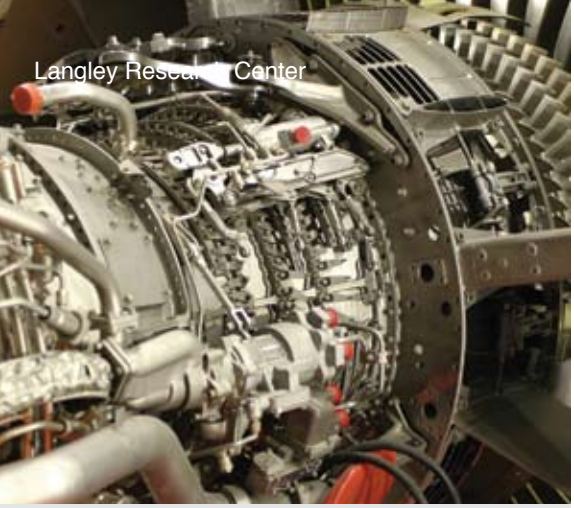
NASA Langley's
Adaptive Noise Reduction
Local intelligence-based impedance optimization

Researchers at **NASA's Langley Research Center** have developed an adaptive noise reduction system that optimizes impedance in an aircraft engine. Aerospace and automotive engineers can take advantage of this innovative system that offers a superior approach to noise dampening. Advantages will be seen in improved noise reduction through all stages of the flight, including takeoff and landing. In addition, the system corrects and adapts to mechanical and chemical changes over the life of the engine liner. The technology employs a honeycomb design with a variable control backing that self-adjusts based on real-time aeroacoustics for maximum effectiveness. The technology can be readily incorporated into existing technologies and transitioned to the marketplace. NASA is seeking market insights on commercialization of this new adaptive noise reduction technology, and welcomes interest from potential producers, users, and licensees.

Benefits

- Active noise reduction – liner adjusts to meet differing requirements throughout a flight
- Dynamic performance over the life of the engine – the system adjusts to changes over the life of the nacelle to maintain optimal performance
- Adjusts based on local information – sensors provide local aeroacoustic information to patches that are operated independently
- Provides real-time impedance modification

partnership opportunity



Applications

The technology has multiple applications in the area of adaptive sound reduction. Specific uses include:

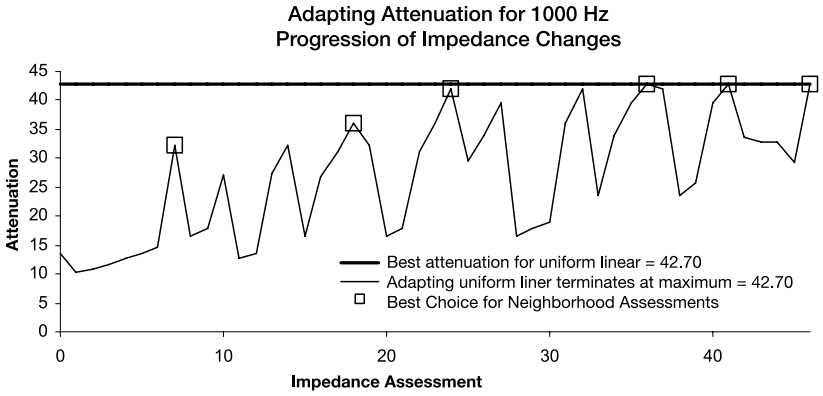
- Aviation
  - Commercial
  - Military
  - Private
- Automobiles
  - Engine
  - Wind noise
- Industrial environments
  - Manufacturing
  - Turbines

The Technology

The technology is a design for a control system to optimize the impedance of a segmented, tunable acoustic liner for reducing aircraft engine noise. Through a local sensor arrangement, the system monitors aeroacoustic conditions within the engine nacelle to determine the optimal liner settings that will maximize sound absorption. As the acoustic properties change in each region of the engine, a sensor sends local information to its assigned region of the liner. The liner backing alters its physical characteristics, thereby changing impedance properties. This dynamic system allows optimization of noise reduction in each phase of a flight and over the life of the engine.

Existing aircraft sound reduction technologies employ passive or static liner designs that provide compromised performance over a diverse range of aeroacoustic conditions throughout a flight. In addition, current technologies experience a decrease in performance over their useful life. The adaptive impedance technology reacts in real time to changes in flight maneuvers and can compensate for performance changes over the life of the engine.

The invention was developed to reduce noise problems associated with current airplane engine designs. Other applications could include reduced automobile noise and development of quieter manufacturing facilities. The liner relies on existing industry technologies and can be easily adapted to work with current product designs.



Adapting attenuation from 0.6-1.0i to 0.9-0.8i

For More Information

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

The Technology Gateway

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