



Community Noise

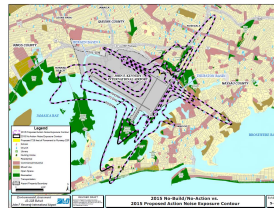
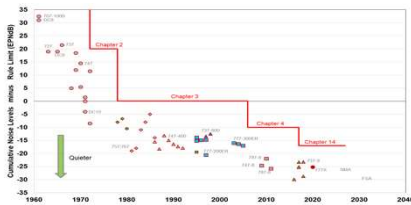
Robert Stoker, Ph.D

Senior Manager – Noise, Vibration and Emissions

ICAO Balanced Approach Towards Noise

The ICAO balanced approach identifies four elements to address noise at airports:

- Reduction of noise at source
- Land-use management and planning
- Noise abatement operational procedures
- Operating restrictions

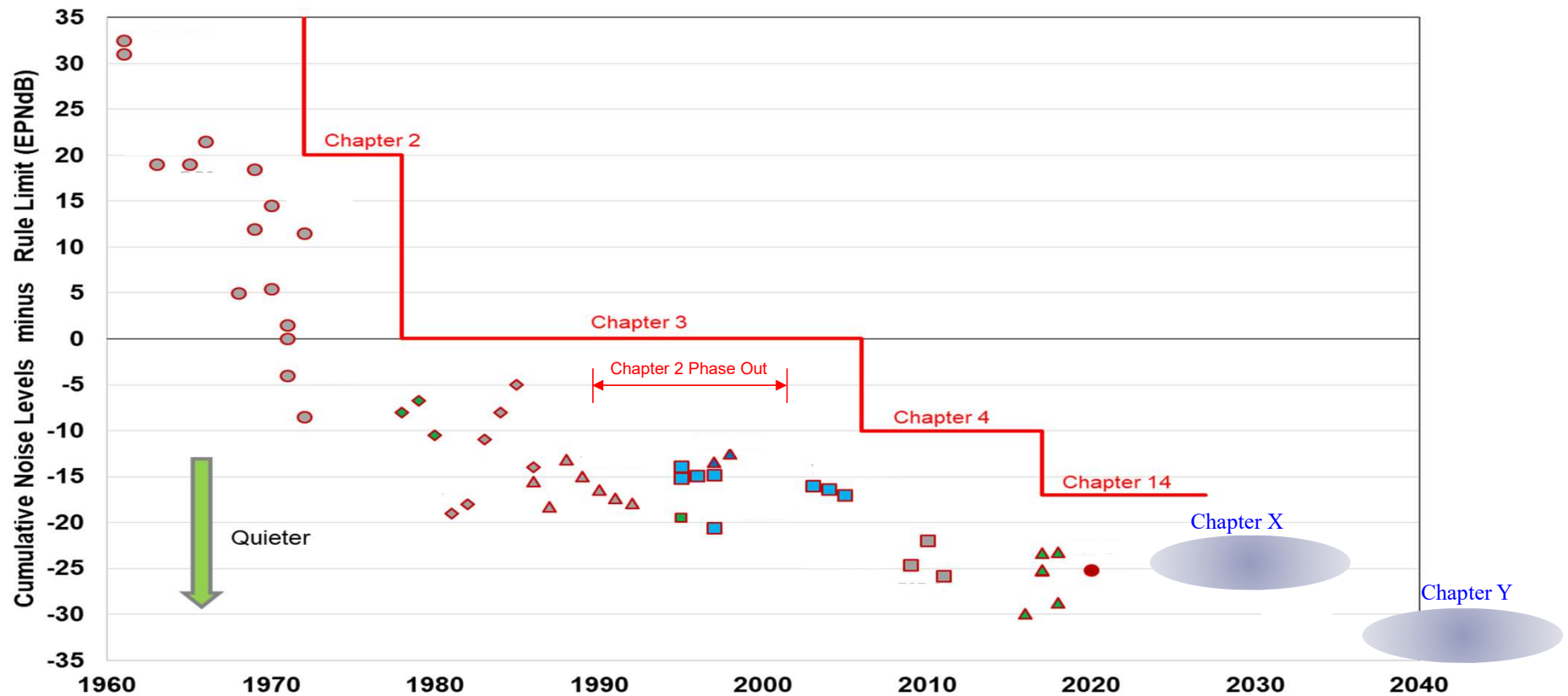


Operating Restrictions should only be used as a last resort

Progress over the last 60 years

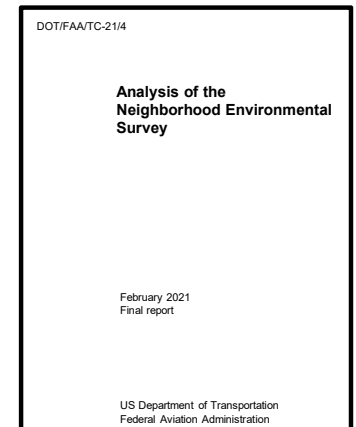
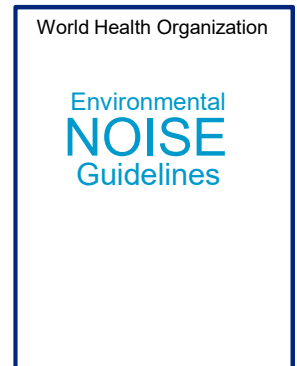
Noise Certification

Noise regulation in 2045 is expected to be 13 to 18 EPNdB below the current Chapter 14 standard.



Increasing Scrutiny on Noise

