Dynamic Design: Launch and Propulsion

Fly Me High

STUDENT ACTIVITY

PROCEDURE

1. In the design groups, everyone should share what was learned in the expert group. Group members should ask questions of the experts. During the launch each student in the design group will assume one the following roles:
   - Safety Officer: Checks for safe practices and can stop a launch whenever unsafe practices are observed.
   - Loading Officer: Responsible for securing the rocket to the pad and charging the rocket with the appropriate air pressure.
   - Principal Investigator/Launch Officer: Commences the countdown and launches the vehicle.
   - Downrange Officer: Observes the launch, measure the height of the rocket at apogee and records data. Spots the rocket and assures the safe landing of the rocket.

2. Read Appendix B, "Safety Checklist." Review the following competition rules:
   - Only materials approved by the teacher may be used in construction of any part of the bottle rocket system.
   - Safety rules and checklists must be followed at all times.
   - The rocket may not be pressurized over 75 PSI

3. After everyone has shared information from the expert groups, your group should decide what variables should be tested during the design phase. During this time experts in your group should have input into the design process for the component they worked during the expert work. Final decisions for the designs of the rocket will be up to the principal investigator in each design group. Your teacher should review and approve rocket designs before construction begins.

4. Assemble the materials before construction. Measure the mass of the cone, body, and tail. With this information, along with the volume of water you plan to use and the air pressure, visit this Web site http://www.ag.ohio-state.edu/~rockets/cgi-bin/design_zone.cgi and input your numbers. The data you receive may allow you to redesign your rocket before construction. You will then construct the rocket. Make sure that you are ready for the launch by the deadline.

5. Once construction is complete, perform a rocket stability determination as described by the teacher. Determine the center of mass and the center of pressure. Using the results from this test, your group can make adjustments to their rocket prior to launch.

6. Redesign the rocket with changes as necessary for the second competition, using these ADD Stability directions:
   a. Tie a string loop around the middle of your rocket. Tie a second string to the first so that you can pick it up. Slide the string loop into a position where the rocket balances. You may have to temporarily tape the nosecone in place to keep it from falling off.
   b. Draw a straight line across a scale diagram of the rocket to show where the ruler's position is. Mark the middle of the line with a dot. This is the rocket's center of mass.
   c. Lay your rocket on a piece of cardboard. Carefully trace the rocket on the cardboard and cut it out.
   d. Lay the cardboard cutout you just made on the ruler and balance it.
   e. Draw a straight line across the diagram of your rocket where the ruler is. Mark the middle of this line with a dot. This is the center of pressure of the rocket.