Aerodynamics

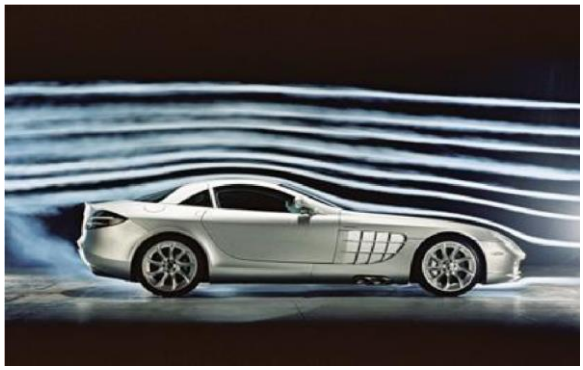
Grade(s): 6-8

Learning & Activity Goals/Objectives:

- What is Aerodynamics? How does it impact my vehicle?
- How can I make aerodynamics work for me

Overview

How does the aerodynamics, or shape, of an object moving through the air increase or decrease the friction (drag) on that object? In this lesson we explore the four (4) forces of aerodynamics: Lift, Weight, Thrust, and Drag. We will discuss these different forces and describe how each of them works with or against a vehicle.



For the experimental portion of this lesson students will be asked to design, using foam pieces, different shaped objects that will be put into a homemade wind tunnel to test how they interact with the air. Using a spring scale students will attach their shapes into the wind tunnel and record the amount of drag that is being placed on their shapes.

Curriculum Standards

Health & Physical Education

- 2.1.8.A.3
- 2.2.8.A.2
- 2.2.8.B.2
- 2.2.8.C.1

Technology

- 8.2.8.B.[1-3]

Science

- 5.2.6.E.3
- 5.1.8.A.2
- 5.1.8.B.[1&2]
- 5.1.8.D.[1-3]
- 5.2.8.E.1

Mathematics

- CCSS.Math.Practice.MP4
- CCSS.Math.Practice.MP7
- CCSS.Math.Content.6.NS.B.3
- CCSS.Math.Content.6.G.A.4
- CCSS.Math.Content.7.G.B.6
- CCSS.Math.Content.8.G.B.7

Aerodynamics Lesson Plan: 2020

Objective: Introduce students to aerodynamics and help them understand how an object interacts with the air as it moves through it.

Time: 1 hour

Materials: Aerodynamics PowerPoint, cardboard or plastic board for the students to make cars, wheels, axles, and paper. Wind Tunnel available to borrow from goHunterdon or you may build your own.

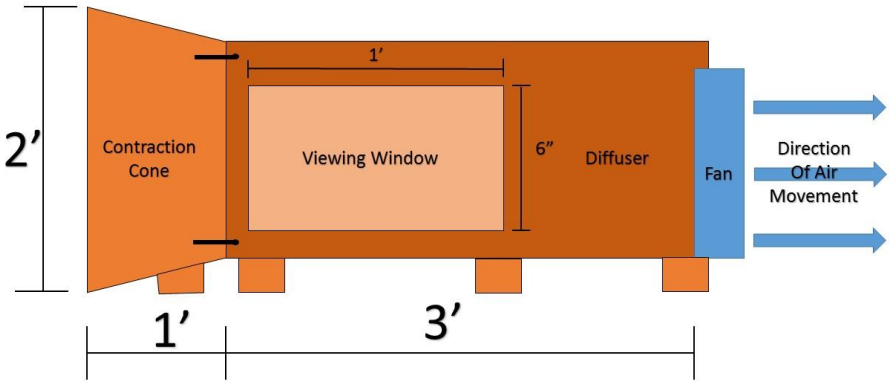
Building your wind tunnel

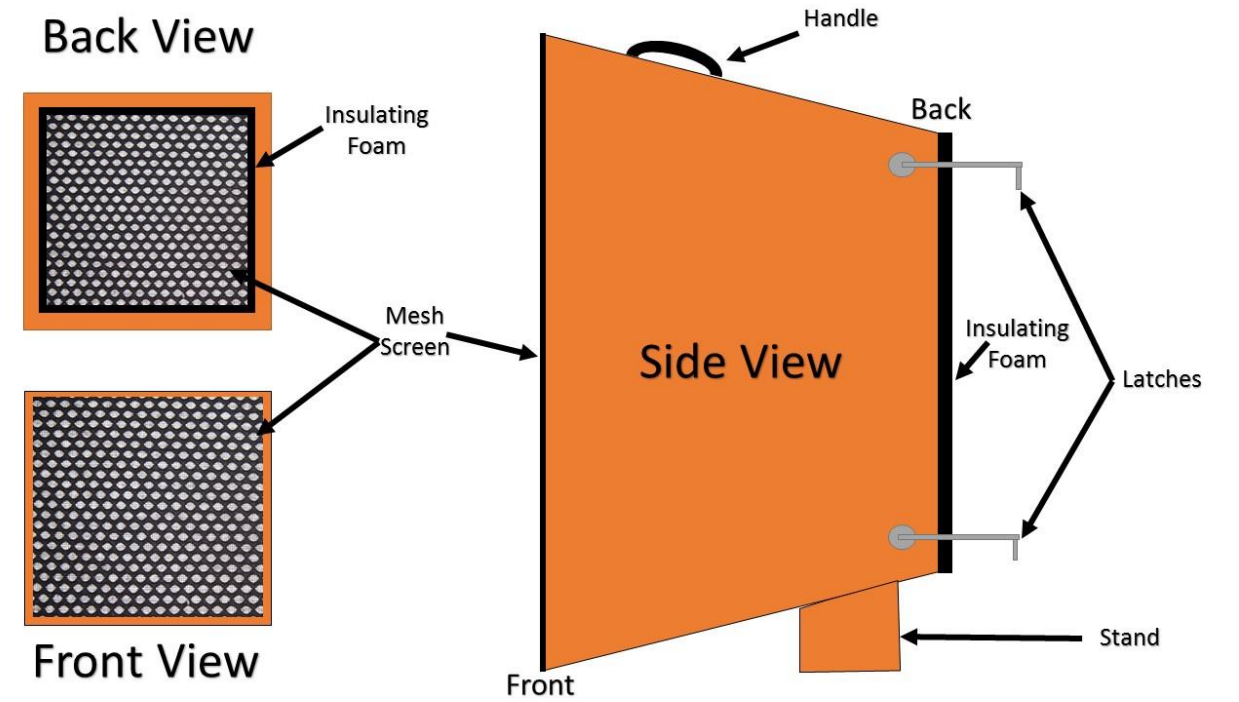
You can build a wind tunnel to utilize in this lesson from some pretty standard materials. I have provided a schematic and some instructions below. If you want to build a more stable wind tunnel with stronger materials you can follow the instructions here: https://www.sciencebuddies.org/science-fair-projects/references/how-to-build-a-wind-tunnel#materials

