

Turbine Research Facility (TRF)

Description:

This facility is used for exploratory development of advanced turbines. It simulates multiple engine operating conditions through the use of aero and thermodynamic similarity in a short duration (transient) test procedure. Advanced, full-scale rotating turbine hardware is evaluated using fast response, nonintrusive instrumentation that measures high frequency surface heat flux, unsteady pressures, inlet and outlet conditions, secondary flows, mass flow, and various other quantities. Turbines as large as 34 inches tip diameter and as small as 17 inches hub diameter can be accommodated. A cryogenic cooling system provides a range of temperature ratios for fully cooled hardware. The research article may be exposed to a range of both design and off-design conditions typical of current and future military engines. A high speed data acquisition system with nearly 1000 channels allows detailed analysis to be done at significantly reduced costs compared to conventional turbine engine investigations. Data from the TRF is used to improve the turbine aerodynamic and heat transfer design process, investigate problems observed in the field, and reduce risk in technology demonstration of core and engine programs.



Purpose:

Perform aerodynamic, aerothermal and aeroelastic research on full-scale turbines. Major emphasis areas include:

- Turbine performance (efficiency, loading)
- Turbine cooling (external & internal heat transfer)
- Structural dynamics (unsteady aero forcing & damping)

Products:

Advanced test data of the most advanced turbines developed and being developed under the national VAATE program.

Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency, DoD contractor and commercial customer programs upon request. Contact: 937-255-2367.