

# MECHANICAL ENGINEER

---

## VALIDATION OF ENHANCED MIXING EDUCTOR DESIGNS FOR GAS TURBINE EXHAUST SYSTEMS

Adam W. Masten-Lieutenant, United States Navy

B.S., United States Naval Academy, 1992

Mechanical Engineer-March 1999

Master of Science in Mechanical Engineering-March 1999

Advisor: Knox Millsaps, Department of Mechanical Engineering

The performance of two newly designed, enhanced mixing exhaust gas eductor nozzle patterns was measured and analyzed. Both designs use a constant area square mixing tube and 16 high aspect-ratio slot nozzles which promote rapid mixing, reducing the required mixing tube length. One design uses arrays of parallel nozzles while the other uses a radial nozzle arrangement. A one-fifth scale, cold flow air tunnel facility was designed and constructed. The secondary-to-primary air entrainment ratios and mixing tube exit velocity profiles are reported for a range of mixing tube standoff distances. An analysis of the results is provided along with projections for hot flow performance.

**DoD KEY TECHNOLOGY AREAS:** Electronic Warfare, Modeling and Simulation, Other (Signatures)

**KEYWORDS:** Modeling and Simulation, Gas Turbine Exhaust, Eductors, Mixing, Cold Flow Testing