Noise Research

Presented to: E&E Subcommittee

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Sean Doyle

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Today's Aircraft Noise Situation – Our Efforts

Understanding Noise

- Improving modeling capabilities
- Examining relationship between noise and annoyance, sleep, cardiovascular health and children's learning
- Evaluating current aircraft, helicopters, commercial supersonic aircraft, unmanned aerial systems, and commercial space vehicles

Outreach

- Enhanced community involvement
- Increase public understanding

Reducing Noise at the Source

- Aircraft technologies and architecture
- Noise standards

Mitigation

- Optimized operations and procedures
- Sound insulation program

MITRE

ASCENT
AVIATION SUSTAINABILITY CENTER

Continuous Lower Energy, Emissions & Noise
CLEEN
Federal Aviation Administration

the VOLPE center

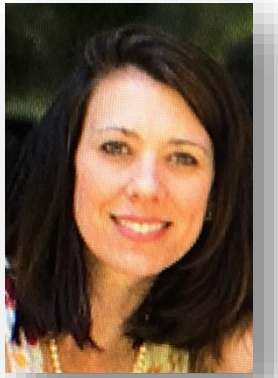
NextGEN

‘New’ AEE-100 Staff

- **Sean Doyle – Senior Aviation Noise Policy & Research Specialist**

- Sean joined the FAA in 2016 brining nearly 10 years of aviation consulting experience where he provided technical expertise on a wide array of airport and airspace related environmental projects
- He is an expert in the use and application of the Aviation Environmental Design Tool (AEDT) and works closely with multiple lines of business within the FAA as well as with external stakeholders to coordinate on technical, research, policy and outreach activities.
- He lives with his wife, two young daughters and Siberian Husky in Arlington, VA

- **Durre Cowan – Community Engagement Officer**



- Durre is on detail to AEE for the next 6 months working with the Noise Complaint Initiative. She is the ATO Community Engagement Specialist for the Eastern Service Center.
- Before coming to the Service Center Durre was the Executive Advisor to Lynn Ray.
- She spent several years on and around Capitol Hill. Her last position before coming to work for the FAA was that of Special Assistant to Congresswoman Kay Granger (TX-12).
- She is married, with two sons, and lives in Atlanta, GA.

New AEE-100 Staff

- **Chris Hobbs – General Engineer**

- Chris worked at Wyle Laboratories in acoustic research and consulting.
- He has measured sound levels from 0 to 176 dB ref 20 μPa.
- He was test lead on numerous measurement campaigns to characterize noise emissions from high performance jet aircraft and NASA programs studying sonic boom propagation.
- His hobbies include canoeing and carpentry.

- **Muni Majjigi – General Engineer**

- Muni worked at GE Aviation in propulsion noise reduction technology development, design and certification of several modern turbofan engines.
- His areas of expertise include fan noise, subsonic and supersonic jet noise, nacelle design, LPT noise, Combustor noise, Static engine noise testing, Flight path optimization for noise, Installation effects.
- His hobbies include hiking, biking and reading classics.

R&D Support to FAA Reauthorization Noise Provisions

Sec. 173 – Alternative airplane noise metric evaluation	Contractor effort	Complete
Sec. 188 – Study regarding day-night average sound levels		Complete
Sec. 175 – Addressing community noise concerns (“dispersal headings or other lateral track variations…”)	ASCENT COE	
Sec. 179 – Airport noise mitigation and safety study (“approach and takeoff speeds…”)		
Sec. 181 – FAA Leadership on Supersonic Aircraft	ASCENT COE & Volpe Center	
Sec. 187 – Aircraft noise exposure	Contractor effort	
Sec. 189 – Study on potential health and economic impacts of overflight noise	ASCENT COE	Grant Funded
Sec. 742 – Technology Review	ASCENT COE	
Sec. 743 – CLEEN Aircraft and Engine Program	CLEEN Program	

FAA Reauthorization act of 2018
Section 188 Report to Congress

Congress directed an evaluation of alternative metrics in Senate Appropriations Report 116-109 (pg. 42) for fiscal year 2019 and the FAA Reauthorization Act of 2018 (Pub. L. 115-254) requested the FAA to provide this report in response to:

- **Sec. 188: Study regarding day-night average sound levels. Within 1 year the Administrator shall evaluate alternative metrics to current average day-night level standard, such as use of actual noise sampling to address community airplane noise concerns.**

