National Aeronautics and Space Administration

Langley Research Center's

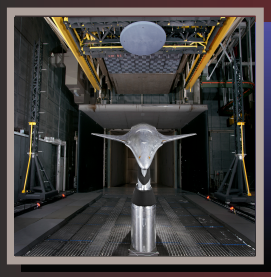
14-by 22-Foot Subsonic Tunnel

Initially named the V/STOL Tunnel, then the 4-by 7-Meter Tunnel and, finally, the 14-by 22-Foot Subsonic Tunnel (14x22) was constructed in 1970 to provide an improved understanding of the aerodynamics of vertical/short takeoff and landing (V/STOL) aircraft. Studies concentrated on the strong downwash generated by the V/STOL model-lift fans or jets and the interaction of the boundary layer with the vertical or forward-facing, propulsion-flow components.

Today, the 14x22 assesses conventional performance for low-speed tests of powered and unpowered models of various fixed- and rotary-wing civil and military aircraft over a wide range of takeoff, landing, cruise and high-angle-of-attack conditions. The tunnel can be easily reconfigured for acoustic, tethered free-flight and forced-oscillation (dynamic stability) testing. Investigators can choose from either closed (walls, ceiling and floor) or open (floor-only) test-section arrangements.

The 14x22 is ideally suited for low-speed tests to determine high-lift stability and control, aerodynamic performance, rotorcraft acoustics, turboprop performance and basic-wake and flow-field surveys.

An extensive modification was completed in 1985 to improve airflow and expand capabilities for both acoustic and rotorcraft testing. In 1999, an automation system and new model carts were added. Major clients have included the Department of Defense and aircraft manufacturers such as Boeing, Lockheed Martin, and Northrop Grumman.





Facility Benefits

- A boundary-layer removal system and moving-belt ground plane prevent the formation of a floor boundary layer in the test section
- A uniform vertical velocity distribution for ground-effects testing is maintained
- The tunnel has a set of flow-control vanes to calibrate and sustain exact air velocity for low-speed testing
- The flow in the closed test section configuration is relatively uniform, with a velocity fluctuation of 0.1 percent or less

Facility Applications

- Aviation safety
- Subsonic fixed wing
- Subsonic rotor wing

Characteristics

Test section dimensions	14.5 ft high by 21.75 ft wide by 50 ft long *(4.42 m high by 6.63 m wide by 15.24 m long)*
Circuit length	770 ft *(234.7 m)*
Area	315.4 ft^2 *(29.3 m^2)*
Speed	348 ft/s *(106 m/s)*
Reynolds number	0 to 2.2×10^6 per ft
Pressure	Atmospheric
Temperature	Ambient
Test gas	Ambient atmosphere
Contraction area ratio	9:1
Drive power	12 000 hp *(8.95 MW)*

Data Acquisition and Processing

Inputs	Analog, digital, and electronically scanned pressure (ESP) system
Controller	Open Architecture Data Acquisition Systems (OADAS)
Capacity/channels	Analog/128, Digital/32, and ESP/2048
Dynamic data acquisition	64 channels at up to 102.4ksps and based upon the VT1432b digitizer
Maximum bandwidth	46kHz, 24 bits for a 108 dB (typical) dynamic range
Classified capability	Yes

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	Q-Flex

Contact Information

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

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NP-2008-11-117-LaRC