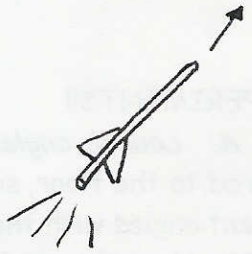
Air Rocket



Simple materials + simple construction = fun tool
to show basic motion, energy transfer, gravity effects

PA Dept. of Education Science and Technology Standards:

Unifying Themes: 3.1.4D, 3.1.4E
Inquiry and Design: 3.2.4C, 3.4.4B, 3.3.4C
Technology: 3.6.4B, 3.6.4C
Technology Devices: 3.7.4B
Physical Science, Chemistry and Physics: 3.4.4B, 3.4.4C

Materials per student:

Drinking straw (7 ¾" long)
Thick "launch" straw (8" long)
Construction paper (for fins)
Double-sided tape

Tools for class: scissors; stop watch, measuring tape for experiments

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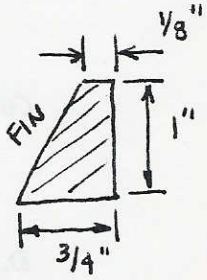
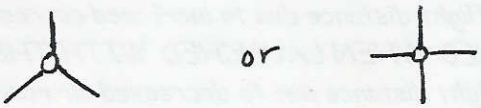
Assembly and use steps:

1. BUILD ROCKET BODY
   Fold one end of drinking straw over ½", tape down to seal end of straw.

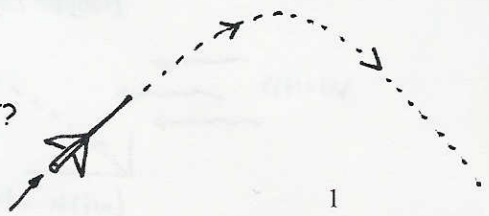
2. TEST FLIGHT!
   Slide rocket body over launch straw.
   To blast off: puff hard on the end of the launch straw
   WHAT HAPPENS? [rocket flies, but tumbles out of control...]
   WHY? [with no fins, the air pushes the rocket randomly. Adding the fins will help direct the airflow over the rocket for straighter flight.]



3. ADD FINS TO ROCKET
   Cut out 3 or 4 fins (or use the fins provided) - they have this shape:
   Fold the side of the fin to create an edge to tape to the Rocket body. Put double-sided tape around rocket body approx. 1" above the rocket's end. Put the fins around the rocket with even spacing, so when you look down the rocket it looks like:

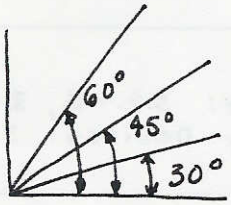


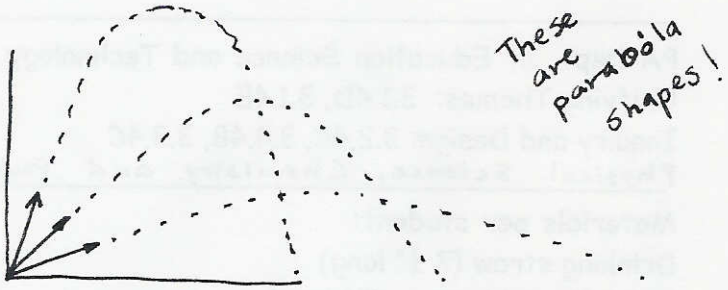
4. TEST FLIGHT #2!
   Launch the rocket - does it fly better? WHY? WHY NOT?



5. EXPERIMENTS!!

A. Launch angles and flight path. Hold the launch straw at different angles compared to the floor, such as 30 degrees, 45 degrees, 60 degrees. Discuss these different angles with the students. WHAT DO THEY PREDICT WILL BE THE FLIGHT PATHS? Have the students sketch the flight paths on the blackboard and talk about what they see.





These arrows are called vectors, showing direction and strength of launch.

B. *Use different "puff" techniques.* Do launches with these different "air power" types:

- slow puff
- really forceful puff
- gentle blow

WHY THE CHANGE IN PERFORMANCE? [to launch, the rocket must overcome the force of gravity and any friction or "stickyness" in the launch tube. A quick puff puts high air pressure into the launch tube.]

C. SPEED ESTIMATE FOR THE AIR ROCKETS! Have students in teams of two. Launch rocket at low angle (30 degrees). Write down time of flight and distance traveled:

Time of flight (seconds) = _____ seconds

Distance traveled (feet) = _____ feet

Calculate VELOCITY (or speed) of air rocket:

Velocity = distance / time (feet per second) = _____ feet/second

D. Air resistance effects: go outside, repeat Experiment C with launches into the wind and with the wind.

WHAT HAPPENS WHEN LAUNCHED INTO THE WIND?

[shorter flight distance due to increased air resistance]

WHAT HAPPENED WHEN LAUNCHED WITH THE WIND?

[longer flight distance due to decreased air resistance]