Wind Tunnel Testing Guide
at NASA Langley Research Center

Comprehensive Capabilities

Nowhere in the world are there as many aerospace ground testing facilities in one location as exist at the NASA Langley Research Center. We have the most complete suite of facilities, all specifically built to collect, analyze and interpret test data.

At Langley, we have conducted projects for NASA, industry, the Department of Defense, and academic partners within the research and development communities.

A One-Stop Setting

All types of vehicles, from subsonic through hypersonic, have been evaluated at Langley. Our unique infrastructure is complemented by unmatched computational capabilities, including state-of-the-art tools, access to world-renowned specialists and extensive code validation.

In addition, test article fabrication capabilities, advanced instrumentation, cutting-edge test techniques, a diverse, highly skilled and experienced workforce, and excellent data support are all available at Langley in a one-stop, ISO9001/AS9100C-certified setting … and we continually invest to maintain, upgrade, and modernize our facilities to keep pace with customer requirements.

Delivering Solutions to Complex Challenges

At Langley, we have a critical mass of subject-matter experts with internationally recognized core competencies in aero-sciences, acoustics, structures, and materials to identify and deliver solutions to your complex aerospace systems challenges.

At Langley, you can

Accomplish your design objectives  ·  Realize your vision  ·  Test in one location  ·  Collect more data to support your decision making  ·  Take the time to make sound design adjustments

Doing Business with Us

Our extensive aerospace expertise and unique ground testing capabilities will prove invaluable to your enterprise.

We offer what others can’t. Infrastructure. Know-how. Experience. And most importantly: Success.

We’re the most complete ground testing facility in the world. And we want to share with you the benefits of our decades of accomplishment. But don’t just take our word for it. Work with us, and your results will speak for themselves.

You won’t be disappointed.

We’re just a call (757-864-6885) or email (larc-dl-gftd@mail.nasa.gov) away.

Visit us on line at: http://gftd.larc.nasa.gov or come see us in person at the NASA Langley Research Center in Hampton, Virginia.

The solution to your aerospace challenges starts by contacting:
Chief Engineer for Test Operations Excellence
Ground Facilities and Testing Directorate (GFTD)
GFTD Main Office, Mail Stop 225
NASA Langley Research Center
Hampton, VA 23681
Facility Capabilities at a Glance

**SUBSONIC SPEED REGIME**

- **14- to 22-Foot Subsonic Tunnel (14 x 22)**
  - Mach 0 to 1.5
  - Reynolds Number: 0 to 2.2 x 10^6 per ft
  - Total Pressure: 1.4 to 1.5 x 10^5 psi
  - Atmospheric
  - Air
  - Open, closed test sections, High-Altitude

- **Low-Speed Anechoic Wind Tunnel (LSWAT)**
  - Mach 0 to 0.32
  - Reynolds Number: 1 to 0.55 x 10^6 per ft
  - Low-speed
  - Subsonic

- **30-Foot Inlet/Swirl Tunnel (G3T)**
  - Mach 0 to 0.6
  - Reynolds Number: 0 to 2.5 x 10^6 per ft
  - Atmospheric

**TRANSonic SPEED REGIME**

- **Transonic Dynamic Tunnel (TDT)**
  - Mach 0 to 1.2
  - Reynolds Number: 0.01 to 3.0 x 10^6 per ft

- **National Transonic Facility (NTF)**
  - Air Mode: Mach 0.1 to 1.05
  - Reynolds Number: 1.0 to 20 x 10^6 per ft

- **Transonic Dynamics Tunnel (TDT)**
  - Air Mode: Mach 0 to 1.2

**SUPERSONIC SPEED REGIME**

- **4-Foot Supersonic Unitary Plan Test Section**
  - Mach 1.5 to 2.0
  - Reynolds Number: 0.5 to 4 x 10^6 per ft

- **5-Foot High Temperature Air Tunnel**
  - Mach 6
  - Reynolds Number: 1.0 to 0.5 x 10^6 per ft

**HYPERSONIC SPEED REGIME**

- **Arc-Heated Scramjet Test Facility**
  - Mach 4.7 to 8
  - Reynolds Number: 0.035 to 2.2 x 10^6 per ft

**Specialized Test Techniques**

- **Doppler Global Velocimetry**
  - A non-intrusive measurement technique that can provide global flow field measurements.

- **IR Thermography**
  - A real-time, nonintrusive surface temperature measurement technique used to measure global surface temperature, heat flux, emissivity, heat transfer, and surface cooling.

- **Oil-Film Interferometry**
  - A method for determining shear stress magnitude and spatial distribution on aerodynamic test articles.

- **Particle Image Velocimetry**
  - A powerful technique for measurement of three-dimensional velocity in particle laden flow. A digital particle image velocimetry technology is used to perform two-dimensional particle flow.

- **Planar Laser Induced Fluorescence**
  - An optical diagnostic technique used for flow visualization and quantitative measurement of local velocity, temperature, and species concentrations.

**Pressure/Temperature Sensitivity Point**

- A technique that permits measurement of global pressure and temperature distributions on aerodynamic test articles.

- **Thin-Film Gauges**
  - A discrete technique used to measure convective heating on model surfaces.

**Virtual Diagnostic Interface**

- A suite of techniques utilizing image processing, data handling, and 3-D computer graphics to aid in the design, optimization, and analysis of complex aerospace experiments.

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### Table: Test Capabilities

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<thead>
<tr>
<th>Facility Speed</th>
<th>Reynolds Number</th>
<th>Test Section Total</th>
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<th>Type</th>
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*Please contact the Ground Facilities and Testing Directorate for a full list of test capabilities and specialized test techniques.*