

## AOE 2104: Homework Assignment 4

Due: Thursday, 10/5 in class

Do each problem on a separate sheet, with name, problem number, problem statement. Staple them together.

1. Imagine that you have designed a low-speed airplane with a maximum velocity at sea level of 90 m/s. For your airspeed instrument, you plan to use a venturi tube with a 1.3:1 area ratio. Inside the cockpit is an airspeed indicator — a dial that is connected to a pressure gauge sensing the venturi tube pressure difference  $p_1 - p_2$  and properly calibrated in terms of velocity. What is the maximum pressure difference you would expect the gauge to experience?

You must state all assumptions and explain your answer.

2. A Pitot tube is mounted in the test section of a low-speed subsonic wind tunnel. The flow in the test section has a velocity, static pressure, and temperature of 150 mi/h, 1 atm, and 70° F, respectively. Calculate the pressure measured by the Pitot tube.
3. The altimeter on a low-speed airplane reads 2 km. The airspeed indicator reads 50 m/s. If the outside air temperature is 280 K, what is the true velocity of the airplane?

Calculate and compare the temperature altitude, density altitude, and pressure altitude.