

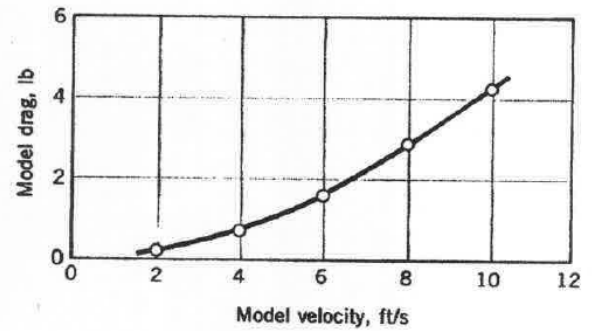
November 11, 2013

NAME

Fluids-ID

Quiz 11.

- A. The drag D on a sphere moving in a fluid is known to be function of the sphere diameter d , the velocity V , and the fluid viscosity μ and density ρ . Using the pi theorem, find an appropriate dimensionless relationship.
- B. Laboratory tests on a 4-in-diameter sphere model were performed in a water tunnel and some model data are plotted in the Figure. Estimate the prototype drag on a 8-ft-diameter balloon moving in air at a velocity 3.28 ft/s. (Hint: You will need to set Π parameters for the tests and the balloon equal to each other)



Notes:

- $D \doteq F; d \doteq L; V \doteq LT^{-1}; \rho \doteq FL^{-3}; \mu \doteq FL^{-2}T$
- For water: $\mu_m = 2.3 \times 10^{-5} \text{ lb}\cdot\text{s}/\text{ft}^2$ and $\rho_m = 1.94 \text{ slug}/\text{ft}^3$
- For air: $\mu = 3.7 \times 10^{-7} \text{ lb}\cdot\text{s}/\text{ft}^2$ and $\rho = 2.38 \times 10^{-3} \text{ slug}/\text{ft}^3$

Attendance (+2 points), format (+1 point)