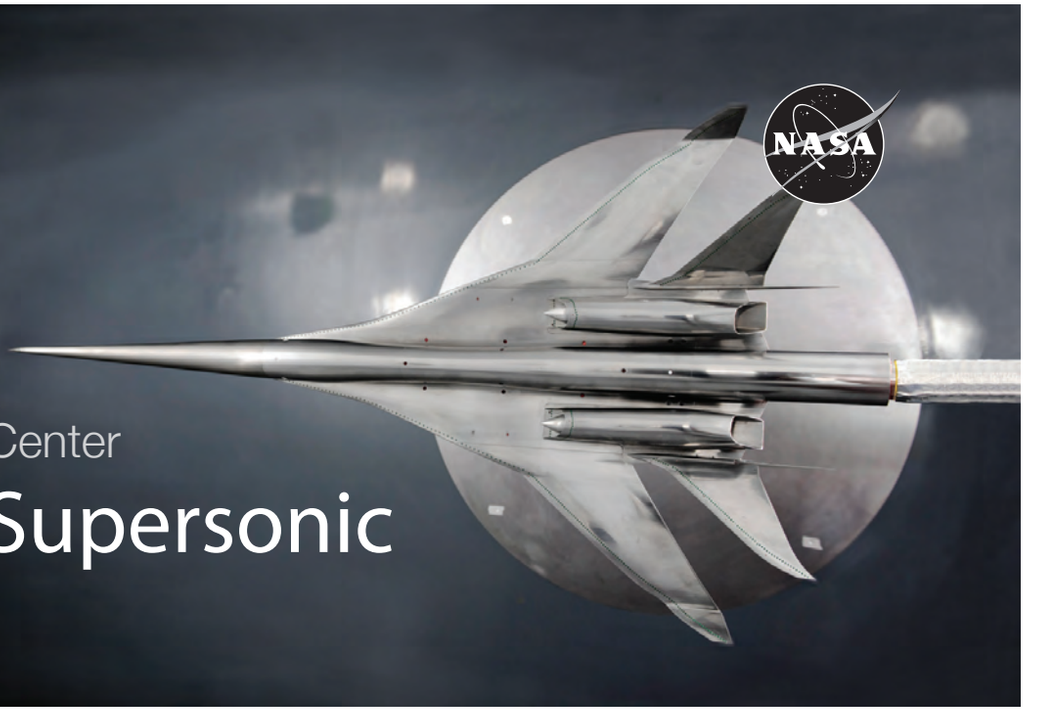
National Aeronautics and Space Administration



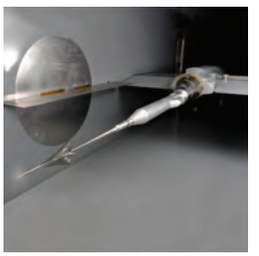
NASA Ames Research Center

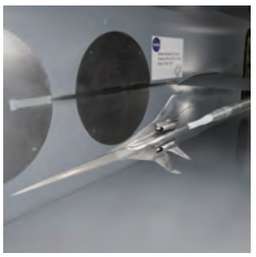
9- by 7-Foot Supersonic Wind Tunnel

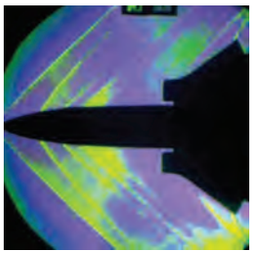
The 9- by 7-Foot Supersonic Wind Tunnel (9×7 SWT) facility is part of the Unitary Plan Wind Tunnel (UPWT) complex at NASA Ames Research Center at Moffett Field, California, where generations of commercial and military aircraft and NASA space vehicles, including the space shuttle, have been designed and tested.

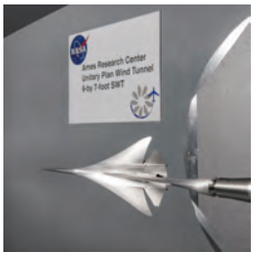
The 9×7 SWT is a closed-return, variable-density tunnel with an asymmetric, sliding-block nozzle. It is one of three separate test sections powered by a common drive system. Interchangeability of models among the UPWT test sections allows testing across a wide range of conditions. Airflow is generated by an 11-stage, axial-flow compressor powered by four variable-speed, wound-rotor induction motors.

The 9×7 SWT continues to provide aerodynamic data for NASA's manned spaceflight efforts, including the Constellation Program, whose goal it is to create the rockets and spacecraft necessary to take explorers to Earth orbit, the Moon, and eventually, to Mars.









Facility Benefits

- Excellent optical access supports advanced flow techniques, including pressure-sensitive paint, particle image velocimetry, oil flow interferometry, infrared thermography, and Schlieren imaging
- Rear-sting model support provides wings-level yaw capability
- High-pressure air at 3000 psi, with a maximum flow rate of 80-pounds per second, is digitally controlled with preheating available and over 6 million scf of storage
- A steady-state data system incorporates the latest technology in a flexible, modular configuration to satisfy the most demanding test configurations, with the capability of acquiring pitch-pause and continuous-sweep data
- On-site instrumentation measures balance loads, model position, thermally compensated surface pressures, temperatures, and tunnel conditions
- An extensive library of standard aerodynamic computations is augmented by the ability to easily add customer-defined equations; corrections include wall interference and buoyancy
- A dynamic data system acquires more than 400 channels of dynamic and transient data, including unsteady pressures, aero-acoustics, and dynamic structural loads

Facility Applications

- Commercial, military, and NASA programs
- Classified capability available

"This was probably the smoothest, most well-executed tunnel test I've ever been on, anywhere." —Customer comment

Characteristics

Test Section Dimension	7-ft high by 9-ft wide by 14-ft long
Area	63 ft^2
Speed	Mach 1.55 to 2.55
Reynolds Number	0.90 to 5.6×10^6 per ft
Temperature	100 ± 20 °F
Pressure	4.4 to 27 psia
Test Gas	Air

Instrumentation

Strain Gauge Balances
Angle-of-Attack (AOA) Accelerometers
Pressure Instrumentation
Temperature Instrumentation

Data Acquisition and Processing

Steady-State Data		
System	Channels	Sample Frequency
Analog Input	48	Up to 2000 Hz
Digital Input	16	Test dependent
Force Balances	32	Up to 3000 Hz
Pressure	2048	100 Hz
Temperature	60	10 Hz
Dynamic Data		
System	Channel	Sample Frequency
Analog	300 to 450*	Up to 204-KHz

* Depending on dynamic sensor style

Flow Visualization

Oil Flow
IR Thermography
Pressure Sensitive Paint (PSP)
Particle Image Velocimetry
Schlieren / Shadow Graph
Background Oriented Schlieren (BOS)

Contact Information

Maureen Delgado
Wind Tunnel Division Chief
NASA Ames Research Center
Phone: (650) 604–1620
E-mail: Maureen.A.Delgado@nasa.gov