



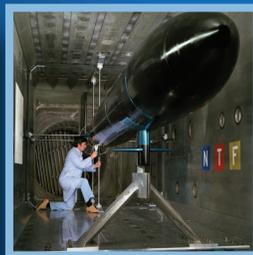
Langley Research Center's

National Transonic Facility

The National Transonic Facility (NTF) is a high-pressure, cryogenic, closed-circuit wind tunnel that uses supercold nitrogen gas at high pressure to duplicate true flight aerodynamics. The NTF can accommodate models as small as one-fiftieth the size of an actual aircraft.

Unlike conventional wind tunnels, this facility can adjust airflow to match model size. The test section has 12 slots and 14 reentry flaps in the ceiling and floor to prevent any near-sonic flow "choking" effect. To ensure minimal energy consumption, the interior of the pressure shell is thermally insulated. The drive system consists of a fan with variable inlet guide vanes for responsive Mach number control.

The NTF has two modes of cooling. In the first, variable temperature cryogenics, liquid nitrogen is sprayed into the circuit. The heat of vaporization and latent heat cools the tunnel structure and dissipates fan heat. In this mode, the NTF provides full-scale-flight Reynolds numbers without an increase in model size. Ambient-temperature air is the test gas in the second mode. Fan heat is removed by chilled water that flows through a cooling coil.



Facility Benefits

- Provides the highest Reynolds number testing capability in the world
- Matches and selectively isolates Mach number, Reynolds number, and aeroelastic effects to accurately determine and understand vehicle performance while in the cryogenic mode
- Provides testing and configuration aerodynamics validation for both full- and half-span models for existing and new vehicle concepts
- Adjustable airflow to match model size

Characteristics

Test section dimensions	8.2 ft high by 8.2 ft wide by 25 ft long (2.49 m high by 2.49 m wide by 7.62 m long)
Area	66.8 ft ² (6.20 m ²)
Speed	Mach 0.1 to 1.2
Reynolds number	4 to 145×10 ⁶ per ft
Temperature	-250 to 150 °F (-156.6 to 65.5 °C)
Pressure	15 to 130 psi (1.05 kg/cm to 9.14 kg/cm)
Test gas	Nitrogen and ambient atmosphere
Circuit length	497 ft (151.4 m)
Drive power	135 000 hp (100 670 kW)
Contraction area ratio	14.95:1

Instrumentation

Strain gauge balances	Six-component internal
Available corrections	Interactions, temperature effects, attitude tares, axes orientation, pressure tares, and momentum (flow) tares
Angle-of-attack (AOA) accelerometers	Thermal conditioning systems available and accelerometers for cryogenic operation
Electronically scanned pressure (ESP) system	Rates up to 500 samples per sec
Modules are available in different pressures of 2.5, 5, 15, 30, and 45 psi	

Facility Applications

- Vehicle testing such as the Boeing 777, the Space Shuttle and Booster, and the Boeing 767
- Blended-wing-body design testing such as the B-2 bomber, the A-6 Intruder, and the F-18 Hornet

Data Acquisition and Processing

Inputs	Analog, digital, and frequency and pulse train
Controller	UNIX
Capacity/channels	Analog/256, Digital/32, Frequency/1
Dynamic data acquisition	14-track FM tape recorder
Customer computers	Yes
Classified capability	Yes

Contact Information

<http://www.aeronautics.nasa.gov/atp/index.html>

O. William Bissett

NASA Langley Research Center

Phone: 757-864-5111

E-mail: wte+fm_ntf@nasa.gov