



Facility Factsheet

Low Speed Wind Tunnel Facility (LSWTF)

Description:

This primary rig in this facility is a large-scale, low-speed open-loop induction wind tunnel which has been modified to house a linear turbine cascade. A 125-hp electric motor powers an axial flow fan, drawing ambient air at velocities up to 80m/s through an 85cm by 122cm inlet section. The entrance to the tunnel consists of a 3.0m by 2.7m rectangular bell-mouth inlet. Honeycomb flow straighteners located in the inlet, combined with a gradual 8:1 area contraction, produce a uniform ($\pm 1\%$), low turbulence ($< 0.5\%$) velocity at the inlet to the test section.

Unsteadiness at the cascade can be augmented through the use of a turbulence generating grid which produces isotropic freestream turbulence levels of approximately 4% at the cascade. The grid may also be fed with high-pressure air to produce controllable turbulence levels of up to 15%. In addition a moving bar wake generator is available to introduce unsteady periodic upstream wakes at reduced frequencies typical of engine operations. The inlet and test sections pivot with respect to the fixed exit section, allowing the cascade inlet and exit angles to be set independently between 0° and 65° , accommodating a total cascade turning of between 0° and 130° . The cascade is modular and can accept 85cm span blades of up to 20cm axial chord. A splitter plate assembly may be installed to allow the study of end-wall flows with controlled wall boundary layer conditions. Available instrumentation includes thermocouples, pressure probes, thermal anemometry, and Stereoscopic Particle Image Velocimetry. Clear polycarbonate side, top, and bottom walls allow use of surface and stream flow visualization as well as a wide range of other optical instrumentation techniques. The facility also houses a smaller wind tunnel with a 30cm square test section. This smaller tunnel is used primarily for development of instrumentation and measurement techniques before transitioning to the larger rig. The facility includes full calibration capabilities for pressure, temperature, and anemometry instrumentation.



Purpose:

This facility is used to perform studies of turbine aerodynamics and flow control.

Products:

- Low Reynolds number and high loading turbine component aerodynamics data.
- Data on development and interaction of secondary and midspan flows.
- Data on production of midspan and endwall pressure losses.
- Data on the effects of periodic unsteadiness on turbine performance.
- Flow control data for application to turbine component design.

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.

