

Active Noise Control Vision: 2007 and 2022

Isam Yunis
NASA Lewis Research Center

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ANC Reality Based Goals

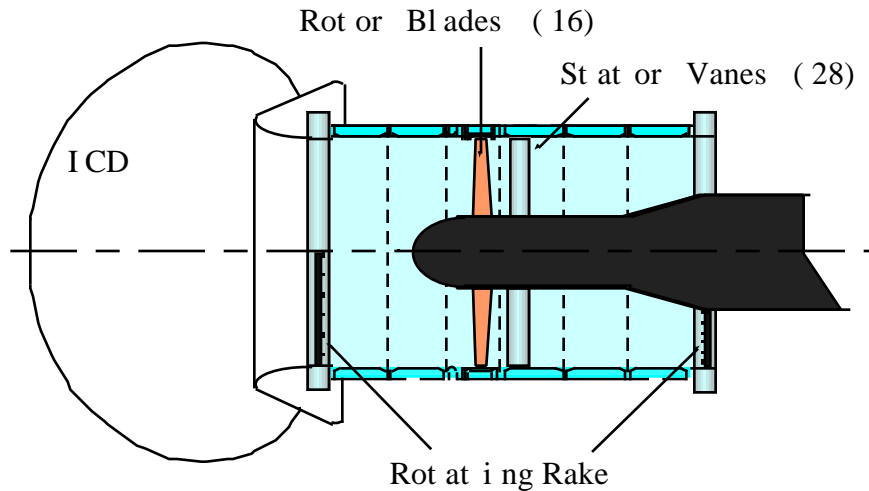
- Zonal/ground attenuation
- Fan tone cancellation
- Fan broadband attenuation
- Jet noise attenuation
- Hybrid active/passive liner optimization

Current/Recent Status

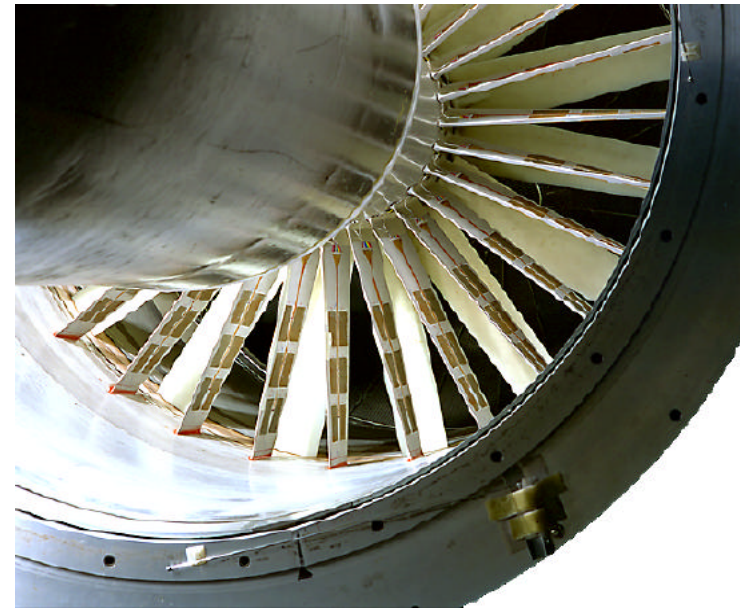
- Demonstrated tone reductions
- Hybrid passive/active systems verified
- Demonstrated systems are not practical:
Weight, reliability, and power
(systems self contained in nacelle, no attempt at true practicality)
- Integration with other noise reduction concepts being worked

ACTIVE NOISE CONTROL

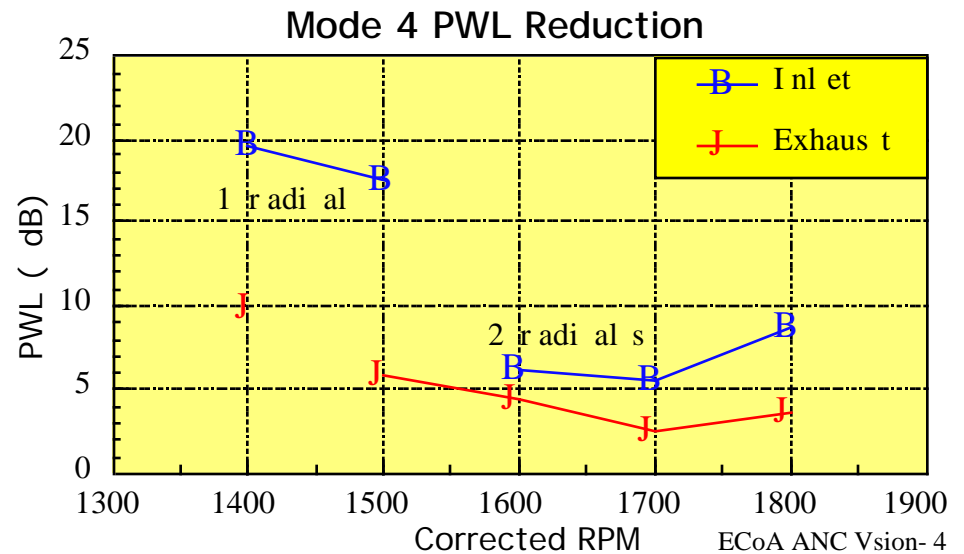
NASA LEWIS ANCF 48" Fan



BBN Actuated Vanes



- Farfield Verification up to 14 dB SPL
- PZT Actuators Embedded in Vane
- 4 Radials Reduced Globally:
2 Inlet and 2 Exhaust



ANC Concepts Towards Goals

- Active actuators along walls and stators
- Active walls or stators
- Active exhaust mixing
- Active volume control liners

Enabling Technologies for Concepts

- Smart materials
- Actuators: Reliable, low-cost, high-temp for exhaust, low-weight
- MEMS
- Turbulence structure control
- Jet instability wave control
- Subscale liner modeling

2007 EIS Vision

- Cut-on BPF engine with ANC for BPF tone reduction

2022 EIS Vision

- Active volume control liners for noise tone and broadband optimization
- MEMS actuators control fan broadband noise
- Active noise control integrated into design cycles of a new engine (similar to liners today)