Soda Straw Rocket

This activity will demonstrate some of the principles used in flight. Participants will learn the basics of momentum, gravity, forces, projectile motion, and how to easily construct a toy rocket!

Number of Participants: 2-6

Audience:

Elementary with assistance

Middle School and above on their own

Duration: 30 minutes

Difficulty: Level 2

Materials Required:

- Soda Straw Rocket Template
    - print several copies of this so you can make lots of rockets!
- Pencil (3-5)
- Scotch Tape
- Measuring Tape
- Scissors
- SPS Target (Optional)

Setup:

Launch Zone Setup

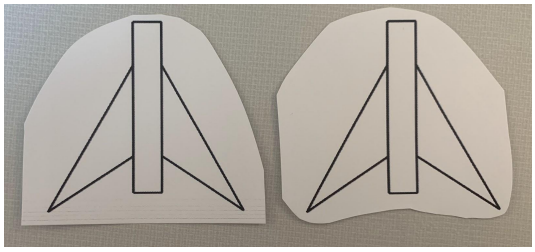
1. Clear a safe area for people to launch rockets.
2. Measure out a launch zone. Recommended area 6 meters x 4 meters.
3. On one end of the launch zone, mark a starting point so everyone launches from the same point.

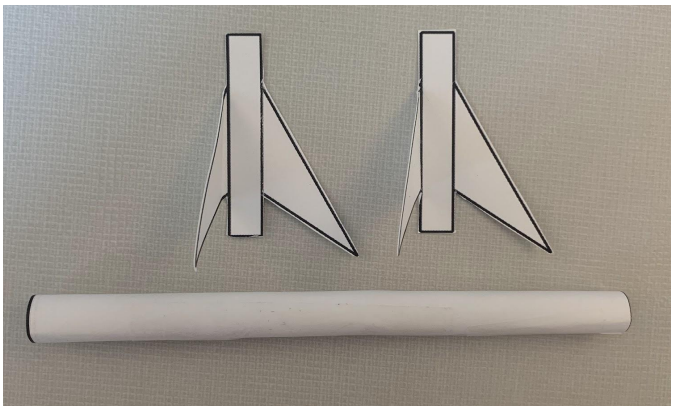
4. Lay out markers to track people's progress, starting where people launch from then add a marker every 2 meters.

Rocket Creation

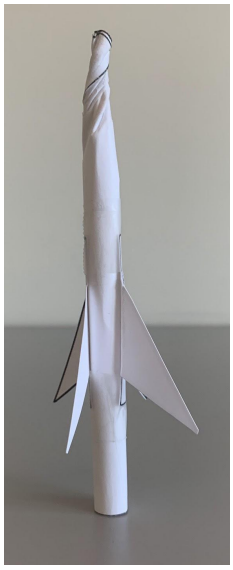
It might be helpful to have some made ahead of time so younger children can still partake in the fun.

1. Cut out the rectangle body and rocket fins. (See Appendix A and Appendix B)
2. Take the body piece (the rectangle) and wrap it lengthwise around your pencil and tape it so it forms a tube.





3. Take your two rocket fins and tape them near the middle/bottom of the rocket.
4. Bend one fin on each fin unit so each fin is at a 90° angle from its neighbor. When you look down the top, the fins should make a “+”.
5. Twist the top of the paper tube around the pencil tip to form the nose of the rocket.
6. Replace your pencil with a straw then blow into the straw to launch your rocket to see how far it goes!
7. As people try the activity, help them measure their distances! To make things competitive, keep track of the farthest distance traveled.
    a. Optional: Set up the target and see who can hit a bull’s eye!



Presenter Brief:

The presenter should have a basic understanding of the scientific method, kinematics, and forces.

Vocabulary:

- Force: a push or pull on an object as it interacts with its environment
    - when you blow air into the straw the air then pushes on the rocket causing it to shoot off the end
- Momentum: p=mv (1); the quantity of motion of an object
- Air Resistance: a force in the opposite direction of the motion of the object
    - similar to friction
- Gravity: an attracting force between two objects
    - in this case, between the rocket and the Earth

Physics & Explanation:

Elementary (ages 5-10):

- Forces cause motion.

Forces are how objects interact with each other. So when you blow into the straw, the air launches a rocket (a pushing force)! When a rocket is flying through the air, gravity pulls on the rocket which is what causes it to fall. Along with gravity pulling down on the rocket, air also pulls on the sides of the rocket causing it to slow down.

- Rockets move because they are pushed by a force.

Our paper rocket is a very simple model for how real rockets work. Rockets use the explosions from their fuel to push the rocket into the air. In our case, our breath is the fuel that launches the rocket.

Middle (ages 11-13) and general public:

- Unbalanced forces cause motion.