- WHO Europe Report on Noise Exposures (2018)
- FAA Survey on Noise Annoyance (2021)
- HKIA introduces QC system with nighttime curfew for 747 (2021)
- Increased Fees at LHR and new Noise Fee Level (2022)
- New Noise Regulations expected as soon as 2025 (ICAO adoption)

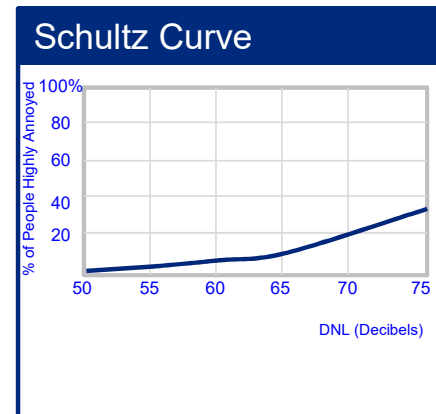


2021 FAA Neighborhood Environmental Survey

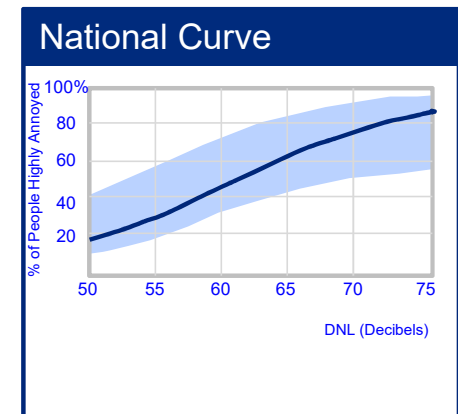
- Updated the national response curve for aircraft noise annoyance
- Provide FAA with data for consideration in future noise policy

- Aircraft Noise is a significant cause of public annoyance
- Percentage of people Highly Annoyed is greater than previous studies
- New national curve is significantly higher than the Schultz Curve
- Result is consistent with other recent surveys taken in Europe