While not directed to include in a report, the information contained in this document also fulfills the FAA's response to:

- **Sec. 173: Alternative airplane noise metric evaluation. Within 1 year complete the ongoing evaluation of alternative metrics to the current Day Night Level (DNL) 65 standard.**

https://www.faa.gov/about/reauthorization/

Section 188 Report Purpose and Goals

The FAA's goal in responding to the request made under Section 188 of the 2018 Reauthorization on alternative noise metrics is to present:

- An overview of community noise exposure
- An overview and balanced discussion of applicable noise metrics
- A discussion explaining why no single noise metric can cover all situations
- A discussion explaining the difference between measurement and modeling
- The role of supplemental noise metrics

Recognizes that in specific situations, a more targeted information on noise may require the use of supplemental noise metrics

- Supplemental noise metrics can provide complementary information to DNL to further highlight potential changes in noise exposure to communities
- Use of supplemental metrics, while not sufficient to inform an environmental decision by themselves, are encouraged and fully supported by FAA's existing noise policies and supported by the agency's noise modeling tools

Future work:

- FAA research programs including through ASCENT are exploring the use of supplemental metrics for informing flight procedure development and community outreach

https://www.faa.gov/about/plans_reports/congress/media/Day-Night_Average_Sound_Levels_COMPLETED_report_w_letters.pdf

Aircraft Noise Exposure And Market Outcomes (A72)

Objective: Quantify the monetary impacts associated with aircraft noise exposure through analyzing the relationship between aircraft noise exposure and resale values for residential properties in communities near U.S. airports

Research Plan: Nationwide data on transaction values for residential properties will be leveraged and compare modeled noise exposure levels in communities surrounding a sample of U.S. airports. Descriptive data analyses of noise exposure and housing values will then be conducted to look for quasi-experimental settings (e.g. recent RNAV introduction) to identify the causal impacts of noise exposure on property values.

Goal: To provide quantified data on the economic impacts of aviation noise to better inform project decisions and policy makers

Team: Massachusetts Institute of Technology, Department of Aeronautics & Astroronautics and Sloan School of Management

Next Steps:
- **Grant Funding just issued**
- **Research findings will be used to inform FAA Reauthorization Section 189**

Outline

- Health
- Rotorcraft ✓
- Tools ✓
- Supersonics ✓
- Operations ✓
- NCI
- Commercial Space
- UAM/UAS ✓