Unbalanced forces cause motion. When the rocket is just sitting on the straw there are no unbalanced forces so it stays still. When you blow air into the straw, the forces become unbalanced (with the air applying a force to the inside of the rocket) so the

rocket flies off the straw! Then as the rocket is flying, the air pushes against it, unbalancing the forces again, causing the rocket to slow down then gravity pulls the rocket downwards.

- Rockets are moved by the pressure created behind it.

Our paper rocket is a very simple model for how real rockets work. Within an actual rocket, combustion create pressure within a small area which creates a push force. This push force is what helps launch the rocket. This combustion pressure is what our breath is in our paper rocket.

- $F = P \times A$ (2)

The force (F) an object, such as a rocket, will feel is equal to the pressure (P) applied to the object at a right to the object's area (A).

- The scientific method is an important process that all scientists use and is applicable to everyone's day to day life. (Use this when using the Target)

The scientific method is the way science happens. You take a problem or a question then give an educated explanation for that problem or question and then you test the explanation.

Let's use our rocket as an example.

What would be a bad hypothesis of what would happen to the rocket after we launch it? (Participants would answer here)

Why is that a bad hypothesis? (Discuss with participants)

What would be a good hypothesis? Why is that a better hypothesis? (Likely based off what we know/what we expect)

Additional Resources:

- Gravity Compilation: Crash Course Kids
  - A nice simplified explanation of gravity and demonstrates the scientific method.
- Newtonian Gravity: Crash Course Physics #8
  - A more detailed explanation of gravity.
- Fundamental Forces- NASA

Important Variables:

Equation 1:

p: momentum

m: mass

v: velocity

Equation 2:

F: force

P: pressure

A: area

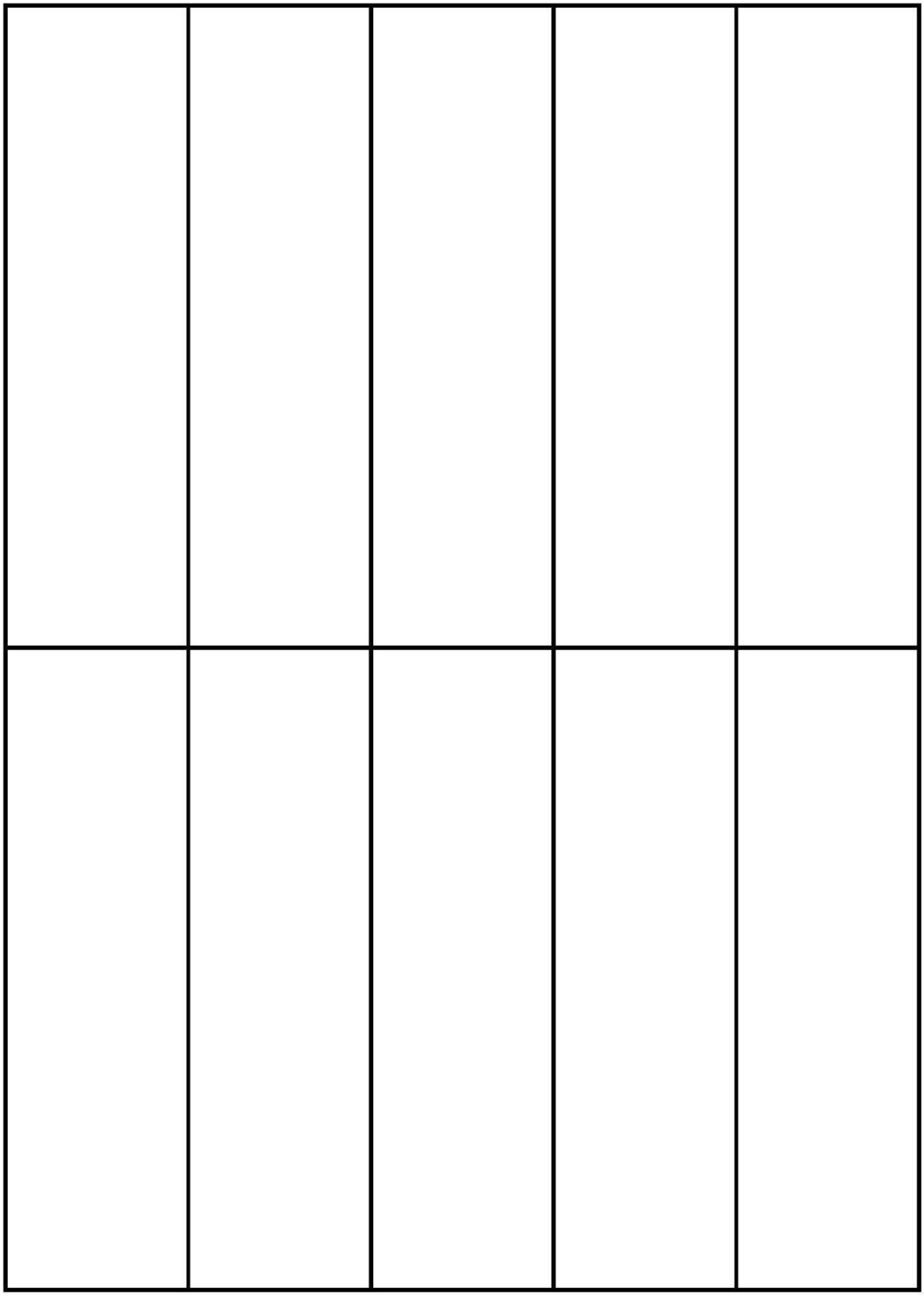
Appendix Table of Contents:

