The Nose Cone Experts

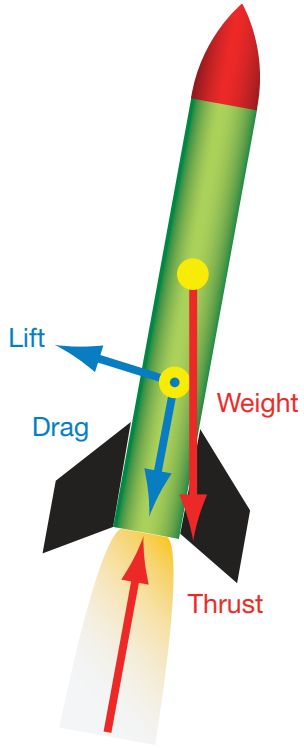
Objective
Students will experiment with different nose cone shapes to determine the advantages and disadvantages of each type. Conic, parabolic and flat shapes will be tested to determine which is most aerodynamic.

- Target concept: Altitude
- Preparation time: 10 min
- Duration of activity: 45–60 min
- Student group size: One to two students

Materials and tools:
- Nose Cone Distance Traveled Table
- Group Questions and Procedures
- Paper towel tube
- Nose cone patterns worksheet
- Yard stick or meter stick
- Several 2-liter plastic soft drink bottles
- Modeling clay
- Card stock
- Leaf blower or vacuum set to blow
- Books to make a path
- Long hall or open area
- Tape

Background
Aerodynamics is the branch of science that deals with the motion of air and the forces on bodies moving through the air. There are four forces that act on a rocket. They are lift, drag, weight and thrust.

Drag is a force that opposes the upward movement of the rocket. It is generated by every part of the rocket. Drag is a sort of aerodynamic friction between the surface of



Forces on a Rocket

the rocket and the air. Factors that affect drag include the size and shape of the rocket, the velocity and the inclination of flow, and the mass, viscosity and compressibility of the air.

Procedure
1. Students in this expert group will complete the What a Drag prelab sheet to allow them to build on their past experiences with aerodynamics.
2. Students construct nose cones by cutting out three different nose cone shapes from card stock. Two of the patterns are given on the following pages. The third nose cone should be a flat against the paper towel tube. They will then attach the nose cones onto paper towel tubes. This time modeling clay can be used inside the nose cone to provide mass.
3. Use a commercial leaf blower or a vacuum cleaner with its airflow reversed to blow to force the rocket backwards. This should

be done on a narrow track to keep the rocket in line with the wind (books may be lined up to make this track).

4. Students should measure the distance the rocket traveled backwards. Record the results and complete the nose cone expert report on the What a Drag sheets.

