National Aeronautics and Space Administration

Turbomachinery Test Facilities at NASA Glenn Research Center

NASA Glenn Research Center has eight **turbomachinery test rigs** with varying capabilities offering state-of-the-art instrumentation and data systems.

Facility Description

The Engine Research Building (ERB) complex houses over 60 test rigs supporting research on all aspects of engine development, providing superior testing of turbomachinery, aerodynamics flow physics, aeropropulsion heat transfer, mechanical components, and combustor facilities.

Eight turbomachinery facilities are located within the ERB at NASA Glenn. They provide the capability for conducting fundamental and applied research aimed at advancing the technology of the compressor and turbine components of aeronautical gas turbine engines.

Both axial- and radial-type machinery are addressed. The research is focused on providing improved understanding of steady and unsteady aerodynamics, flow physics, and the modeling and advanced numerical flow code development and validation. Research experiments utilize advanced instrumentation systems such as hot wire anemometry and laser diagnostics where detailed flow data is obtained on a nonintrusive basis.

Facility Benefits

- Advanced compressor/turbine research facilities capable of simulating advanced engine entry/exit conditions, including an inlet refrigerated air supply to –60 °F
- Central, variable frequency system for compressor drive motor systems (10 to 120 Hz, up to 15,000 hp)
- Accommodates in-house and private industry research programs
- Highly qualified staff of technicians, engineers, researchers, and operators
- High customer satisfaction

Commercial Applications

- Aircraft engines
- Aerospace propulsion

Compressor test hardware mounted in NASA's Multistage Axial Compressor Facility (W–7).

Programs and Projects Supported

- Fundamental Aeronautics Subsonic Fixed Wing Program
- Ultra-Efficient Engine Technology (UEET) Program
- Environmentally Responsible Aviation (ERA) Project

Facility Testing Information

http://facilities.grc.nasa.gov

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Capabilities

Turbomachinery Facilities—ERB

Testing Capabilities Parameter	W–1A Low Speed Compressor Facility	W–6A Single Spool Turbine Facility	W–7 High Speed Multistage Compressor Facility	W–8 Single-Stage Axial Compressor Facility	CE–18 Small Engine Components Compressor Test Facility
Inlet air pressure	Atmospheric	2 psia to 40 psig	Atmosphere to 20 psig	5 to 20 psia	2 psia to 40 psig
Inlet air temperature	Ambient	Up to 940 °F	–30 to 100 °F	Ambient	–20 to ambient
Inlet airflow	66/32 lb/s (centrifugal/axial)	30 lb/s	95 lb/s	100 lb/s max.	60 lb/s max.
Atmosphere exhaust	.8 psid blowers	N/A	.8 psid	.8 psid blowers	14.7 psid
Altitude exhaust	20 to 26 in. Hg (vacuum)	20 to 26 in. Hg (vacuum)	26 in. Hg (vacuum)	26 in. Hg max. (vacuum)	20 to 26 in. Hg (vacuum)
Rotor speed	1920/1050 rpm (centrifugal/axial)	14,000 rpm max.	18,700 rpm	20,600 rpm max.	60,000 rpm max.
Rotor size	60/48 in. (centrifugal/axial)	52 in. max.	20 to 22 in.	20 in.	8 to 20 in.
Drive motor	1500 hp	12,420 hp max.	15,000 hp	7000 hp max.	6000 hp

Low Speed Axial Compressor Facility (W–1).

Small Engine Components Test Facility (CE–18).

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