



Aeronautics

# Active and Controllable Noise Reduction System

for Jet Engines

NASA's Langley Research Center researchers have developed a novel noise reduction system for jet engines. Aircraft jet engine noise is a major issue for airports, the communities near airports, and, of course, for the jet engine designers. Even with the use of recent high-bypass-ratio jet engine designs, noise continues to be a major concern. The present innovation represents a significant advancement to the concept of using mechanically fixed chevrons on the trailing edge of jet engine nozzles to reduce noise. While the effect of chevrons on noise reduction is well known, commercial implementation has been limited. Unfortunately, the turbulence created with the chevrons, while useful for reducing noise upon takeoff, serves to reduce efficiency during cruising. The present innovation is a simple noise reduction system with effects similar to that of chevrons, yet it is active and controllable to maximize noise reduction while maintaining efficiency.

## BENEFITS

- ➔ Noise reduction system is active and controllable
- ➔ Simple design is based on fluid (water) injectors at the nozzle exit. No moving parts are used
- ➔ Can be used as standalone noise reduction system or in complement with chevrons (hence the term wet chevrons). Increases effectiveness of chevrons, while minimizing chevron penetration into the flow stream and resulting loss of engine efficiency
- ➔ Can provide noise reduction exceeding that of mechanically fixed chevrons
- ➔ Increases turbulence at the nozzle exit in order to mix inner and outer flow streams
- ➔ Noise reduction can be maximized at takeoff or other periods of operation as desired, and turned off when applicable to maximize engine operating efficiency

technology solution



# NASA Technology Transfer Program

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## THE TECHNOLOGY

The noise reduction system makes use of injectors placed on the inside trailing edge of a jet engine nozzle. The momentum of the injected water causes turbulence, much like a chevron, to induce mixing of the inner core nozzle flow with the outer flow (bypass fan stream or free stream) upon exit from the nozzle. Optimization and control of the injector noise reduction is possible through control variables such as injector angle, injector placement and distribution, injector port shape, water flow, etc. This innovation has been developed and tested at NASA Langley Research Center using scale wind tunnel testing. The technology is protected under US patent application US20080078159, published April 2008.



Jet engine builders can leverage this technology into next-generation aircraft jet engines for maximum efficiency and quiet operation.

## APPLICATIONS

The technology has several potential applications:

- The technology offers commercial opportunities within the civilian and defense aerospace markets for jet engines. Jet engine builders can leverage this technology into next generation aircraft jet engines for maximum efficiency and quiet operation.

## PUBLICATIONS

Patent No: 8,015,819

National Aeronautics and Space Administration

### The Technology Gateway

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