

"To Make the Best Better"

4-H Youth Development



Discipline: All
Age Level: All
Time: 30 minutes

Next Generation Science Standard : MS-PS2.A.1
For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction.

Author: *90's Science Series*

Stomp Rockets

Objective/Success Indicators: Students can demonstrate Newton's 3rd Law of Motion, and explain how the stomp rockets illustrate it.

Assessment Question:

Supplies:

Stomp Rocket Launcher (supply list and assembly instructions attached)
Stomp Rocket Assembly tube (24 inch length of 1/2 inch PVC pipe)
8.5x11 sheets of paper
Masking or Scotch Tape
A way to measure to 250 feet +/-

Lesson Outline:

1. Construct rockets
 - A. Wrap a sheet of paper around the extra tubes provided with the Launcher to form the body of the rocket.
 - B. Using the template, or your own design, cut and configure fins and a nose cone.
2. Set up launcher, aiming down-wind in a safe direction, then slide rocket over launch tube, and STOMP!
3. Evaluate and record results on Chart A. Modify design and measure results again? Repeat and see if performance can be increased.

Variables to Consider:

Fins = Drag: What is the optimum amount?

Some drag is essential to maintain a correct direction of travel. Too little drag and the rocket will spin out of control. Too much drag and the rocket is inefficient and won't travel as far on a given thrust.

Experiment with fins to determine the optimum number. Does the number needed depend on whether the body of the rocket is 8.5" or 11" long? What are noticeable affects of too much or too little drag? Complete chart A and find the optimum drag for your rocket.

Friction and Air Pressure: How tight is the rocket on the launch tube? The looser it is, the less friction, but the more potential pressure leakage.

Force: Consider the pressure applied to the Stomp Bladder; does it matter who stomps it and how hard?



...To Make the Best Better.

Background Information:

Visit NASA for a complete introduction, video and assembly help

<https://www.jpl.nasa.gov/edu/teach/activity/stomp-rockets/>

Terminology

Lift - a force that perpendicular to direction of flow.

Drag - an opposing force that is parallel to the direction of flow.

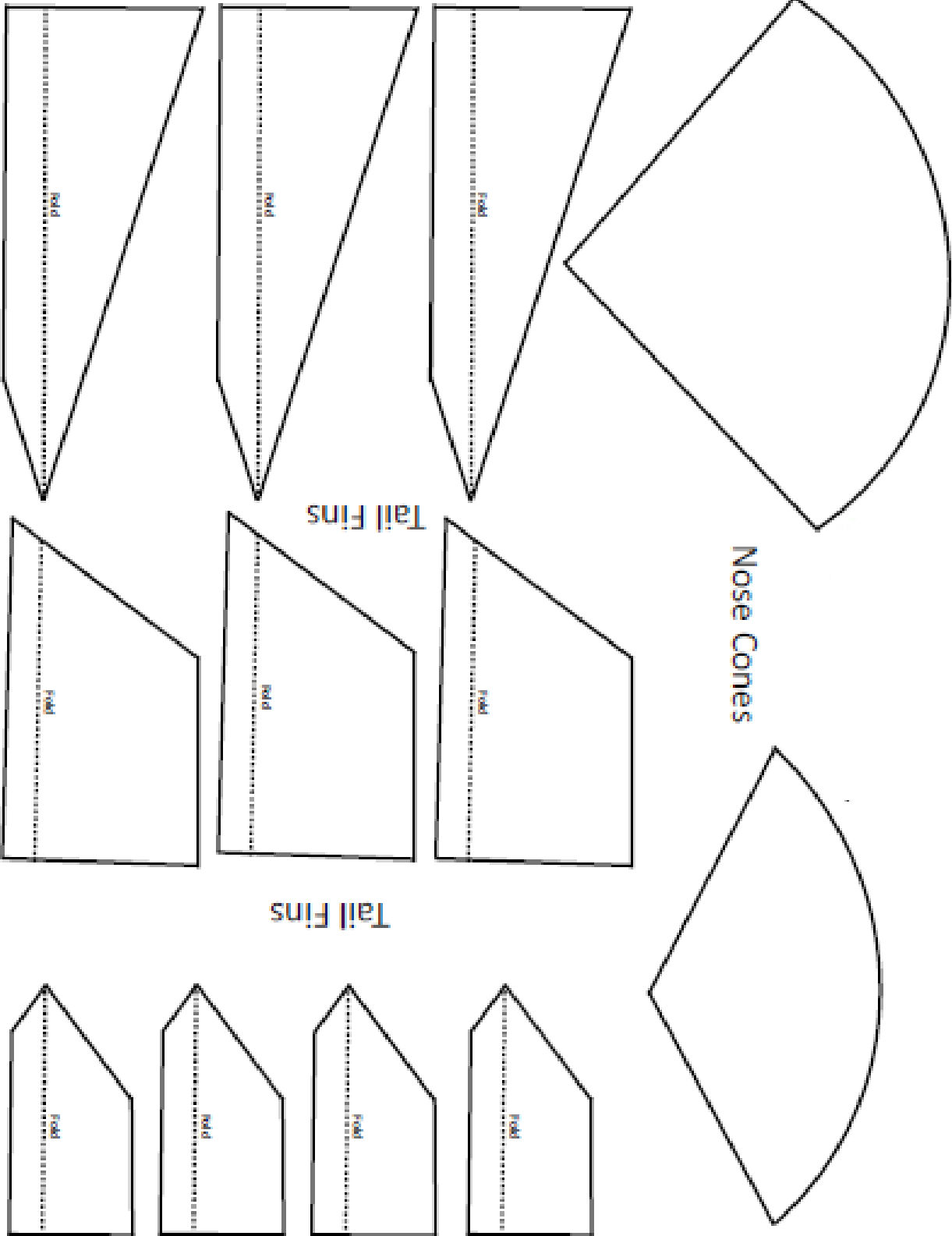
Thrust - the force the propels an object forward, usually given in newtons (N).