✓ = covered during other discussion items

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- Health
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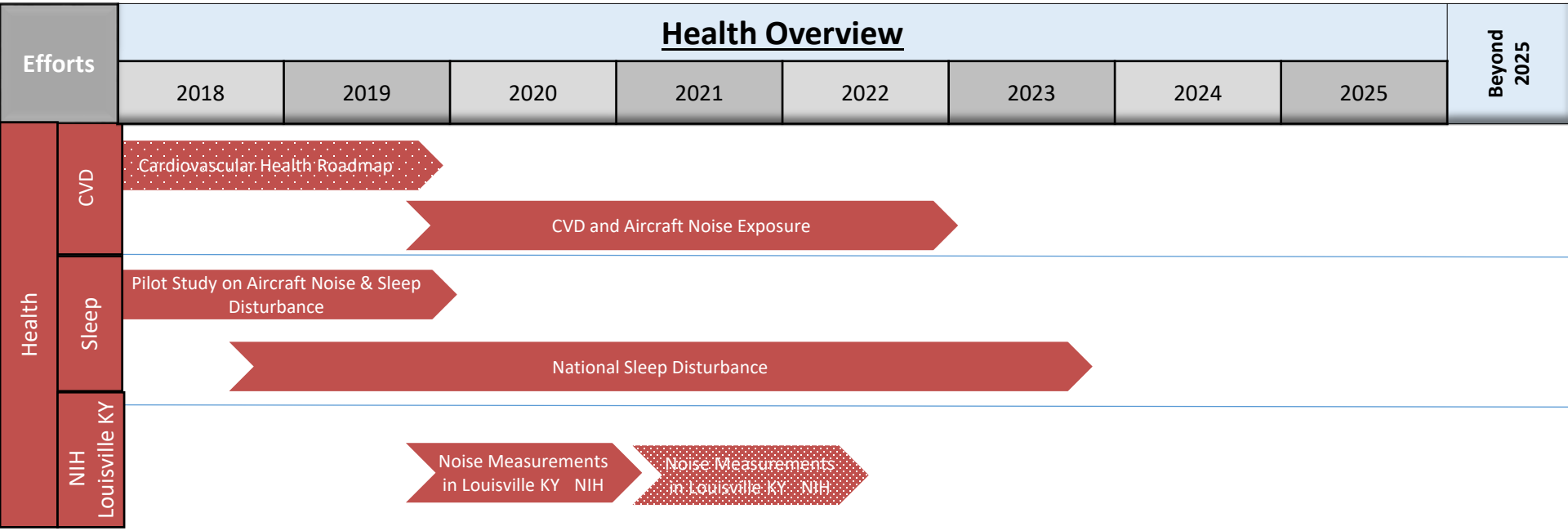
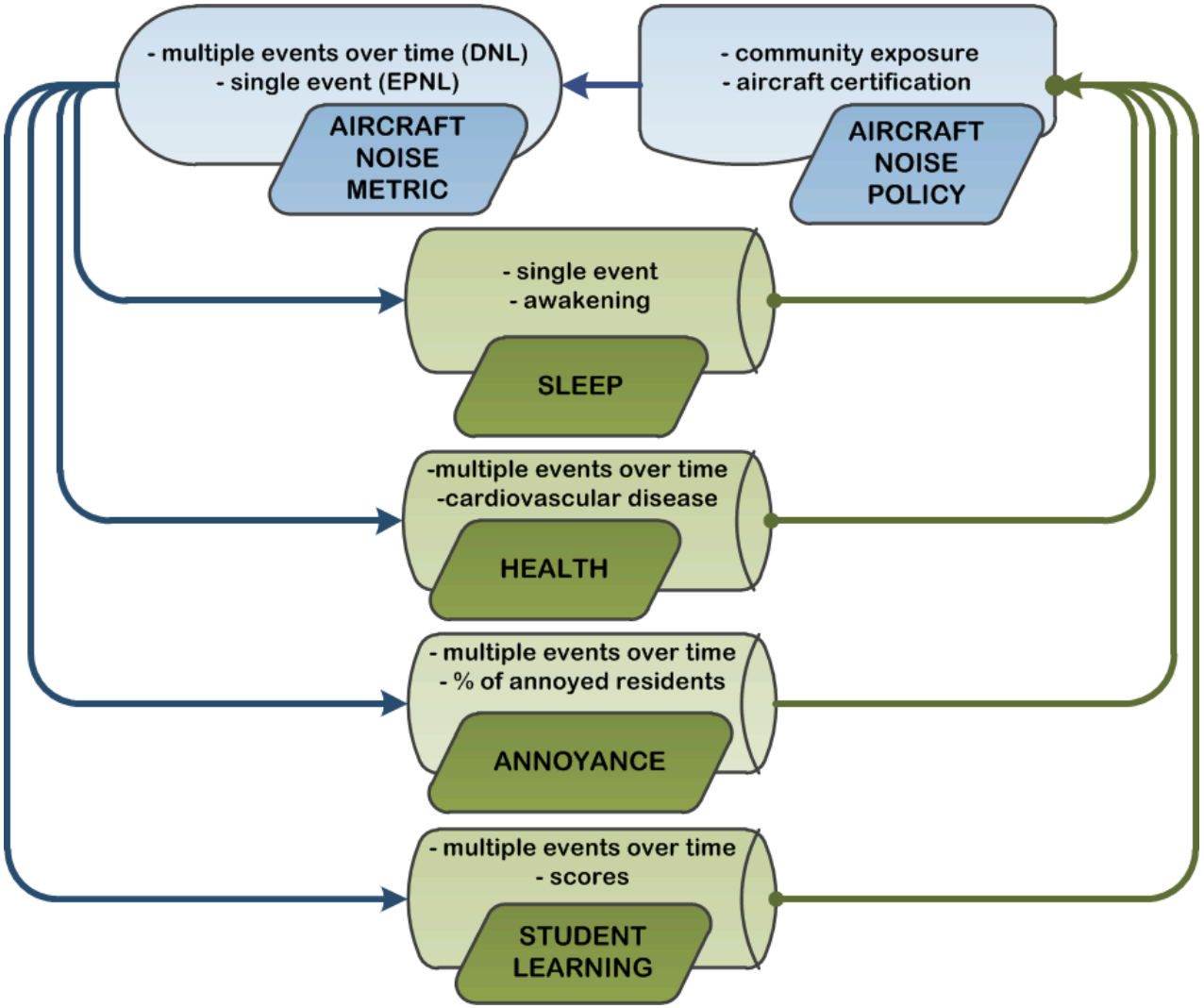
✓ = covered during other program review sessions

