

# Adaptive Liners for Broadband Noise Reduction, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



## ABSTRACT

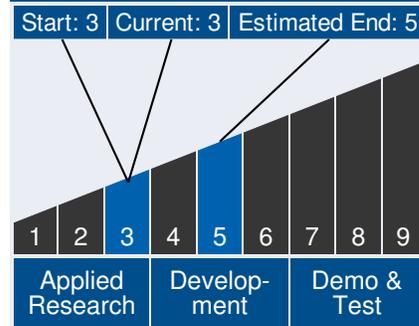
This project will combine the advantages of adaptive materials with the simplistic passive design of state-of-the-art acoustic liners to provide the ability to tune them for specific operational frequencies (ex. take-off/cutback, cruise, and approach). Many proposed solutions are not practical from a manufacturing/cost perspective: too complex or add weight to the aircraft that is not justifiable. The requirements for aircraft noise are becoming more stringent with greater emphasis on improvements in performance efficiency and lower fuel consumption. CRG has demonstrated feasibility in implementing adaptive technologies into acoustic liners. The next step is to develop increased understanding at more relevant size scales to demonstrate repeatable liner control performance supported by more extensive acoustic testing runs to understand the initial shifting and increased suppression behaviors that have been observed. Automated cyclic testing of a given adaptive liner parameter will be executed on the order of hundreds of thousands of times to demonstrate the durability of the adaptive material for this application. CRG has focused adaptive liner design on demonstration of tuning reactance to TRL 3-4 in Phase I. CRG will develop multiple integrated prototype demonstrators with flow duct testing to achieve a TRL 5-6 at the end of Phase II.



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## Technology Maturity



## ANTICIPATED BENEFITS

### To NASA funded missions:

Potential NASA Commercial Applications: Supporting several of NASA Aeronautics Research Mission Directorate projects and the Fundamental Aeronautics Program, this project's technologies directly address requirements for improvements in noise reduction and control for subsonic and supersonic vehicle systems, including fan, jet, turbomachinery, and airframe noise sources. This project's technologies offer system-level improvements in noise, emissions, and performance. The resulting adaptive liner capabilities could potentially be used by

## Management Team

### Program Executives:

- Joseph Grant
- Laguduva Kubendran

### Program Manager:

- Carlos Torrez

### Principal Investigator:

- Jason Hermiller

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NASA to more quickly study different passive liner concepts.

## **To the commercial space industry:**

Potential Non-NASA Commercial Applications: The proposed adaptive acoustic liner technology has high potential for application in public and private sector commercial airline jet engine systems. This project's technologies, developed for NASA liner concepts, would directly apply to systems operated by other government and commercial enterprises. Government systems that would derive the same benefits would include improvements in noise reduction, prediction, measurement methods, and control for subsonic and supersonic vehicle systems, including fan, jet, turbo-machinery, and airframe noise sources operated by the DoD and all major commercial aviation companies. This technology's attributes for commercial jet engine manufacturers should yield a high potential for private sector commercialization for implementation of tunable characteristics for turbofan engine acoustic liners. Additionally, CRG also sees a future for resulting commercialization of the adaptive liner technologies with commercial turbine generators, marine turbine systems, and the rail industry.

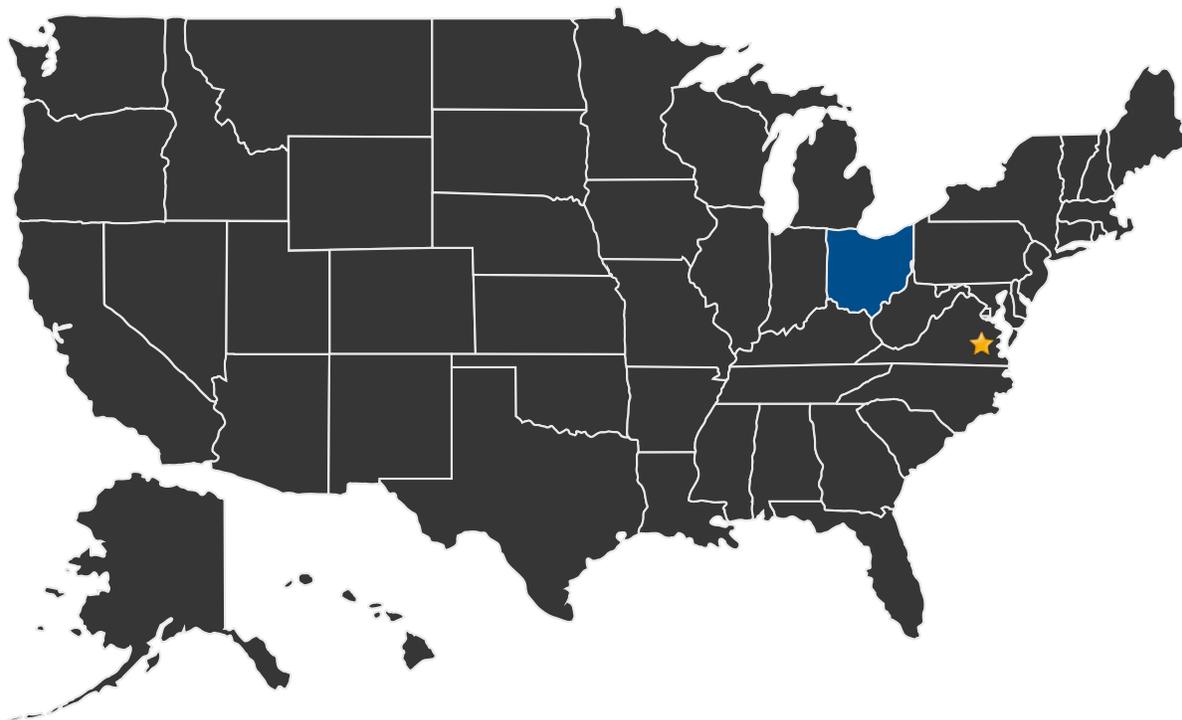
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## U.S. WORK LOCATIONS AND KEY PARTNERS

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- U.S. States With Work      ★ **Lead Center:**  
Langley Research Center

### Other Organizations Performing Work:

- Cornerstone Research Group, Inc. (Dayton, OH)

## PROJECT LIBRARY

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### Presentations

- Briefing Chart
  - (<http://techport.nasa.gov:80/file/20292>)

Active Project (2015 - 2017)

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## DETAILS FOR TECHNOLOGY 1

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### Technology Title

Adaptive Liners for Broadband Noise Reduction