

# SciGirls Activity 14

## High Flyers!



### Icebreaker:

### Follow the air's path with Bernoulli's Blowout!



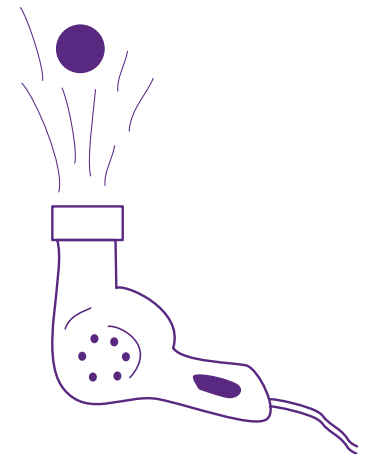
#### You'll need:

- a hairdryer
- a ping pong ball

### SciGirls Skill: Interpreting

#### Guide your girls as they:

- 1) Turn the hairdryer on the high, cool setting and point it straight up.
- 2) Hold the ping pong ball over the air stream, and let go. The air pushes the ball right up.
- 3) Now tilt the hair dryer. You would think that the air would just send the ball flying away! But watch... the ball stays trapped in the air stream!
- 4) How far can you tilt the dryer before the ball falls? Have each pair of girls try a variation, such as setting the blower on a lower speed setting, or trying it with the heat on. Does this change the outcome?



**SciGirls Suggestion:** This is a great group activity. Gather the girls around the demonstration, and offer them turns at holding the dryer, trying the various settings, and recording their predictions.



For more information, blow over to [pbskids.org/dragonflytv/superdoit/bernoullis\\_blowout.html](http://pbskids.org/dragonflytv/superdoit/bernoullis_blowout.html).

## Investigation:

### Kites

Girls design and test the optimal high-flyer.

We're Danielle and Jasmine. Kites are colorful and graceful, but they're also fierce competitors. We love to enter kite-flying contests, and we're serious about winning. Our SciGirls question: **How does our kite's shape affect its performance? Which kite lets us maneuver our way to victory?**



For each group of three girls, you'll need:

- Delta kites (meaning, kind of "bat"-shaped) of three different aspect ratios (relationship of width to height). You can purchase kites at toy and hobby stores. Kites of the style used by the DFTV girls can be found at [www.prismkites.com](http://www.prismkites.com). Select "tall and narrow" (Elixir model), "suarish" (Illusion model), and "short and wide" (Prophecy model).
- You might also want to make simple diamond kites with a range of widths and heights, so you'll need kite-making material, like nylon, dowels, heavy tape, and string. Enter "kite-making" into an Internet search engine to find construction instructions that suit your girls' age level and interests.
- Optional: digital anemometer, as wind speed can affect kite performance.



For more high-flying fun, go to <http://pbskids.org/dragonflytv/show/kites.html>. Then surf to [pbskids.org/dragonflytv/contact/index.html](http://pbskids.org/dragonflytv/contact/index.html) to tell us what you learned!



Check out this investigation on Tape 2, Segment 14.



## SciGirls Want to Know: How does the shape of a kite affect its performance in the air?

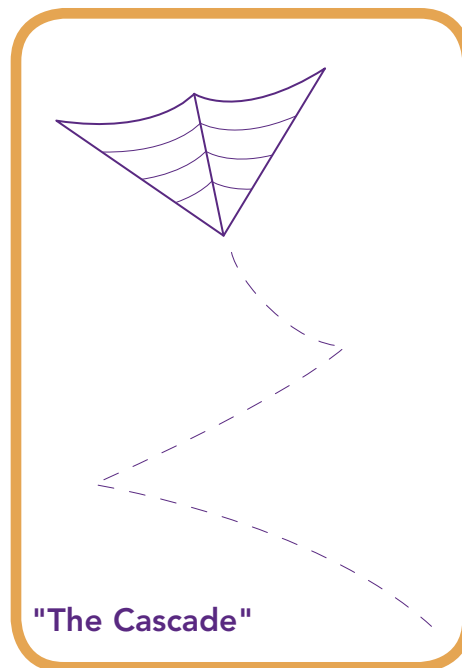
Guide your girls as they:

- 1) Select or construct kites.
- 2) Select three stunts to perform. DFTV chose to do geometric figures (Figure 8, and Square), and one ballet maneuver (the "Cascade"). Watch the video for instructions on these stunts, or check out the drawings below.
- 3) Fly each kite and take each through the three stunts. Evaluate the performance on a rating scale of one to ten, where ten indicates excellent execution, and one indicates poor execution.
- 4) Or try this alternate investigation: Use the different kites to investigate how high the kites fly, letting out the same amount of string. Let out 100 feet of string, say, and let the kite find its altitude. You may find that certain shape kites have a tendency to climb higher, while others fly at a lower altitude.



### SciGirls Secret:

Research shows that girls respond well to activities with real-life applications. Think about this when initiating discussions with your girls. For example, why do you think kites were invented in the first place? Were they a tool, a toy, a weather predictor, or simply beautiful works of art? In what country did kitemaking originate? Who is the inventor? Encourage girls to hop online, hit the library, or interview experts and find out more about the history or simply the "so what?" factor behind kites or any topic that sparks their collective interest.



"The Cascade"



## SciGirls Synthesize: Data and Analysis

Here are Danielle and Jasmine's results. You can use their table as a guide for your own.

The taller and narrower the kite, the better its performance on precision maneuvers requiring sharp turns and precise control. The property that makes the kite good for precision stunts makes it a poor choice for delicate ballet stunts like the Cascade. The short and wide kite performed really well on the ballet move, but could not execute the precise maneuvers of the Figure 8 and Square.

### Kite Performance

Kite model	Figure 8	Square	Cascade
Elixir (tall & narrow)	9	8	2
Illusion (squarish)	7	6	5
Prophecy (short & wide)	4	3	10

See Appendix A for a graphing example.

### Conclusion:

Danielle and Jasmine decided that although each kite had the same general shape, the differences in its relative height and width meant that air flowed around it differently. A tall and narrow kite catches less wind, meaning it performs better when the wind is a littler stronger, and can respond more sharply to the control line. The short and wide kite catches more air (i.e., generates more lift with less wind flow), and performs the Cascade maneuver (a kind

## Keep Exploring!

Another fun investigation with kites is to make the smallest kite you can that still flies. Try a bunch of different designs and find the one that catches air the best, even though it's little.