Newton's Third Law of Motion - for every action there is an equal and opposite reaction.

Stomp Rockets—Chart A

Rocket Test	Number of Fins	Size of Fins	Distance
A			
B			
C			
D			
E			
F			

Stomp Rockets—Tail Fins and Nose Cones



Stomp Rocket Launcher Assembly Instructions

1 - 1/2" (PVC)
5 feet long (to be cut
into smaller pieces)
Hardware store or
plumbing supply



2 - 1/2" 45° Elbow (PVC)
Slip*
Hardware store or
plumbing supply



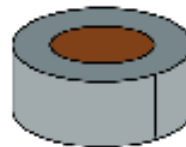
2 - 1/2" Tee (PVC)
Slip*
Hardware store or
plumbing supply



2 - 1/2" Caps (PVC)
Slip*
Hardware store or
plumbing supply



Duct Tape
Hardware store



* Slip connectors have no threads

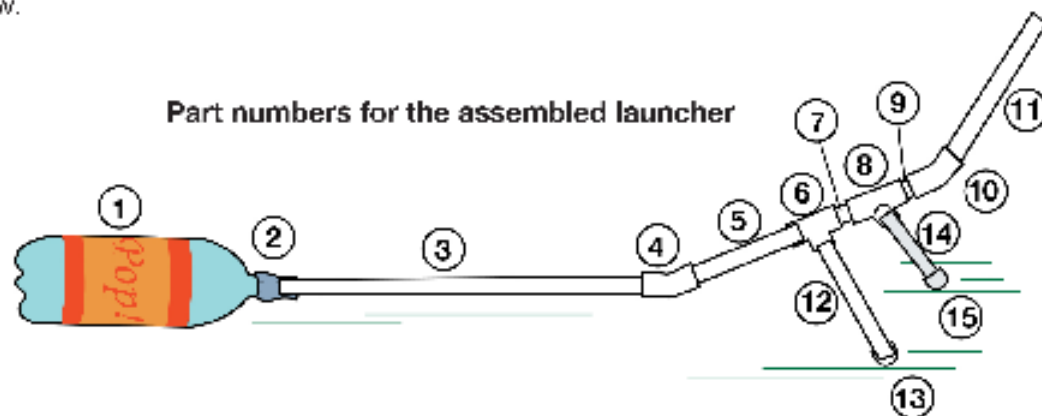
Procedure

1. Cut the PVC pipe into the following lengths:

- #3 - 50 cm
- #5 - 18 cm
- #7 - 4 cm
- #9 - 4 cm
- #11 - 25 cm
- #12 - 20 cm
- #14 - 25 cm

2. Insert the end of pipe #3 into the neck of the bottle and tape it securely with duct tape.
3. Follow the construction diagram below for assembly of the launcher. Match the pipe lengths with the parts numbers.
4. Swing the two legs outward or inward until each touches the ground to form the tripod. The launcher is ready for use.

The part numbers indicate where each piece is placed in the assembled launcher diagram below.



For the full Stomp Rocket activity visit: www.jpl.nasa.gov/edu/teach/activity/stomp-rockets