Health

Health | Rotorcraft | Tools
Supersonics | Operations | NCI
Commercial Space | UAM/UAS



Relationship between Impacts & Policy



- blue boxes- current policy

- green- on-going research

Cardiovascular Disease & Aircraft Noise

Objective: Evaluate associations between aircraft noise and cardiovascular outcome

Methods: Use existing health cohorts to evaluate link between health outcomes and noise exposure while accounting for wide range of factors

National longitudinal health cohorts:

- Medicare database
- Women's Health Initiative
- Nurses' Health Study /Health Professional Follow-up Study

Team: Research being conducted by Boston University

Reauthorization Connection: HR 302 § 189 – Study on Potential Health and Economic Impacts of Overflight Noise

Future work:

- **Utilize existing cohorts to determine if an association exists. The current cohort work will take 3 years.**
- **Seek additional cohorts that could be used to further examine association.**
- **Depending on the results, develop improved noise exposure metrics and policies**

Sleep-Disturbance Research & Implication

Objective: Inform future considerations regarding aviation noise in the U.S. by obtaining dose-response relationships between aircraft noise exposure and sleep disturbance

Goal: National field study: acquire current objective sleep disturbance data relative to varying degrees of exposure at many airports; 4-5 year effort

Team: Research being conducted by UPenn with support of FAA Office of Airports' Airport Technology Research (ATR) Program

Next Steps: Address comments received during Federal Register notice period and Complete U.S. Government data collection requirements (e.g. OMB and PRA)

NOTE: This project will be reviewed at the REDAC Airport Subcommittee

Future work:

- **Partner with other organizations and experts who have expertise on the subject matter**
- **Depending on the results, develop improved noise exposure metrics and policies**
- **Exploring information exchange and partnerships with the FAA Civil Aerospace Medical Institute (CAMI)**

National Sleep Survey Status

Survey design has been submitted for DOT-Bureau of Transportation and Statistics Review

Prior to submittal additional review of the sampling methodology was conducted due to the uncertainties introduced by the operational decreases across the country triggered by COVID19

- The statistical "power" of the study is based on the number of night time aircraft noise events each field study volunteer is expected to experience
- Uncertainties in the timeline for recovery of aircraft operations levels introduces a new unknown to the expected sampling outcomes during the filed study collection period
- Review by UPenn concluded that the current study design is still viable if operational levels are at least 50% of 2018 levels

Other Factors: Due to high demand for COVID related emergency collections, the FAA Privacy Office, DOT and OMB are experiencing delays in processing new collection requests.

Noise Measurement in Louisville, KY

Objective: Improve our understanding of how trees reduce sound exposure in communities by leveraging ongoing NIH-funded university work in the Louisville KY area. U Louisville researchers are planting trees in proximity of the airport to understand public benefits of additional trees.

Research Plan: Noise data will be collected in proximity of Louisville KY airport (SDF) before and after trees are planted. This data will be compared to modeled prediction of aircraft noise in the area surrounding airport. The effect of the ground impedance on model accuracy will be studied.

Goal: Improved AEDT modeling of sound impedance to improve its accuracy in predicting noise. Also better understanding of the efficacy of trees as a cost-effective means of reducing community noise exposure.

Team: Volpe Center supporting University of Louisville with measurements

Next Steps:

- **Looking for additional funding for UPenn / Sleep**
- **Meeting with NIH**

Commercial Space

Past

- FAA Order review: 1050.1F Desk Reference Chapter 11. Guidance on Commercial Space Launch Noise and Sonic Boom Modeling and Assessment, July 2019
- Launch noise model review, June 2015
- ACRP 02-66: Commercial Space Operations Noise and Sonic Boom Modeling & Analysis, $600K, November 2017
- ACRP 02-81 Commercial Space Operations Noise and Sonic Boom Measurements, $600K, July 2019
- Commercial Space Launch Noise and Sonic Boom roadmap, March 2018, $70K
- Periodically review applications for launches and sites