Group Questions and Procedure

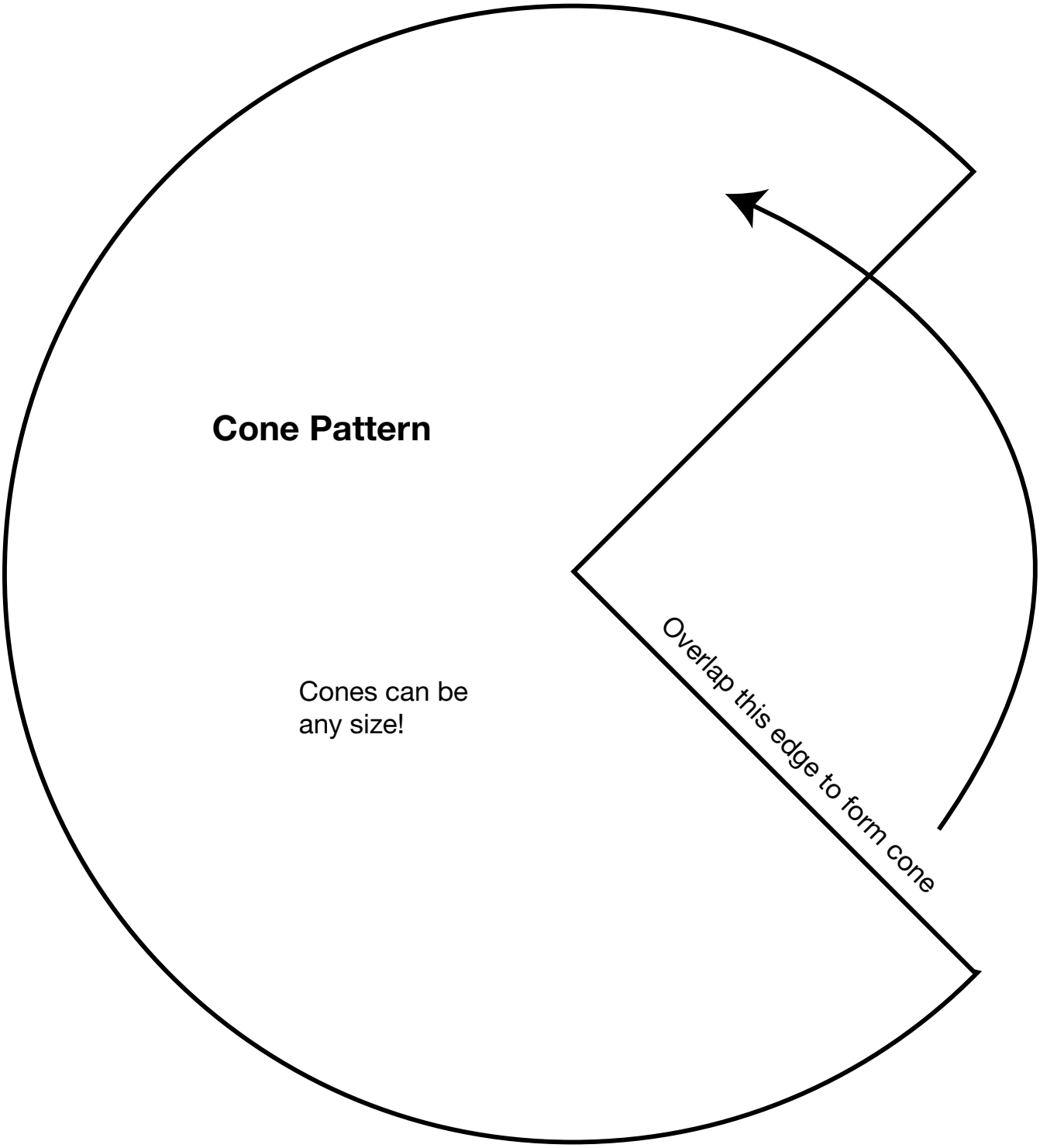
In your expert groups, complete the following:

1. What is the first thing you think of when you hear the word aerodynamic? Where have you heard the term before?
2. Using the resources on the Internet or in your library, find information on aerodynamics and the importance of the use of wind tunnels. Give several examples.
3. What is drag as it relates to aerodynamics?
   a. What are some things that can be done to an object to decrease its drag?
   b. What are the parts of a rocket that may result in drag?
4. Using the patterns in the nosecone pattern, cut out three different nose cone shapes from card stock. Assemble the nose cones onto paper towel tubes. The tubes will be tested with the leaf blower as shown below.
5. List the variables that need to be controlled in this activity.
6. Use a commercial leaf blower or vacuum set to blow air to force the rocket backwards. This should be done between two rows of books to keep the rocket in line with the wind.
   a. Place the nose cone design in front of the blower, as shown below.
   b. While holding the blower, turn the blower on until the nose cone design stops moving.
7. Measure the distance the rocket traveled backwards.
8. Record results in the data table below.
9. Set up a data table in your journal similar to the table on page 92 to record your results.