1978 (validated 1992)
Basis of 65 DNL threshold



2015-2016 Neighborhood
Environmental Survey

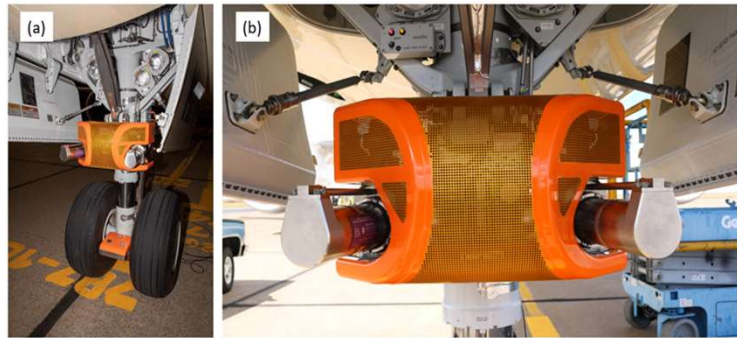
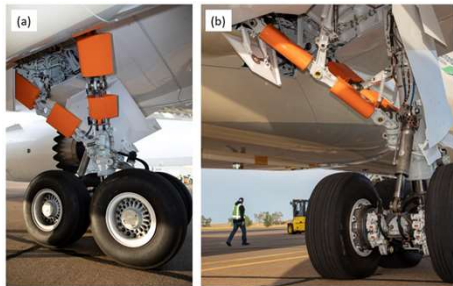


Configuration Changes for Efficiency may have negative impact to Noise

- Compact Nacelle
- Potential for Highly Loaded Flaps
- Fan system architecture
- Open Rotor

Airframe noise reduction technologies

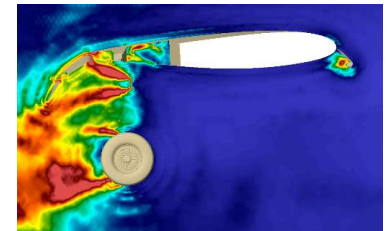
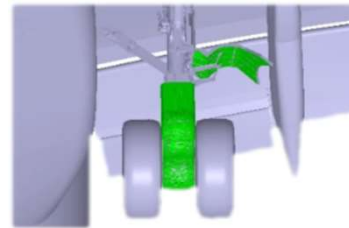
Landing Gear Technologies
(2020 Boeing ecoDemonstrator
787 Flight Test with Safran)



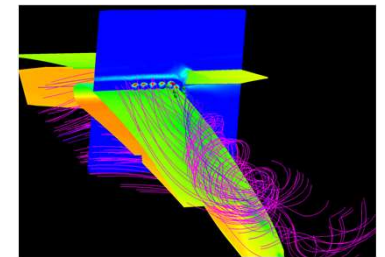
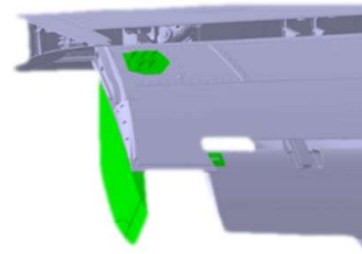
Photos courtesy of Boeing

FAA/CLEEN3

Landing gear fairings and door treatment



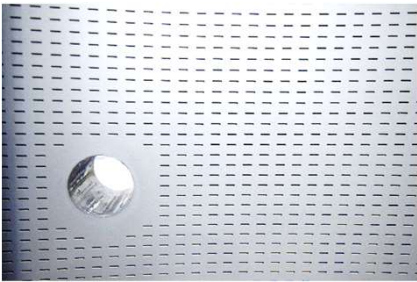
Flap side edge fairings



Reduce airframe noise at the source through flow control

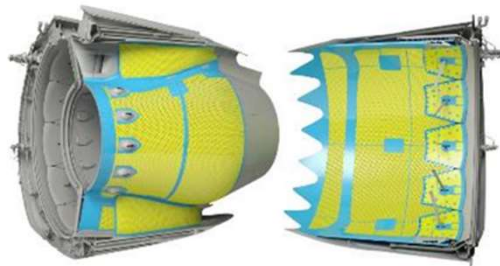
Advancing Acoustic Lining Technologies

Advanced acoustic inlet lining materials

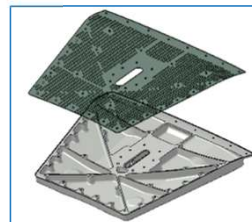
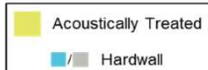


