



AERODYNAMICS with PAPER AIRPLANES!



What makes the perfect paper airplane? With this experiment, you'll play with different designs, and see which one flies the best.

MATERIALS:

- Regular printer paper (other papers can be incorporated as well, see "other questions to explore")
- Ruler
- Scissors
- A large open area to fly in, such as a long hallway (outside also works, but try to do the experiment on a day where there's not a lot of wind).
- Something to make at least a one foot line, like another ruler, tape measure, rocks, sticks, masking tape, etc.

AERODYNAMICS EXPERIMENT

INSTRUCTIONS:

1. Make a standard “dart” paper airplane. for instructions, check out Fold ‘n Fly’s tutorial [here*](#). Take care to fold carefully, and use something like your thumbnail or a ruler against the folds to make them as sharp as possible.
 2. Go to the space you’ll be flying your plane, and make a starting line using one of the materials mentioned before (another ruler, tape measure, rocks, sticks, masking tape, etc.)
 3. Now it’s time to test your plane! Place your toes on the starting line and throw your plane.
 4. In order to truly test it, throw it four more times. Try to be in the same position and throw it with the same power every time. It’s also important to make sure the plane is in good condition (the folds and the point are still sharp).
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5. It’s time to mix it up! There’s several things you can do from here to continue the experiment...
 - a.** Alter the plane you have already made! Try cutting flaps into the back of the wings, or add paperclips to the front of the plane.
 - b.** Make a whole new airplane! You can either try your own design, or look at the other planes on [Fold ‘n Fly**](#) for inspiration here.
 - c.** Make something that isn’t a plane! Check out [Science Bob’s website***](#) for instructions on how to make the wacky-looking Incredible Hoop Glider.
 6. With your new plane(s), test them the same way you did the first one—Throw them five times, from the same place and with the same strength.

You probably noticed that some of your creations flew differently than others. What makes a paper airplane fly farther, or faster?

*Dart paper airplane: <https://www.foldnfly.com/1.html#Basic-Dart>

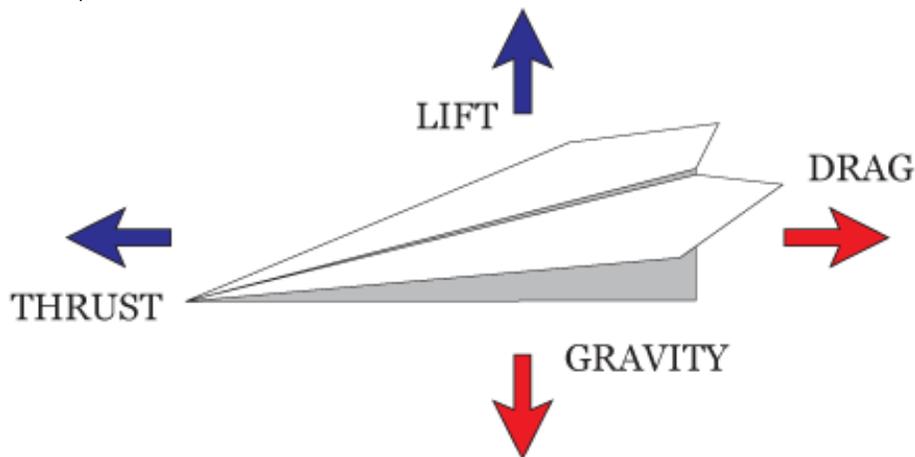
**Fold 'n Fly planes: <https://www.foldnfly.com/index.html#/1-1-1-1-1-1-1-1-2>

***Science Bob's website: <https://sciencebob.com/the-incredible-hoop-glider/>

AERODYNAMICS EXPERIMENT

HOW DOES IT WORK?

Both real airplanes and paper airplanes are affected by the same things—forces. Forces are things that push and pull against an object, in this case our planes. There are four main types of forces that planes have to deal with: thrust, lift, drag, and gravity. Thrust pushes an object forward; when you throw a paper airplane, you are applying thrust to it. The air moves over and under the plane and its wings, giving the plane an upward lift. While the plane is being lifted upward, gravity is also pulling the plane (And everything else on planet Earth!) downward. While lift and gravity are opposite forces, thrust and drag are also opposite forces; the air that pushes against a plane creates drag, a force that slows the plane down. When you alter your plane by adding flaps, you are altering the drag that is applied to the plane. With an understanding of these four forces, you can try to make the optimal paper airplane!



OTHER QUESTIONS TO EXPLORE

- How would different types of paper affect your paper airplane? Would newspaper fly better? Or construction paper?
- What if you made a really big paper airplane? Or a really small one? Which would fly better?

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**This experiment was inspired by a project highlighted on Scientific American's website:
www.scientificamerican.com**