

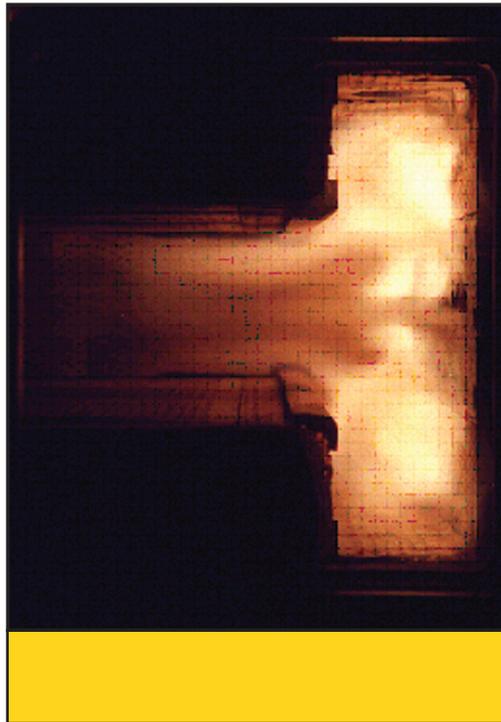


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*Science and Technology for Tomorrow's Aerospace Forces*

## **Success Story**

### **PROPULSION DIRECTORATE-LED COMBUSTION RESEARCH NAMED POLLUTION PREVENTION PROJECT FOR 2001**



The Strategic Environmental Research and Development Program (SERDP) office, a joint Department of Defense, Department of Energy (DOE), and Environmental Protection Agency program, named the Propulsion Directorate-led trapped vortex combustion project the Pollution Prevention Project of the Year for 2001. The Trapped Vortex program is a joint effort with the Navy, General Electric Aircraft Engines (GEAE), Innovative Scientific Solutions Incorporated, and the DOE.

The Trapped Vortex program began as a potential method to keep aircraft jet engines lit even when operating at the extremes of the flight envelope. The trapped vortex combustor (TVC) satisfies the initial requirement and reduces pollution while increasing performance.



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## **Accomplishment**

The TVC project produced impressive results for jet engine operation while enabling significant reductions in emissions. Use of a TVC in a jet engine improves performance by allowing a 40% expansion of the operating envelope, a 50% decrease in engine blowout occurrence, and a 50% improvement in relight if blowout occurs.

The pollution prevention numbers are equally impressive. Using TVCs in turbine engines could reduce aircraft emissions to 50% below the International Civil Aviation Organization standard for nitrogen oxides (NOx) as well as a comparable amount for volatile organic compounds (VOCs).

Compared to conventional combustors used in marine gas turbine engines, a trapped vortex combustor-equipped turbine engine will reduce yearly emissions of NOx and VOCs from Navy ships by 52% and 60% respectively. When applied to various fleets of aircraft, turbine powered ships, and stationary power plant turbines, TVC use will reduce NOx emissions by 95 million pounds per year and VOCs by 300 million pounds per year.

## **Background**

The TVC concept grew from fundamental studies of flame stabilization conducted by the directorate. The TVC is an innovative design that departs from the traditional swirl stabilized designs used in turbine engines for the past 40 years. It consists of a pilot combustor for stability and a main combustor for power.

The pilot section includes cavities that capture or trap a flame vortex, thus the name TVC. It is a simple design that provides low NOx because of a good mix in the main and trapped vortex pilot combustors. The directorate, GEAE, Naval Sea and Air Systems Commands, and National Energy Technology Laboratory are developing the TVC with funding from SERDP and other sources.

## **Additional information**

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTT, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (01-PR-10)