

Battelle Subsonic Wind Tunnel at ARC

The Battelle Subsonic Wind Tunnel is an Eiffel-type wind tunnel with a $0.91 \times 1.52\text{m}$ (3×5 ft) test section. The flow is turned by 90 degrees from the entrance to the test section. Turning vanes and hexagonal-cell honeycomb are arranged upstream of test section to improve flow uniformity. The length of test section is 2.4m with optical access on top and on one side. The floor and windows (top) of the test section are removable to allow for different test configurations. The tunnel is driven by a 2.44m (8 ft) diameter, 6-bladed fan located at the exit. The fan is powered by a 93.2 kW (125 hp), 3-phase AC motor. The maximum tunnel speed is 45 m/s (100 mph). Total pressure is measured via a pitot probe at the upstream end of the test section, and static pressure is measured via a ring of static pressure taps located at the exit of the contraction section. The tunnel speed can be set and controlled using either the control unit or LabView code.

Various flow visualization and diagnostic techniques are available for testing in this wind tunnel including kHz-rate and stereo particle image velocimetry (PIV) systems, kHz-rate pressure-sensitive paint (PSP), and smoke visualization. Pressure transducers (one Chell Microdaq32DTC $\pm 2.5\text{psi}$) and load cells (one Gamma US-30-100 & two Theta US-600-3600) are also available for pressure and force measurements.



Figure 1: A side-view mirror model is being tested using smoke visualization.