

ME, ECE, BE Capstone Design Programs



Team #32- Closed-Loop, Low-Speed Wind-Tunnel for the ME Thermal Sciences Lab



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Objective

Design a closed-loop, low-speed wind tunnel and accompanying laboratory experiment that effectively demonstrate fundamental fluid dynamic principles for undergraduate students.

Engineering Specifications

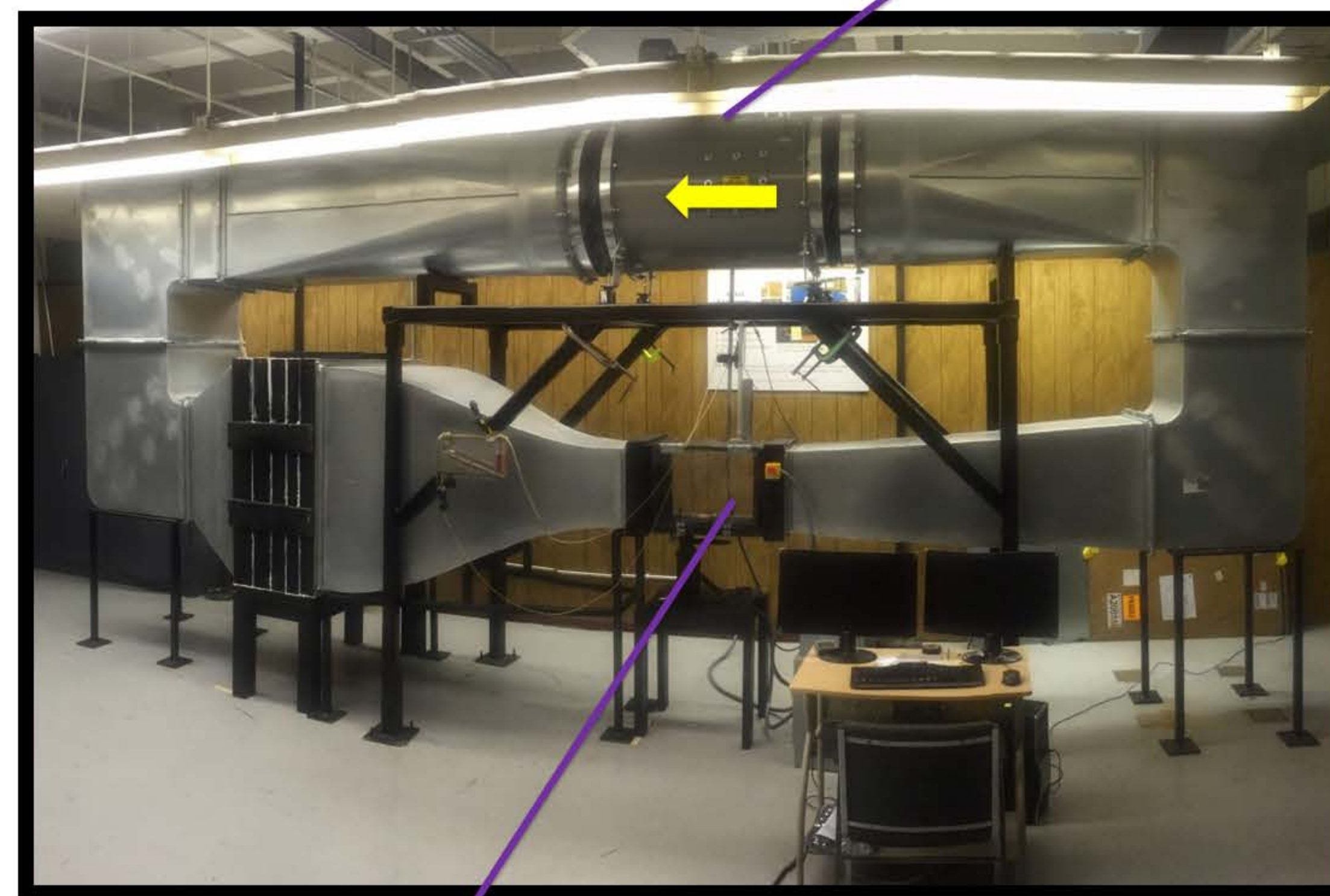
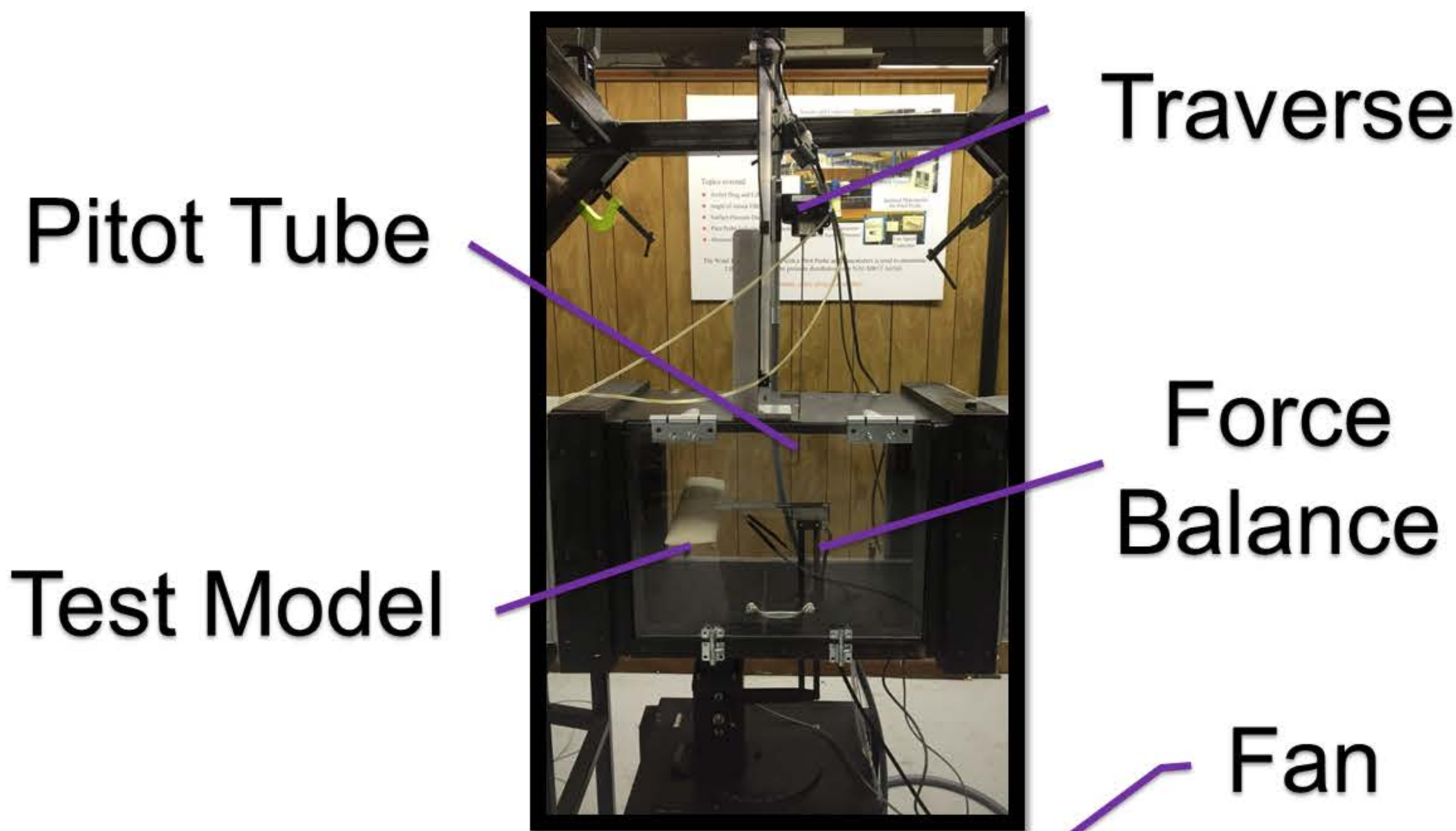
Parameter	Constraint	Result
Overall Height	≤ 12 ft	11 ft
Wind Tunnel Footprint	22 ft x 5 ft	21 ft 8 in x 4 ft 6¼ in
Maximum Size of Individual Component (for entry through laboratory doors)	84 in. x 69 in.	45 in. x 45 in.
Test Section Testing Velocity Range	0 ft/s – 66 ft/s	0 ft/s – 43 ft/s
Maximum Test Section Turbulence Intensity	~1%	0.14%
Test Section Cross-Sectional Area	≥ 12 in x 12 in	15 in. x 15 in.
Test Section Length	≥ 30 in	29.5 in
Power Supply Requirements	208V	208V

Laboratory Experiment

Lift & Drag:

- Determine the lift and drag force and coefficients of the models from the surface pressure measurements
- Estimate the stall angle on the airfoil
- Construct lift-drag polar for airfoil model
- Statistically compare calculated force values with sting balance data

Test Section



Test Section

Safety

- Mechanical Safety**
  - Access doors in lower two corners
  - Emergency stop switch
  - Test section door locks
- Electrical Safety**
  - Proper termination of wires
  - Normally closed magnetic switch
  - Circuit Breakers

Testing Results

Parameter	Values
Maximum Deflection	0.018"
Repeatable Experimental Results	Pass
Maximum Noise Level	66.1 dBA

Budget - \$35,000