A. Rocket Body Handout

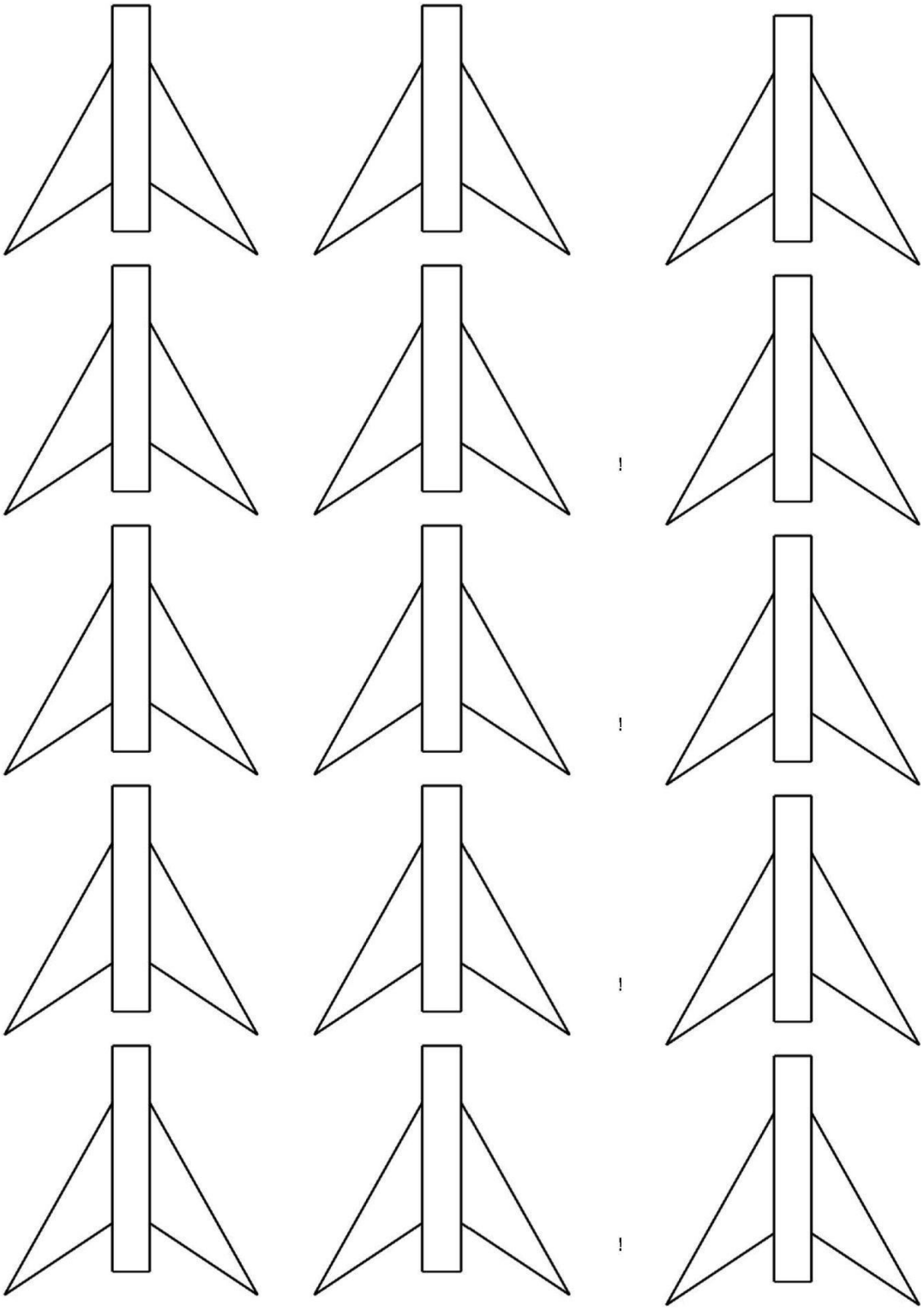
B. Rocket Fins Handout

C. SPS Target

Appendix A: Rocket Body



Appendix B: Rocket Fins



Appendix C: SPS Target (Optional)