

Aerodynamics
SYE 3801
Spring 2014

HW#4

Due: February 17th, 2015, at class time

Total Points: 100

Note:

Solve the following problems:

- 3.3.** During a flight test of a new airplane, the pilot radios to the ground that she is in level flight at a standard altitude of 35,000 ft. What is the ambient air pressure far ahead of the airplane?
- 3.7.** The atmosphere of Jupiter is essentially made up of hydrogen, H_2 . For H_2 , the specific gas constant is $4157 \text{ J}/(\text{kg})(\text{K})$. The acceleration of gravity of Jupiter is 24.9 m/s^2 . Assuming an isothermal atmosphere with a temperature of 150 K and assuming that Jupiter has a definable surface, calculate the altitude above that surface where the pressure is one-half the surface pressure.
- 3.16.** For the flight of airplanes in the earth's atmosphere, the variation of the acceleration of gravity with altitude is generally ignored. One of the highest-flying aircraft has been the Lockheed U-2 (see Fig. 5.52) which was designed to cruise at 70,000 ft. How much does the acceleration of gravity at this altitude differ from the value at sea level?
- 4.1** Consider the incompressible flow of water through a divergent duct. The inlet velocity and area are 5 ft/s and 10 ft², respectively. If the exit area is 4 times the inlet area, calculate the water flow velocity at the exit.
- 4.3** Consider an airplane flying with a velocity of 60 m/s at a standard altitude of 3 km. At a point on the wing, the airflow velocity is 70 m/s. Calculate the pressure at this point. Assume incompressible flow.