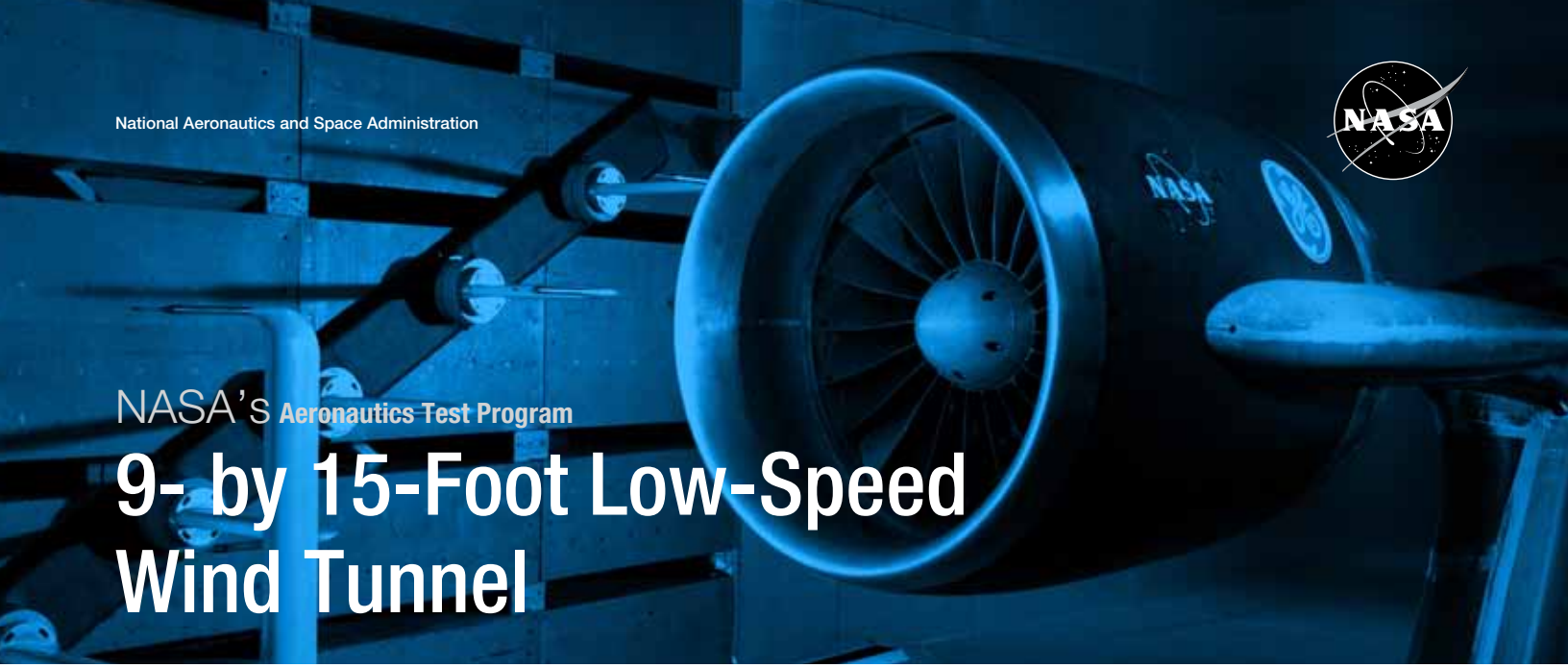

National Aeronautics and Space Administration

NASA's **Aeronautics Test Program**

9- by 15-Foot Low-Speed Wind Tunnel

Built in 1968, the 9- by 15-Foot Low-Speed Wind Tunnel (9×15 LSWT) is the most utilized low-speed propulsion acoustic facility in the world. It is the nation's only research facility that can simulate takeoff, approach, and landing in a continuous, subsonic-flow, wind-tunnel environment. The 9×15 LSWT offers state-of-the-art acoustic capabilities, enabling studies of aerodynamic performance and acoustic characteristics of fans, nozzles, inlets, and propellers, as well as investigations of advanced short takeoff and vertical landing (STOVL) concepts.

Programs supported in the facility have included a wide variety of state-of-the-art commercial aircraft propulsion systems, the Advanced Tactical Fighter, the Joint Strike Fighter, and other military STOVL aircraft applications.

From left to right: Ultra High Bypass (UHB) ducted fan test, Allison low-speed noise fan, Open Rotor (unducted) fan testing, and laser imaging of exhaust from the supersonic STOVL hot gas ingestion model.

Facility Benefits

- Operates in both aerodynamic and propulsion cycle modes
- Provides realistic simulations of STOVL aircraft takeoff and rolling landings with a dynamic actuation system
- Offers rotor-alone nacelle test capability making it possible to isolate fan-alone noise
- Can provide 1,000- and 5,000-hp high-speed fan drive rigs using heated compressed air
- Can provide 750-hp (per shaft) counter-rotating fan drive rig
- Employs an experienced staff of technicians, engineers, researchers, and operators
- Offers a conventional, fixed ground plane with a sliding door and a four-degrees-of-freedom, model-integrated support system for hot gas re-ingestion studies

Facility Applications

- Engine system noise reduction
- Fan noise prediction codes and measurement methods
- Low-speed flight applications for aircraft
- Advanced propulsion system components
- High-speed and counter-rotating fans
- Airport noise
- Programs and projects supported include Ultra-Efficient Engine Technology (UEET), Quiet Aircraft Technology (QAT), Versatile Affordable Advanced Turbine Engine, Joint Strike Fighter, and Advanced Tactical Fighter

Characteristics

Test section dimensions	9 ft high by 15 ft wide by 28 ft long
Speed	0 to 175 mph
Reynolds number	0 to 1.4×10^6 per ft
Temperature	Ambient to 550 °R
Dynamic pressure	0 to 72 psf
Fuels	Gaseous hydrogen

Instrumentation

Pressure measurement	1024 channels and ranges from ±2.5 to 500 psi
Flow visualization	Pressure-sensitive paint, sheet laser, and high-speed video
Test article controls	Digital model control system with graphical interface

Data Acquisition and Processing

Steady State Data Acquisition	Real-time acquisition and display of up to 640 engineering unit converted data channels and up to 8,000 calculated channels in tabular or graphical formats with 1 to 2 updates per sec. Analog input accuracies of better than ±0.05% of range (±5 to 10,240 mV) are provided. Custom application-specific features (customer system integration, remote data access, secure testing, to name a few) are available upon request.
Dynamic Data Acquisition	Engineering unit converted data channels (63) and calculations are acquired and displayed on real-time tabular, X–Y, FFT, scope, and other displays. Un-aliased bandwidths of 420 Hz to 44 kHz are provided by a 24-bit A/D per channel sampling at 1,000 to 200,000 samples/sec. Data can be transferred in near real-time to customers in standard or custom data formats. Channels can be added, in groups of 63, to meet customer requirements.

Contact Information

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