

Compressor Aero Research Laboratory (CARL)



Description:

Design concepts are tested and fundamental fluid experiments are performed in a 6,000 hp facility. All instrumentation and measurement systems are maintained at levels that produce highly accurate results. The following table provides some of the CARL's capabilities:

- Speed Range - 4,500-22,500 rpm
- Air Flow Range - 10-60 lbs/sec
- Inlet Total Pressure - ambient (less inlet system pressure losses)
- Steady State Pressure Measurements - 256+ channels
- Steady State Analog Measurements - 160+ channels
- Unsteady Analog Measurements - 32 channels (up to 200 Khz)

Three primary research vehicles are available to investigate the complex flow phenomena present in transonic compressor designs: (1) a single-stage fan rig with 10 different transonic rotor, (2) a two-stage high-load compressor, (3) a single-stage fan or core configuration with upstream wake generating capability.

Purpose:

The overall mission includes: (1) enhance the understanding of complex internal flow physics within fans and compressors through analytical, computational, and experimental methods, (2) develop high payoff fan and compressor design concepts, (3) assist transition of research findings through the development of improved design methods and modeling techniques.

Products:

The development of high through flow fan technology, widely used today. Fan leading edge sweep, being incorporated in advanced fans and compressors. Shock loss models, being incorporated in compressor design models. Transonic compressor profile loss models, being integrated into compressor design codes. High- and low-fidelity descriptions of fan and compressor vane/blade interaction, being used for modeling and design work.

Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency, DoD contractor and commercial customer programs upon request. Contact: 937-255-2351.