Noise of the Future

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Aviation Working Together
A Strong Track Record

~ 90% Reduction in Noise Footprint
~ 70% Fuel Improvement and Reduced CO₂
More Efficient, Quieter Family of New Airplanes

**777X**
- 12% Reduction in fuel and CO₂
- Substantially smaller noise footprint

**787**
- 20% Reduction in fuel and CO₂
- 60% Smaller noise footprint

**737 MAX**
- 14% Reduction in fuel and CO₂
- 40% Smaller noise footprint

**747-8**
- 16% Reduction in fuel and CO₂
- 30% Smaller noise footprint

*than the model it replaces

Less fuel, lower operating costs, lower CO₂ emissions
Significant Reduction in Community Noise
London Heathrow International Airport

1960 707
1965 727
1980 DC10
1995 777
2011 787

85 dBA takeoff noise contours
787 is Quieter for Communities
Chicago, O’Hare International Airport

- Chicago-O’Hare International Airport RWY 28
- 85-dBA noise contours
- Takeoff noise contours
- 6000-nmi mission
Pioneers on the Frontier of Innovation
Technologies For Quieter and Efficient Airplanes

All Composite Fuselage

Operational Procedures

Modern High Lift Devices

Chevrons

Higher Bypass Ratio Engines
Finding Noise and Fixing It

Advanced Test Techniques:
- Identify opportunities for source noise reduction
- Distinguishes between engine and airframe sources

Wing Anti-Icing Exhaust Vents

Phased Array (614 Microphones on Ground)
Advanced Aeroacoustic Tools for Efficient Wing Design

State of the art computational tools
• Complex due to geometry, grid size, flow physics, (or all three!)
• Simply not possible on past programs
• Grid size on the order of 100 million cells
• Runs using hundreds of processors

Smooth wing design
• Laminar flow technologies
• Advanced wing tip designs
• State-of-the-art high lift systems
• Composite structure allows high aspect ratio
2016 ecoDemonstrator
Slat Noise Cove Filler
Landing Gear Fairing

- Examined on QTD 2
- Showed Noise Reduction Promise
- Other issues –
  - Brake Cooling
  - Maintenance
- Looking and Next Generation Landing Gear Fairing on ecoDemonstrator
Advanced Concepts
Thanks