**Massachusetts Institute of Technology**
**Department of Aeronautics and Astronautics**
**Cambridge, MA 02139**

## 16.01/16.02 Unified Engineering I, II
## Fall 2003

# Systems Problem 7

Name: _____

Due Date: 10/30/03

| | Time Spent (min) |
|---|---|
| **SP7** | |
| **Study Time** | |

Announcements:

# Fluids Lab 1 (SPL8) – Assignment
## Wind Tunnel Pitot Measurements

### Learning Objectives

– Practice acquiring and reducing wind tunnel data

– Practice using pitot probe relations (Bernoulli, etc)

– Familiarization with tunnel test procedures

### Experimental Rig

Test Article:     F-16 model in Wright Brothers Wind Tunnel

Instrumentation:

  – Tunnel's pitot-static probe

  – Hand-held pitot-static probe

  – Tunnel's force balance

### Test Conditions

Nominal tunnel speed:     50 mph

Angles of attack:     $\alpha = 0°, 5°, 10°, 15°$

### Raw Data Acquired

$p_\infty$, $p_{o\infty}$    (from tunnel's pitot-static probe)

$p(x)$ , $p_o(x)$    (along nose centerline, using hand-held pitot probe)

Lift, Drag    (from tunnel balance)

### Normalized Data Presented

Top and bottom centerline $C_p(x)$ for each $\alpha$. (All 8 curves on one plot)

$C_L(\alpha)$, $C_D(\alpha)$

### Analysis

Propose locations of static ports on centerline, and how their measured $p$'s could be used to best estimate $p_\infty$ and hence $V_\infty$ for any $\alpha$. You may assume that $p_{o\infty}$ is known accurately on the aircraft (since this is easy to measure).