

- Group size: 1-3 students
- Turn in one project (one of each of the items below) per group.
- Due to the time remaining in the quarter, you will not get a chance to revise the project and get back points that you lost. No retake.
- Grading impact – Will count $\frac{1}{2}$ as much as the motion and forces test

Steps:

1. Finish the first tab in your “Water Rocket Data and Calculations” spreadsheet.
2. Work on these two items together, but for each snapshot, you should do the diagram first:
 - a. Make a rough draft copy of your Annotated Force diagrams.
 - b. Complete the 2nd tab in your “Water Rocket Data and Calculations” spreadsheet. See Instructable Step 12 for specific directions.
3. Complete your motion graphs. See step 13 of the Instructable for specific directions.
4. Make a plan to create a rocket that stays in the air as long as possible. Draw at least one nice diagram of your rocket design. Show and label its important features. Provide its dry mass, water volume, and any other important data. Provide an estimate of its time in the air (assuming that it will work as planned). Provide quantitative evidence/show calculations to support your estimate. Evidence can come from your spreadsheets, new calculations, or other sources.

5 Parts to Turn-In:

- A. Parts to turn in via Google Classroom, in the “Rocket Project Turn-In” assignment:
 1. **Your group’s copy of “Water Rocket Data and Calculations” spreadsheet.** This spreadsheet should be populated with data matching the coasting portion of your rocket’s flight – the time between the end of thrust and the moment of parachute deployment.
 2. A completed (**both tabs**) and correct copy of **your group’s “Y Dimension Projectile Trajectory With Drag” spreadsheet.** The tab 2 calculations (“Snapshots of Moments During Flight”) will be graded on reasonableness and correctness, not effort. They must be reasonable, and they must obey Newton’s laws (e.g. the individual forces acting on the rocket must add up to the net force acting on the rocket, which must equal the rocket’s mass x the rocket’s acceleration).
- B. Parts to turn in on paper:
 3. **Annotated Force Diagrams** (handout provided).
 4. **Motion Graphs** (templates provided).
 5. **New rocket design, time aloft estimate, and evidence supporting estimate**

Timeline:

- Wednesday/Thursday, 10/14-15 – Project Work Time
- Friday/Monday, 10/16-19 – Project Work Time
- Tuesday/Wednesday, 10/20-21 – Project work time.
Projects due by midnight on Wednesday (10/21).
- Monday/Tuesday 10/26-27 (last day of quarter) – rebuild rockets. Launch at next opportunity.