AerE344 Pre-Lab Assignment - Experiment Design Component

Lab #04: Pressure Coefficient Distribution on the Surface of a Circular Cylinder

DUE: At lab time for Lab Experiment # 04

What you will be given for your experiment:

- Undergraduate low-speed wind tunnel: Blue Wind Tunnel
- A circular cylinder with pressure tabs around it
- Two 16 channel digital pressure transducer units- Scanivalve DSA 3217.
- A computer and data acquisition system connected to Scanivalve DSA 3217 units.
- Tubing to connect pressure sensors and plenum

What your experiment needs to measure:

- Atmosphere pressure in the lab, $P_{atm} = ?$
- The temperature in the wind tunnel, $T = ?$
- The density of air in the wind tunnel, $\rho = ?$
- The pressure at the entrance of the contraction section $P_A = ?$
- The pressure at the inlet of the test section $P_E = ?$
- The velocity of the incoming flow, $V_\infty = ?$
- The Reynolds number of the incoming flow $\mathrm{Re} = \dfrac{\rho V_\infty D}{\mu} = ?$
- The surface pressure data from the pressure taps around the circular cylinder.

What results you need to include in your lab report:

- To make a table showing all the time-averaged data you obtained for all the cases you tested.
- To show all the calculation steps leading up to the final answer.
- To plot pressure coefficient $C_p = \dfrac{P - P_\infty}{\frac{1}{2}\rho V_\infty^2}$ distribution on the cylinder for all the cases you tested.
- To make comments on the characteristics of the pressure distribution compared with the theoretic predictions.
- To calculate the drag coefficients $C_D = \dfrac{D}{\frac{1}{2}\rho V_\infty^2 2R}$ of the circular cylinder for

all the cases you tested.

- To plot the drag coefficients C_D of the circular cylinder as a function of the Reynolds numbers.

What you need to turn in for this assignment:

- You should write up a step by step procedure that you will follow when you get to the lab for the experiments.
- If you have to change the procedure somewhat once you get to the lab and start working that is acceptable. However, you must start with a plan.
- *You only need to turn in one plan per lab group.*