Present

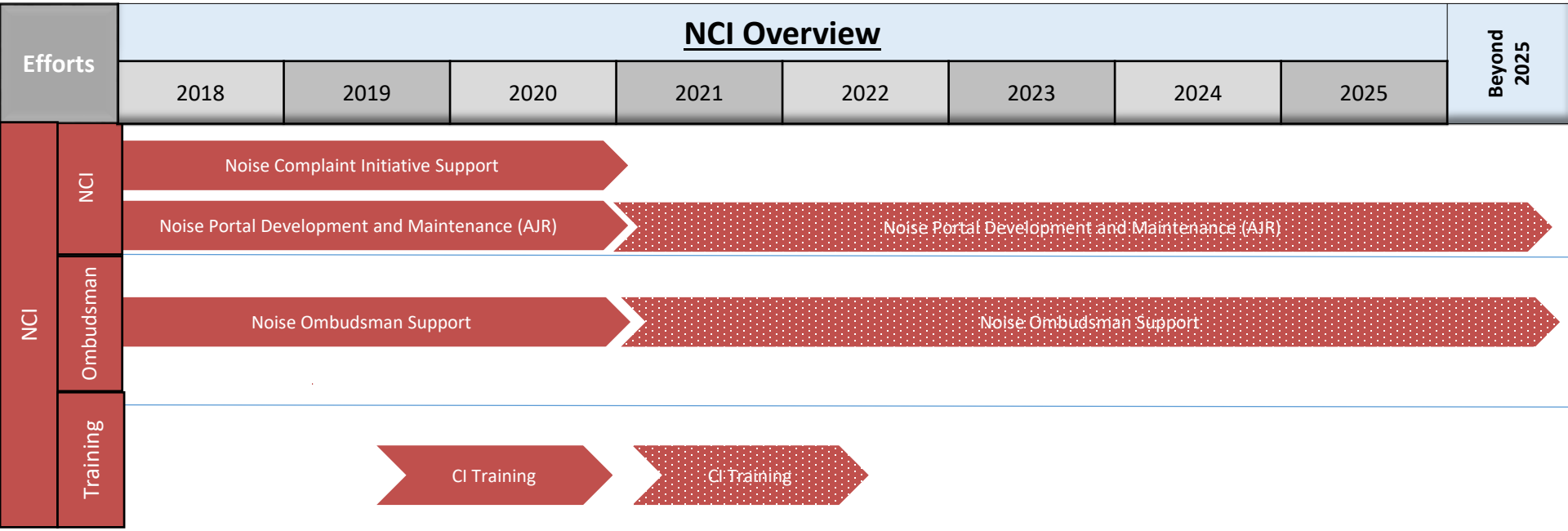
- Periodically review applications for launches and sites
- Stakeholder road-mapping effort to identify and prioritize research

Future

- Aiming to have special session @ AIAA Science and Technology Forum (2021 AIAA SciTech Forum), 11–15 January 2021, Nashville, TN

NCI

Health | Rotorcraft | Tools
Supersonics | Operations | NCI
Commercial Space | UAM/UAS



NCI Purpose and Goals

Purpose: *to identify how the FAA can more efficiently and effectively respond to and address noise complaints in a clear, consistent and repeatable manner that is responsive to the public and applies the best use of FAA resources.*

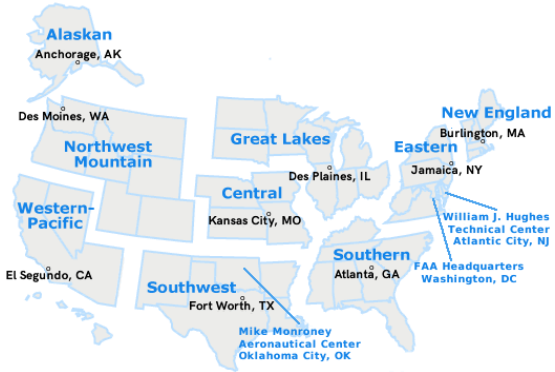
Part 1

Identify and implement improved and consistent agency-wide policy and procedures for the FAA's process to respond to noise complaints / inquiries, and

Part 2

Identify and evaluate potential actions that the FAA might take to better address the underlying issue raised by complaints, particularly regarding the implementation of NextGen procedures.

