What A Drag!

Areas of Science	Aerodynamics & Hydrodynamics (http://www.sciencebuddies.org/science-fair-projects/project-ideas/aerodynamics-hydrodynamics)
Difficulty	
Time Required	Very Short (≤ 1 day)
Prerequisites	You will need access to a swimming pool.
Material Availability	Readily available
Cost	Very Low (under $20)
Safety	Adult supervision is required. Use caution when working near the swimming pool.
Strength of Match	This project is in your personal top 100. See how we rank projects. (http://www.sciencebuddies.org/science-fair-projec

Abstract

What makes some objects more streamlined than others? Find out which ordinary objects around your house are made to move science fair project. Which objects will produce the most drag when pulled through the water?

Objective

In this science fair project, you will test ordinary objects for their aerodynamic and hydrodynamic properties by measuring the am

Credits

Sara Agee, PhD, Science Buddies

Cite This Page

General citation information is provided here. Be sure to check the formatting, including capitalization, for the method you are using and upd

MLA Style

Science Buddies Staff. "What A Drag!" *Science Buddies*, 12 Jan. 2020, https://www.sciencebuddies.org/science-fair-projects/proj hydrodynamics/water-drag. Accessed 6 Mar. 2020.

APA Style

Science Buddies Staff. (2020, January 12). *What A Drag!* Retrieved from https://www.sciencebuddies.org/science-fair-projects/pr hydrodynamics/water-drag

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Introduction

Moving objects appear to glide gracefully through the air or water. But in reality, moving objects are constantly fighting to balance have four main forces that act upon them: lift, weight, thrust, and drag (FI, 2006).

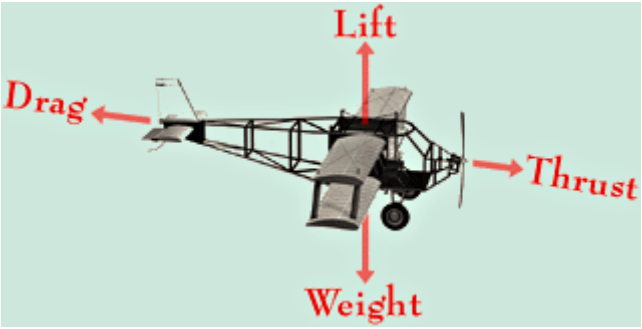

Figure 1. The aerodynamics of this airplane are due to the balance of four forces: lift, weight, thrust, and drag (image

The **drag** on an object is a combination of **friction** and **pressure**. Air moving over the surface of an object causes drag due to fric object pushes back on it more than lower-pressure air behind it, which causes drag due to pressure. The combination of the two i called **air resistance.** An object moving through water also experiences drag for the same reasons. The force of drag is importan **hydrodynamics** of a design.

In this science fair project, you will test how much drag ordinary objects produce when pulled through the water. You will make a s using a pull-scale and fishing line. After testing different objects around your house, will you be able to find out what types of obje Which shapes are the most aerodynamic and the most hydrodynamic?

Terms and Concepts

To do this type of science fair project, you should know what the following terms mean. Have an adult help you search the Interne out more!

- Drag
- Friction
- Pressure
- Air resistance
- Aerodynamics
- Hydrodynamics

Questions

- What causes drag?
- How does drag influence the aerodynamics of an object?
- Which objects will produce the most drag?

Bibliography

- NASA. (n.d.). *Four Forces on an Airplane*. Retrieved February 27, 2018, from *http://www.grc.nasa.gov/WWW/K-12/airplan 12/airplane/forces.html)*.
- Andrew Rader Studios. (2006). *Motion: Vectors.* Retrieved December 15, 2006, from *http://www.physics4kids.com/files/mo (http://www.physics4kids.com/files/motion_vectors.html)*
- Sobey, E., 1999. *Wacky Water Fun with Science*, New York, NY: McGraw-Hill.
- Sobey, E., 1998. *Just Plane Smart! Activities for Kids in the Air and on the Ground*, New York, NY: McGraw-Hill.

For help creating graphs, try this website:

- National Center for Education Statistics. (n.d.). Create a Graph. Retrieved May 27, 2009, from *https://nces.ed.gov/nceskid*

  (https://nces.ed.gov/nceskids/CreateAGraph/default.aspx)

Materials and Equipment

- Scissors
- Fishing line
- Leader line
- Spring scale
- Swimming pool
- Fishing swivels
- Objects to test, with the following features:
  - You should use several different types and sizes of each.
  - They should not be so large that they are difficult to handle.
  - They should all be waterproof, because you will be submerging them in a pool of water.
  - They should be objects that naturally sink and not float. For example, choose a baseball instead of an air-filled ball

  Use objects of the following shapes:

  - Spheres (baseball, grapefruit, orange, etc.)
  - Rectangular shapes (cubes, plastic blocks, boxes, brick, etc.)
  - Circular shapes (Frisbee, plate, CD, etc.)
  - Irregular shapes (toy, pipe, hammer, jar, boomerang, etc.)
- Lab notebook
- Graph paper

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https://www.sciencebuddies.org/science-fair-projects/project-ideas/Aero_p022/aerodynamics-hydrodynamics/water-drag

projects/project-ideas/Aero_p022/aerodynamics-hydrodynamics/water-drag)

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Experimental Procedure

1. Select several objects that you want to use for your science fair project, as described in the Materials and Equipment list.
2. Wrap fishing line securely around each object. Make a loop out of fishing line at the leading edge of the object and attach a attach the leader of the spring scale to each object. Have an adult help you, if necessary.
3. Attach a leader line to the spring scale. It should be long enough for your object to reach down into the pool as you are wa while you are holding onto the spring scale handle.
4. Attach an item to the leader line of the spring scale.
5. Do a test to measure the drag on the object.
   a. Hold the spring scale as close as possible to the surface of the water without touching it.
   b. Then, walk from one end of the pool toward the other end at a constant stride, pulling the item behind you, as it is s
   c. It is important to walk at the same speed as you drag each item. Drag can depend on how fast an object is moving, between each object, you need to move them at the same speed.
   d. You should try to make sure that the leader line is as close to horizontal as possible while you are towing the object mostly measuring drag force (which acts in the horizontal direction), and not any contributions from the object's wei which all act in the vertical direction.

6. Look at the spring scale and record the drag on the object (in newtons) in a data table in your lab notebook. Remember to spring scale reading might still bounce around slightly — try to take a middle-value reading if this happens.

Trial Number	Spheres			Circ	
	Golf ball	Baseball	Cantaloupe	CD	Plate
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Average Drag (N)					

7. Repeat steps 5–6 for the first object, for a total of at least 10 trials to be sure that the results are meaningful.
8. Repeat steps 4–7 for all of your other objects.
9. Calculate the average drag for each object by adding together the numbers for each object for all 10 trials and dividing you data table.
10. Make a graph of your data, either on paper, or with a website, such as Create a Graph (https://nces.ed.gov/nceskids/CreateAGraph/defau type of experiment. Make a scale of the force of drag, in newtons, on the left side of the graph (y-axis) and order your diffe the graph (x-axis). Draw a bar for each item up to the matching force of drag measured in the pool with the spring scale. B and the bars of your graph, and to give your graph a title.
11. Analyze your data by asking yourself some questions. Which object caused the most drag? The least? If you compare acr shapes better than others? If you compare within a group of similarly shaped objects (for example, all spheres) are some s

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If you like this project, you might enjoy exploring these related careers: