Adaptive Wall Technology

The five by six by twenty-five foot long test section of the Lucas Adaptive Wind Tunnel is provided with top and bottom walls that are flexible, and whose shape may be altered by electric-motor driven screw jacks.

Static pressure measurements are made on the walls of the tunnel to determine pressure distribution for each model. These measurements are then used to compute the correct wall shape for that model in order to achieve minimum wall interference, and the appropriate commands are given to the screw jacks to adjust the walls.

**LAWT Specifications**

The wind tunnel is of the closed circuit design utilizing a 670 hp synchronous motor driving a 16-blade variable pitch fan.

A heat exchanger is provided to maintain a constant air temperature in the wind tunnel circuit, and flow straightening devices such as honeycomb, and four fine mesh screens which are utilized to reduce the turbulence levels.

- **Velocity Range:**
  - 0 - 170 mph
  - 0 - 75 m/sec

- **Top & Bottom Wall Deflection:**
  - One foot (0.3 m)

- **Projected Turbulence:**
  - 0.1%

- **Contraction:**
  - 5th order profile; area ratio 6.5:1; L/D: 1.25

**Equipment & Measurement Capabilities**

- **Ground Plane Yaw Table System:**
  - Smooth, Solid, Stationary

- **Force & Moment:**
  - 6-Component Strain Gage Balance

- **Data Acquisition:**
  - Lab View based PC

- **Flow Visualization:**
  - Smoke Wand, Tuft Probe, Surface Tufts, Technical Photography and Video.

- **Pressure Analysis:**
  - Pitot Tubes, Surface Pressure Taps, Total Pressure Rakes.

- **Instrumentation:**
  - Pressure Transducers
Models in the Lucas Adaptive Wind Tunnel

- Thirty Meter Telescope Dome
  - Flow visualization with smoke wand

- Active Vortex Control
  - Use of acoustically-generated tangential flow to control forces on cylinder declined to flow

- Ink Drop Test on 1:4 Scale Automobile
Wind Tunnel Testing of Keck Telescope Enclosure

Mory Gharib
Lucas Adaptive Wind Tunnel (Specifications)

Upper Wall Displacement
1.2 sq ft automobile model

Ceiling Cp, 70 m/s Adapting wall removes streamwise pressure gradient and horizontal buoyancy

Effect on Cd, Cl Blockage causes acceleration of airflow near model and artificially high forces