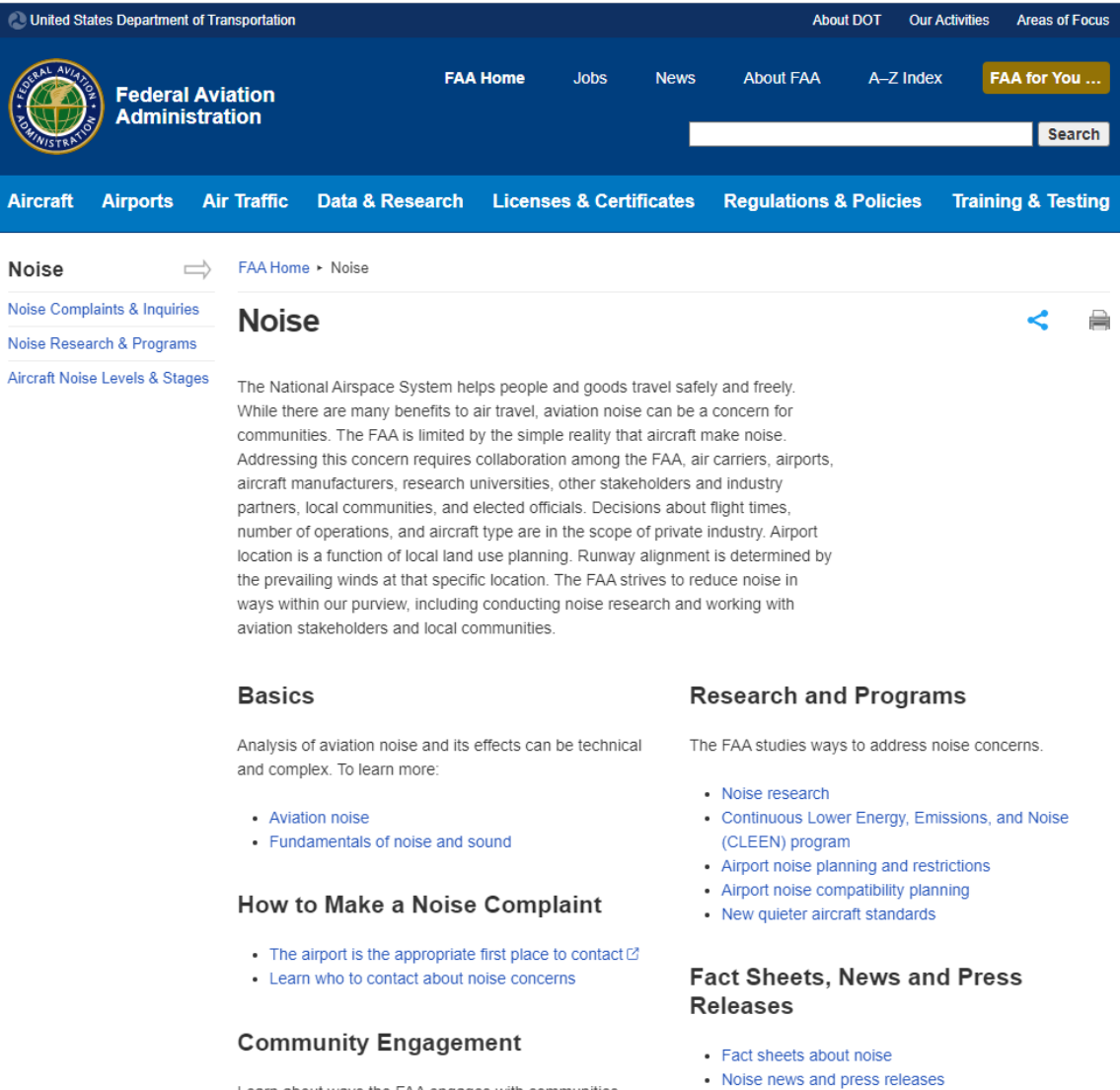
NCI Status



- **Regional Websites**
  - All have been published as of 8/31 and all include Noise Portal Access
  - We have not seen any increase in noise complaints following rollout
- **Partnering Airports**
  - Met with more than 90 airports
  - 13 follow-up one on one meetings with different airports
  - Confirmed 3 partners so far, but expect more based on discussions

New Noise Landing Page

www.faa.gov/noise



Discussion

Health

Rotorcraft

Tools

Supersonics

Operations

NCI

Commercial Space

UAM/UAS

Discussion

- **Are there R&D areas within the E&E Portfolio that should be lower / higher priority?**
- **Are there R&D areas that AEE is not examining that should be added to the E&E Portfolio?**
- **What do you see coming on the horizon regarding E&E that may require future R&D efforts**