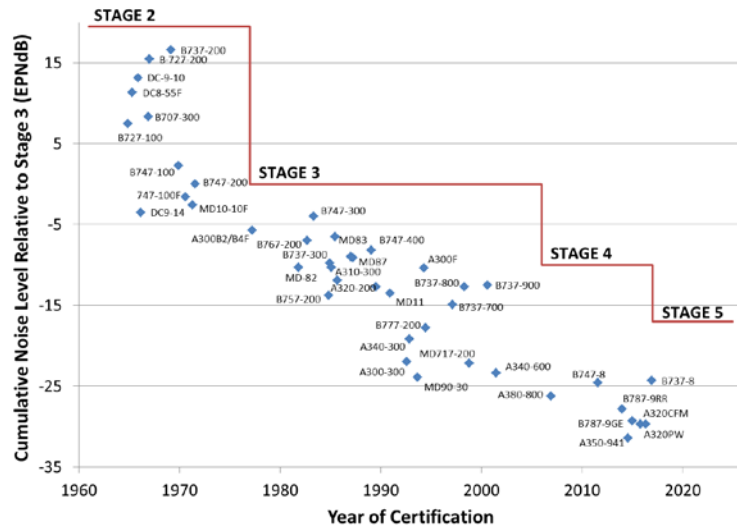
## Community Exposure

*Community exposure set by aircraft types and operational tempo over day and night*



Federal Aviation  
Administration

# Historical Trends: Source Noise and Noise Exposure



*A factor of 20 decrease in community noise exposure has been accompanied by increased community concerns*



# Equivalent Operations for DNL = 65

## ***DNL Metric***

- DNL metric provides cumulative noise exposure to many individual noise events
- Can reach given DNL with single loud noise event or many quieter noise events

## ***Aircraft Noise over Time***

- Aircraft noise from 1970s is different than aircraft noise today
- Aircraft from 1970s produced the same acoustic energy as 10 to 30 aircraft operations today

## ***Equivalent DNL***

- A few, but relatively loud, events in 1970s would result in DNL 65 dB
- Many, relatively quiet events today would also result in DNL 65 dB
- However, noise experience would be very different

1 Event/Day SEL 114.4 dBA = 65 DNL

Car Horn



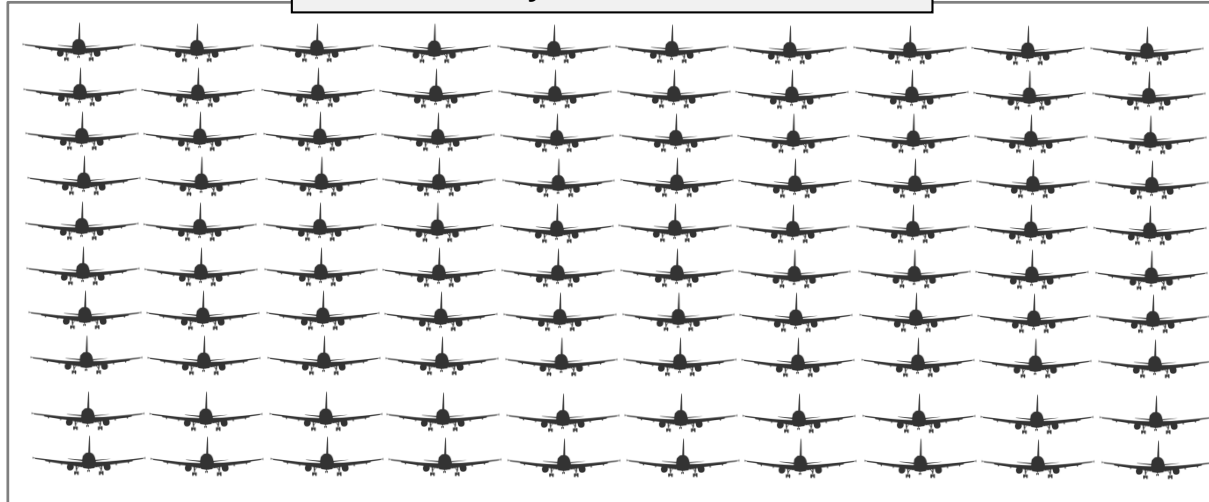
10 Events/Day SEL 104.4 dBA = 65 DNL

Chain Saw



100 Events/Day SEL 94.4 dBA = 65 DNL

Lawn Mower



Federal Aviation  
Administration



# Precision Navigation

- Precision navigation is being implemented to increase the safety and efficiency of the NAS.
- It also leads to a reduction in the overall number of people exposed to noise from aircraft operations.
- However, the implementation of precision aircraft navigation over the last few years has been accompanied by increased airport community concerns regarding noise due to the level of exposure of those under flights paths.

