



Facility Factsheet

Compressor Aero Research Lab (CARL)

Description:

Design concepts are tested and fundamental fluid experiments are performed in two facilities. The first is a 6,000 hp Compressor Facility (CF). The second is a vertical, continuous inflow Annular Cascade Facility (ACF). All instrumentation and measurement systems for both facilities are maintained at levels that produce highly accurate results. The following table provides some of the CARL's capabilities:

Compressor Facility	Annular Cascade Facility
Speed Range - 4,500-22,500 rpm	Air Flow Range - 5-70 lbs/sec
Air Flow Range - 5-60 lbs/sec	Inlet Total Pressure - ambient
Inlet Total Pressure - ambient	Steady State Pressure - 256+ channels
Steady State Pressure - 256+ channels	Steady State Temperature - 32+ channels
Steady State Temperature - 145+ channels	Particle Image Velocimetry- 7 kHz 2D and 3D
Unsteady Analog - 56 channels (up to 200 kHz)	



The CF has three transonic vehicles available for research: (1) a single-stage fan rig with parametrically related transonic rotors, (2) a two-stage high-load compressor, (3) a single-stage fan or core configuration with upstream wake generating capability. The ACF has a state-of-the-art diffuser, pressure distortion screen rotator, and a swirl distortion (StreamVane™) rotator on which to conduct research. Each of these devices is interchangeable between the two facilities.



Purpose:

The CARL mission: (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, and (3) transition research findings via development of improved design methods and modeling techniques.



Products:

High through flow fan technology. Fan leading edge sweep. Shock loss models. Transonic compressor profile loss models. High- and low-fidelity models of fan and compressor vane/blade interaction.

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.