Physics 200 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rocket Analysis Practice Part 1

Using A Spreadsheet + Guess-And-Check To Find A Rocket’s Drag Coefficient –And More

**Summary**:Use your Trajectory with Drag spreadsheet to find the drag coefficient, terminal velocity, and max height for a rocket using these launch data:

* + Rocket diameter = 0.11m;  Extra cross-sectional area (in addition to the circular cross-sectional area of the bottle fuselage) = 20cm2; Rocket mass (without water) = 150g;
  + Initial X velocity = 1m/s;  Intial Y velocity = 50m/s;  *Time aloft = 6.995*; Initial X position = 0; Initial Y position = 4m.
  + Air density = 1.22kg/m^3; g = 9.8

**Steps to follow** (feel free to ignore these and just figure this out yourself)

1. Calculate the cross-sectional area, in m2.
   1. Use the formula for the area of a circle to calculate the main fuselage area.
   2. Convert the “extra cross-sectional area” from cm2 to m2.
      1. Find the number of cm2 in a m2.
      2. Use dimensional analysis
   3. Add up the fuselage area and the extra area to get the total A.
2. With the exception of time aloft, enter the cross-sectional area and the rest of the rocket data (listed in the directions above) into your spreadsheet’s yellow cells.
   1. Make sure that you convert the rocket mass to kg.
3. Now take a look at the time aloft. The actual time aloft for this example rocket is 6.995s, but the time aloft currently showing on your spreadsheet is probably something different.
4. Find the rocket’s drag coefficient by guess-and-check.
   1. Before you begin this process, you may want to download the spreadsheet as an Excel file. Guessing and checking is faster in Excel. There are so many calculations that, in the past, Google Sheets has been really slow. Maybe that has changed?
   2. Enter a drag coefficient guess.
   3. Check the time aloft to see if it’s closer to 6.995s.
   4. Guess a new drag coefficient.
   5. Check to see if the time aloft is closer to 6.995s.
   6. Keep going until you have entered a drag coefficient that gives a time aloft that is very close to 6.995s. How close is very close? You can decide.

When you have found the approximate drag coefficient, use your spreadsheet to enter the rocket data below:

Drag Coefficient: \_\_\_\_\_\_\_\_\_\_\_\_\_

Terminal Velocity: \_\_\_\_\_\_\_\_\_\_\_\_\_

Maximum Height: \_\_\_\_\_\_\_\_\_\_\_\_\_