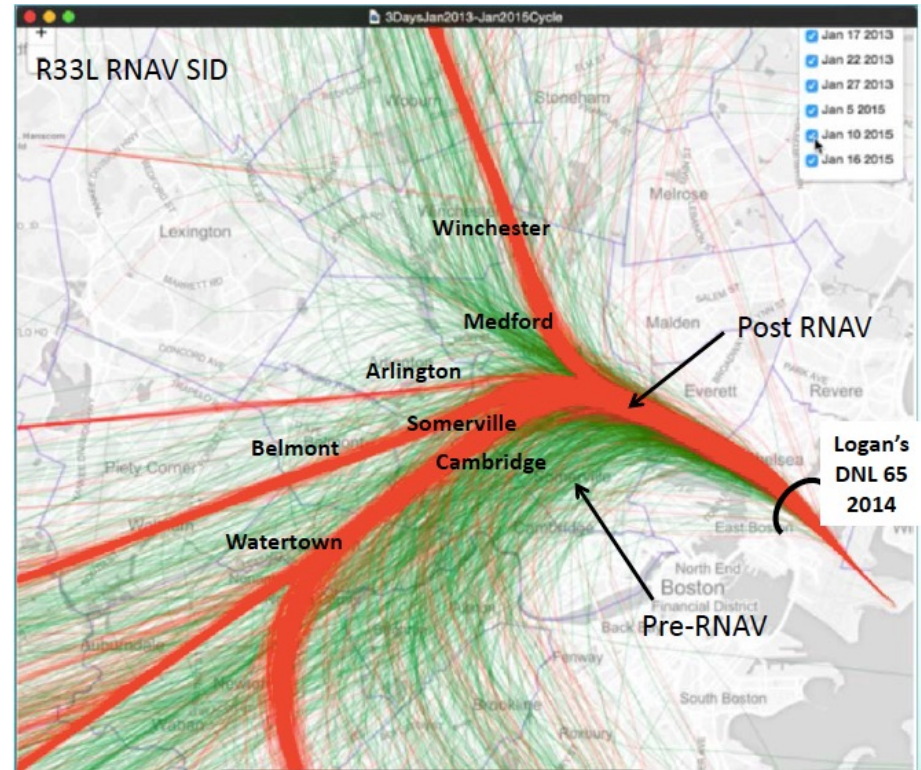


Image Source: Massport

***The current opposition to aircraft noise in communities is causing challenges with implementing precision navigation procedures.***