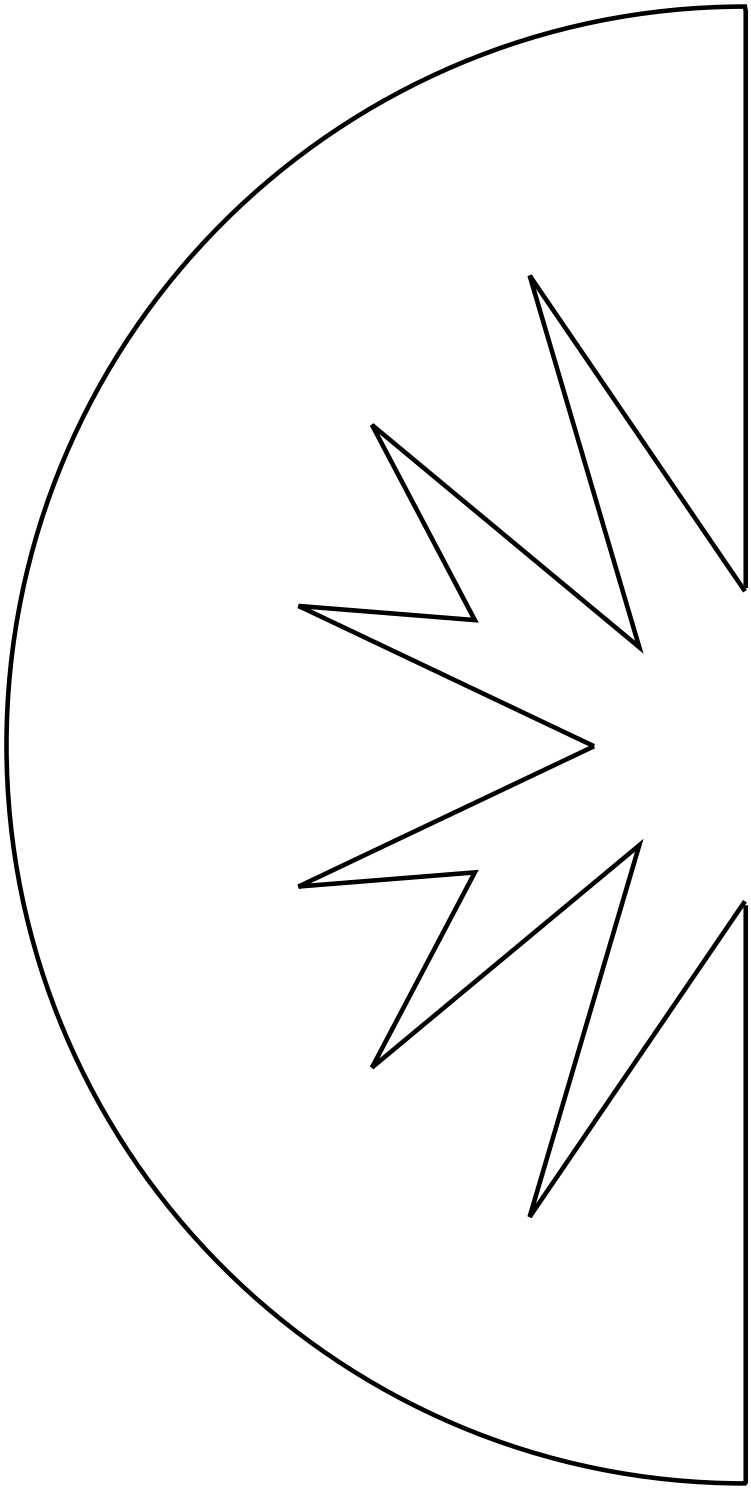
Nosecone Distance Traveled Table

Shape of Nosecone	Distance Traveled			
	Trial One	Trial Two	Trial Three	Average

Cone Pattern



Cones can be
any size!



Cut along the lines. Tape the sides of the triangles together starting with the smaller triangles.