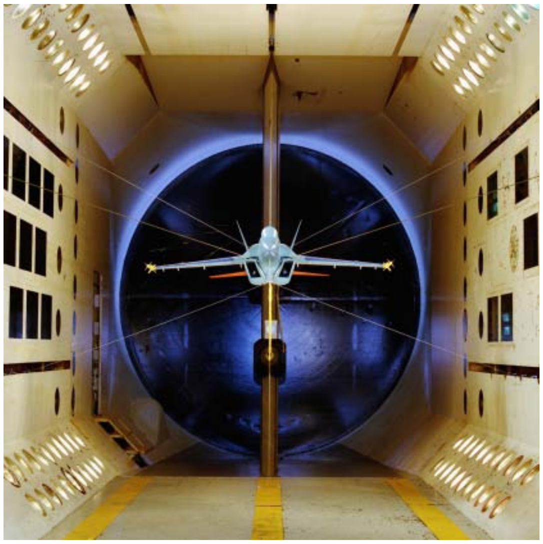
National Aeronautics and Space Administration

NASA's **Aeronautics Test Program**

Transonic Dynamics Tunnel

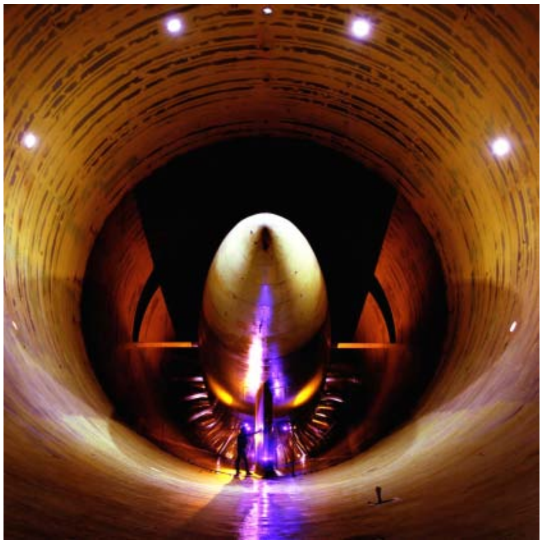
The Transonic Dynamics Tunnel (TDT) is a closed-circuit, continuous-flow, variable-pressure wind tunnel capable of using either air or R-134a as a test medium. The TDT is dedicated to identifying, understanding, and solving aeroelastic issues confronting fixed-wing aircraft, helicopter, and tiltrotor configurations. Rotary-wing tests at the TDT have investigated performance, loads, and stability characteristics, while fixed-wing flutter, buffet, and divergence have been scrutinized as well.

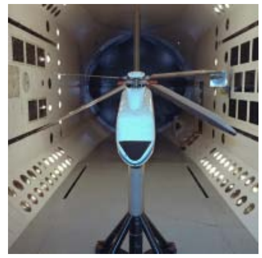
Researchers have also used the TDT to study the use of active controls technologies for both fixed- and rotary-wing configurations, to determine the effects of ground-wind loads on launch vehicles, and to provide steady and unsteady aerodynamic pressure data to support computational aeroelasticity and computational fluid dynamics code development and validation.



F/A–18 E/F flutter clearance model in the TDT.

Particularly useful for flutter tests is a group of four bypass valves that connect the TDT test section area to the opposite leg of the wind tunnel circuit downstream of the fan motor. In the event of model instability, these quick-actuating valves open, causing a rapid reduction in the test section Mach number and dynamic





pressure that serves to potentially stabilize the model. In addition, there is excellent model visibility from the tunnel control room and safety screens that protect the tunnel fan blades from debris in case of a model failure.

Facility Benefits

- Testing in R-134a has important advantages over testing in air, particularly for aeroelastic models. These advantages include improved model to full-scale similitude, higher Reynolds numbers, easier fabrication of scaled models, reduced tunnel power requirements, and in the case of rotary-wing models, reduced model power requirements.

Facility Applications

- Studies have been conducted at the TDT by the aircraft industry, NASA, Department of Defense, and an array of universities.

Characteristics

Test section dimensions	16 ft high by 16 ft wide by 8 ft long
Speed	Up to Mach 1.12
Reynolds number	3.0 to 10.0×10^6 per ft
Test gas	Air or R-134a
Drive power	30 000 hp

Instrumentation

Strain gauge balances	Six component
Available corrections	Interactions, temperature effects, attitude tares, axes orientation, pressure tares, and momentum (flow) tares

Contact Information

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M–1870–8
May 09