National Aeronautics and Space Administration

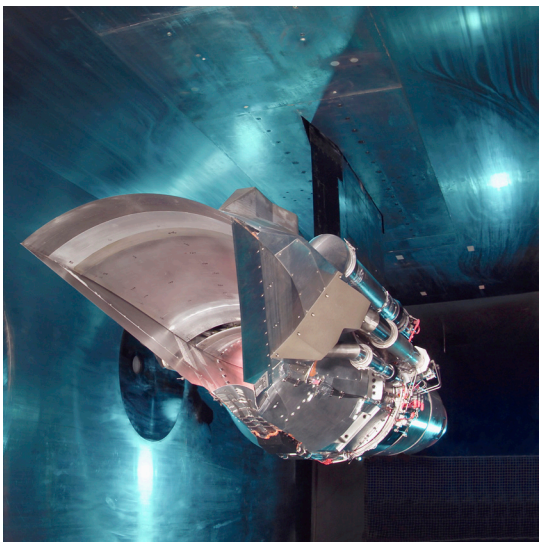
NASA

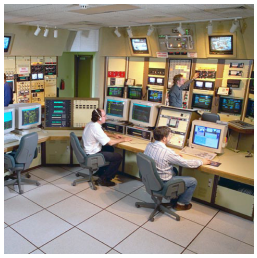
NASA's **Aeronautics Test Program**

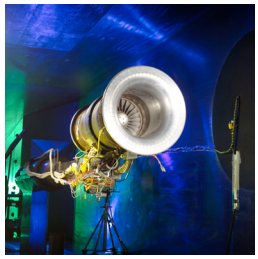
10- by 10-Foot Supersonic Wind Tunnel

Throughout its history, the 10- by 10-Foot Supersonic Wind Tunnel (10×10 SWT) has made valuable contributions to the advancement of fundamental supersonic propulsion technology. Researchers have used the facility to aid in the development of the Atlas-Centaur, Saturn, and Atlas-Agena-class launch vehicles, and for such vehicle-focused research programs as the High-Speed Civil Transport, the National AeroSpace Plane, and the Joint Strike Fighter.

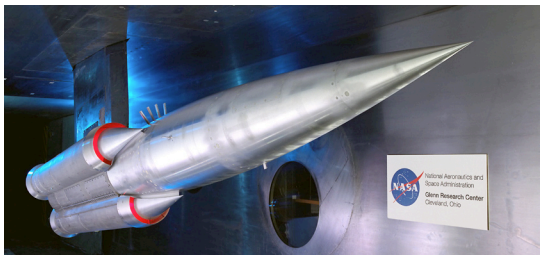
The test section is voluminous enough to accommodate large-scale models and full-size aircraft components. The 10×10 SWT was specifically designed to test supersonic propulsion components such as inlets, nozzles, and full-scale jet and rocket engines.

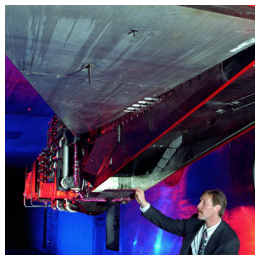






From left to right: Parametric inlet model, operators monitor a test from the control room, Active Inlet Flow Control (AIFC) fan and bellmouth installed in test section, and technicians in front of the Trailblazer rig.





Facility Benefits

- Equipped with model support systems (hydraulics, exhaust, high-pressure air, fuels, etc.)
- Able to accommodate large-scale models and full-size aircraft components
- Offers continuous operation across the entire speed and altitude regime, allowing greater flexibility and productivity during testing
- Capable of expanding local Mach number range with gust and Mach plates
- Employs an experienced staff of technicians, engineers, researchers, and operators

Facility Applications

- Next-generation launch vehicles
- Aircraft and missile development
- Inlet performance and operability
- Propulsion system integration
- Jet and rocket engines
- Development of launch vehicles
- Supported programs and projects including the High-Speed Civil Transport, National AeroSpace Plane (NASP), space shuttle, and Joint Strike Fighter (JSF)

Characteristics

Test section dimensions	10 ft high by 10 ft wide by 40 ft long	
Speed	Mach 0 to 0.36 and 2.0 to 3.5	
	Aerodynamic mode	**Propulsion mode**
Reynolds number	0.1 to 3.4×10^6 per ft	2.1 to 2.7×10^6 per ft
Temperature	540 to 750 °R	520 to 1140 °R
Simulated altitude	50 000 to 154 000 ft	57 000 to 77 000 ft
Dynamic pressure	20 to 720 psf	500 to 600 psf
Fuels	Liquid jet fuel, gaseous hydrogen, and gaseous oxygen	

Instrumentation

Pressure measurement Electronically scanned pressure (ESP) system	 768 ports, ±15 psid 192 ports, ±30 psid
Temperature measurement Thermocouples	 48 (type J, T, or R)
Flow visualization	Schlieren system, sheet laser, pressure-sensitive paint, and high-speed video

Data Acquisition and Processing

Steady state ESCORT	Real-time online analog signals, conversion of Neff data to engineering units, calculations displayed in tabular or graphical format, and 1-s update rate
Dynamic Multichannel high-speed digitized acquisition	Precision filter amplifiers with elliptical (132 dB/oct) or linear phase (46 dB/oct) anti-aliasing filters (132 dB/oct); offloading data by FTPing in near real time for postprocessing; 16-bit A/D per channel; and throughput of 40 million samples per second
Remote access control room	Real-time remote access to data, video conferencing in real time, workstations supplied for remote site, and secure network connections provided

Contact Information

www.aeronautics.nasa.gov/atp
David Stark
NASA Glenn Research Center
Phone: 216–433–2922 · Fax: 216–433–8551
E-mail: David.E.Stark@nasa.gov

M–1870–12
Nov 07