Advanced acoustic materials in the fan duct

CLEEN II Experimental



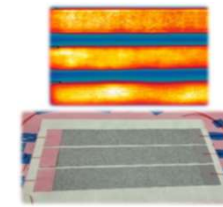
Acoustic treatment = 70% of total wetted area



Treated blocker door concept

Nacelle inlets with acoustically treated lip

Novel ice-protection system



Maximize Inlet Acoustic Treated Area



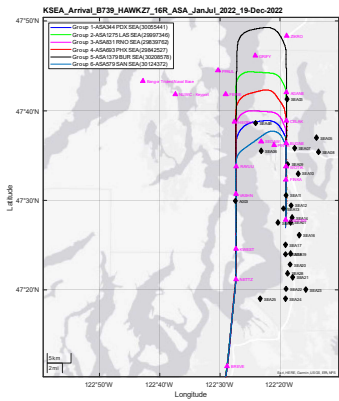
Acoustic Flight Test Verification



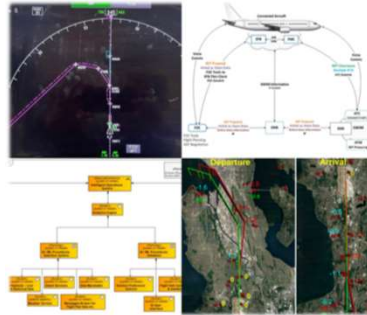
Targeting increased acoustic coverage and improved performance

Operational Efficiency for Noise

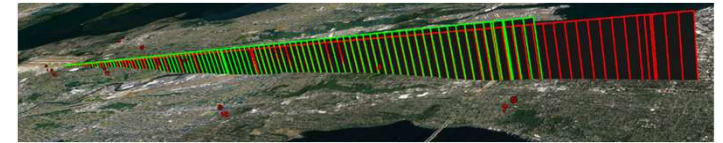
Flight track assessments



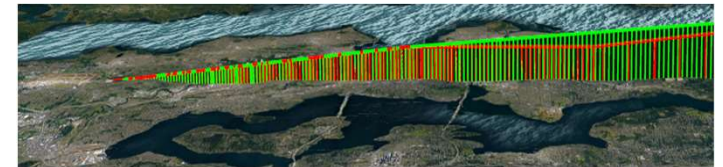
Noise-Optimized Flight Paths



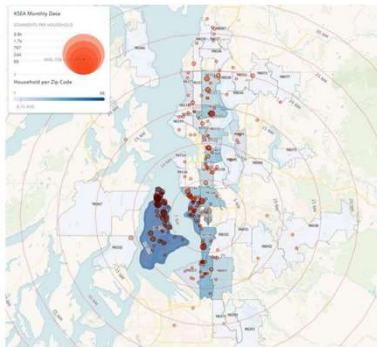
Steeper glide slopes



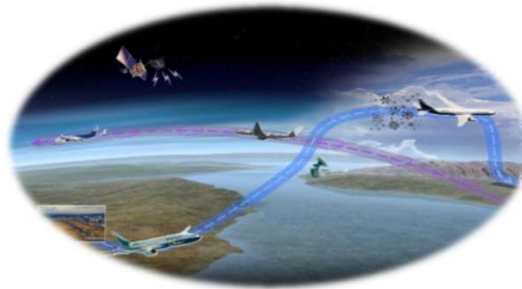
Continuous Descent Approach



Community response



Intelligent operations



Leverages Existing Capabilities



Develop aircraft operational noise reduction technology to reduce aircraft noise at take-off & approach

Sustainable Flight Demonstrator – NASA / Boeing

Improved performance

Engine installation (Shielding)



Novel gear integration

Conclusions

- Significant Progress has been made in noise reduction
- People continue to have significant concerns about aviation noise
- Technologies targeting carbon reduction can / may have a negative impact on noise
- The aviation industry is continuing to invest and develop technologies to reduce noise