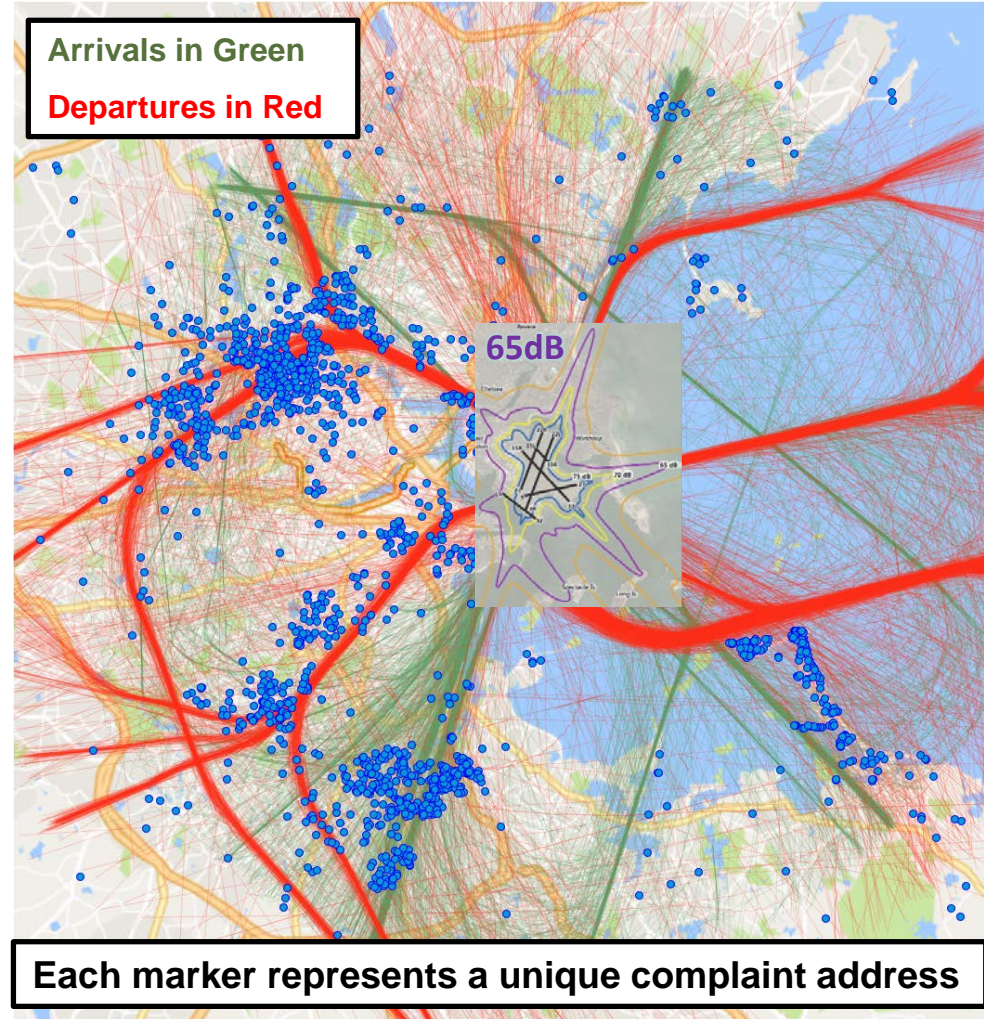
Federal Aviation  
Administration

# Today's Situation

***"If you don't like airport noise,  
then don't live near an airport."***

*- Anonymous blogger in response to  
Washington Post editorial on aircraft noise*

While this may have been true in the past, people from well outside the DNL 65 contour are expressing concerns today.



# Addressing the Aircraft Noise Challenge

- **Understanding the Impact of Noise**

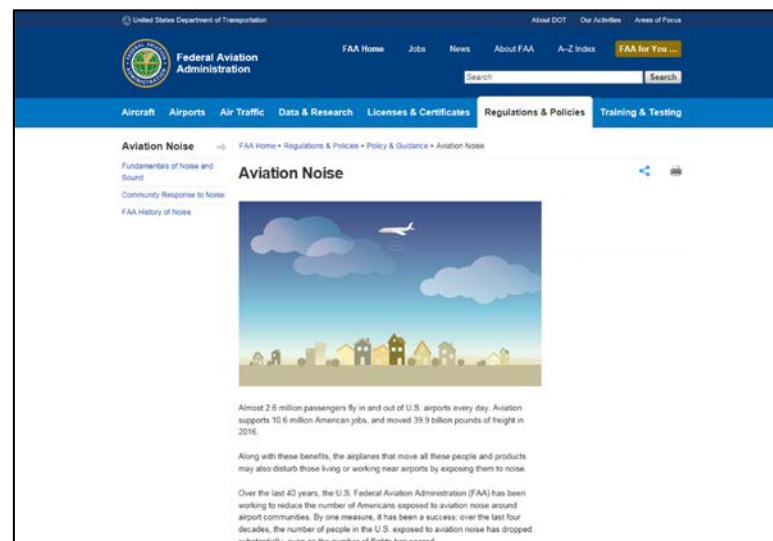
- Noise impacts: annoyance, sleep, cardiovascular health and children's learning
- Improving modeling capabilities
- Evaluating current aircraft, helicopters, commercial supersonic aircraft, unmanned aerial systems, and commercial space vehicles

- **Outreach**

- Increase public understanding
- Community outreach

- **Mitigation**

- Land use planning
- Vehicle operations
- Airframe and engine technology
- Aircraft architecture



<http://www.faa.gov/go/aviationnoise>





# FAA Aircraft Noise Impact Research (1 of 2)

## Community Annoyance

- **Objective:** Develop an updated and nationally representative dose-response curve of civil aircraft noise exposure and community annoyance. Query individuals experiencing a wide range of noise exposure near airports with variations in aircraft operations using an identical methodology.
- **Status and Timeline:** Survey results and a draft report are in process of being reviewed by FAA in coordination with Department of Transportation and other federal agencies.

## Children's Learning\*

- **Objective:** Understand potential effects of aviation noise exposure on learning in children through test scores, classroom observations, and teacher questionnaires.
- **Results:** First study showed a small but statistically significant correlation exists between noise exposure and student test scores. Teacher survey in the second study suggests that even moderate levels of aircraft noise exposure may impact children's learning experiences; however, there were no observed aircraft noise related distractions on any day of the study period.
- **Status and Timeline:** Current studies are complete. Determining appropriate next steps.

