



Facility Factsheet

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. The capabilities of the facility have been expanded to accommodate a complete High Pressure stage with a Low Pressure Vane assembly in order to assess various aerodynamic means to reduce unsteady interactions between stages. 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 for exceptionally detailed flowfield verification at significantly reduced costs compared to conventional turbine engine investigations. Data from the TRF is used for exploratory development of advanced turbines. The TRF also supports research on advanced instrumentation hardware and systems. This includes non-invasive thermal measurement technologies such as infrared (IR) probe assemblies as well as revolutionary methodologies for on-shaft digitization of rotating sensors and the transfer of large data sets. Recently the TRF has implemented the Advanced Instrumentation and Measurement Technology (AIMTec) rig as a second flow leg from the main supply tank. This rig utilizes a 2 x 3 inch test section for the development and calibration of advanced instrumentation such as Kiel-head probes, dynamic air-angle rakes, IR imaging, etc.



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:

Highly-resolved test data for the most advanced turbines operating in the USAF and under development in the national ATTAM program.

Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency, DoD contractor and commercial customer programs upon request. Contact: 937-255-4100.