### \*More Information:

- ACRP 02-26: Assessing Aircraft Noise Conditions Affecting Student Learning  
<http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2797>
- ACRP 02-47: Assessing Aircraft Noise Conditions Affecting Student Achievement--Case Studies  
<http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3693>



Federal Aviation  
Administration

# FAA Aircraft Noise Impact Research (2 of 2)

## Sleep Disturbance\*

- **Objective:** Develop and use an inexpensive, scientifically sound methodology to obtain objective measures of sleep disturbance from aircraft noise. Use methodology to develop relationship between aircraft noise exposure and sleep disturbance that is representative of airport communities across the U.S.
- **Status and Timeline:** Conducted field studies to test different equipment viability in PHL. Validated in another U.S. airport (report Fall 2018). Began a national sleep study that will require 4 to 5 years of effort.

## Health Impacts+

- **Objective:** Determine what, if any, correlation exists between cardiovascular disease and aviation noise. Using noise modeling with epidemiological studies.
- **Status and Timeline:** Have expanded upon initial work that used U.S. Medicare database to look at other health cohort databases. Leveraging work being funded by U.S. National Institutes of Health. Initial results with new cohorts coming out this year. Want to have work done by 2020.

\*More Information on sleep research:

- ASCENT Project 017: <https://ascent.aero/project/noise-exposure-response-sleep-disturbance/>

+More information on Health Impacts research:

- PARTNER Project 44: <http://partner.mit.edu/projects/aviation-related-noise-effects-elderly>
- ASCNET Project 003: <https://ascent.aero/project/noise-impact-health-research/>



Federal Aviation  
Administration

# Emerging Aircraft Types

## New noise challenges exist with emerging types

- Some potential vehicles will produce noise in areas away from airports where aviation noise is not currently experienced
- Operations will occur closer to the ground
- Potential for sonic booms to occur in areas that have never experienced them



### Types under consideration:

- Unmanned Airspace Systems (UAS) and Urban Air Transport
- Civil Supersonic Aircraft
- Commercial Space Vehicles

### Areas being explored:

- Certification needs
- Annoyance and other potential impacts

# Noise Outreach

**Enhanced methods to inform, educate and collaborate with communities across the nation to address concerns, such as noise, that changes in the airspace and flight paths have caused**

## Community outreach

- Facilitating active partnerships with communities, local elected officials, airports, industry stakeholders and air carriers nationwide to establish ongoing dialogue and collaborative decision-making
  - FAA is hosting additional meetings in areas where we are considering flight procedure changes
  - Actively participating in Airport-sponsored roundtables to discuss purpose and need for the changes
- Agency-wide guidance materials have been developed and staff are being trained on best practices for engagement

## Increase public understanding

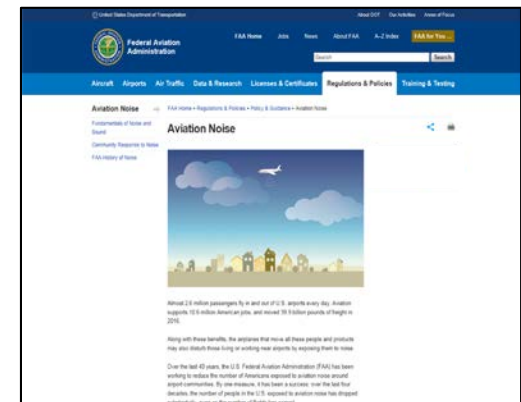
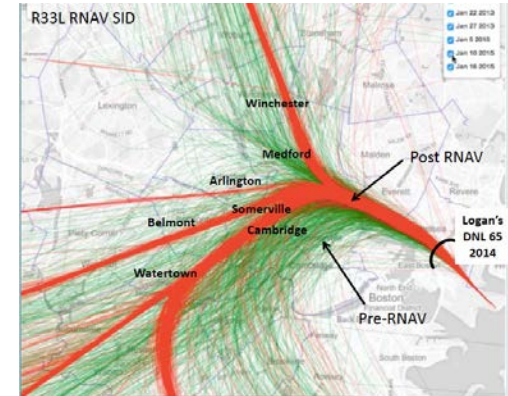
- Developing new FAA website on noise to help inform public with background information, links, and relevant information as it becomes available





# Closing Observations

- Despite considerable reductions, noise remains a constraint on aviation growth
- New users of the NAS (Unmanned Aerial Systems, Commercial Space Vehicles, Civil Supersonic Aircraft) present additional challenges
- Have developed a comprehensive approach to address aircraft noise
- Executing research program to better understand noise impacts





**Rebecca Cointin**  
**Manager, Noise Division**  
**Federal Aviation Administration**  
**Office of Environment and Energy**  
**Email: [rebecca.cointin@faa.gov](mailto:rebecca.cointin@faa.gov)**