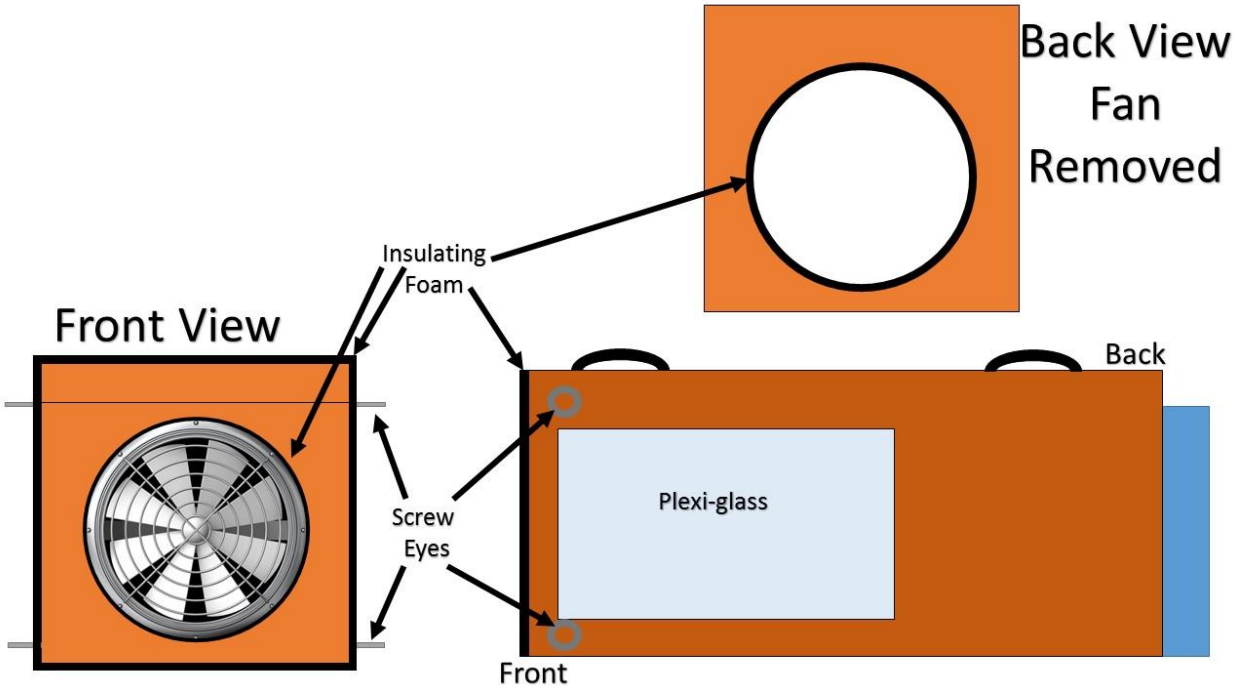
The only issue with the wind tunnel that they build above is that it is very large and likely fairly heavy. If this is something that you can utilize more than a single time, perhaps for other lessons, then it may make sense to build something more stable. However, if you require mobility and storability then building something a bit smaller would probably be better.

Materials needed:

• Cardboard	• Caulk	• Foam Air Sealant
• HVAC seam sealant	• Latches	•
• Plexiglass sheet	• Small tabletop fan	•
• Rubber Sealant	• Screw Eyes	•







***Notes: Be sure to seal all potential air leaks to improve the ability of the tunnel.**

Procedure:

1) Begin the lesson by asking the students if they know what Aerodynamics is. You will then explain what it is and describe the different forces that make up aerodynamics, Lift, Weight, Thrust, and Drag. Provide the students with examples of each force.

2) Once you get to drag you can explain how drag is similar to friction when two objects rub together. The only difference is that friction deals with two objects or an object and a surface, while drag deals with an object and its interaction with the air. You can provide the students with the drag coefficient picture to show them how air flows over and around certain shapes.
3) Finally, you can explain to the students that they will be building and testing cars inside of a wind tunnel to see who has the most aerodynamic car.

Activity:

For the activity students will build a small car to test in the wind tunnel. Each group should be provided with:

- Tape
- Square of Cardboard or Corrugated Plastics
- 2 Axels
- 4 wheels
- Axel holders
- A sheet of paper

Utilizing all of these materials, other than the paper, the students will build a car chassis. Utilizing the paper the students will manipulate it in any way necessary to a “top” to their car. They can make any shape they want with two exceptions. There must be a surface that the wind can make contact with, and not flow through. And the shape on top of the car must be 3-Dimensional.

Once students have built their cars, but before they are allowed to put their car into the wind tunnel, they should test it to make sure that it can actually roll. Once they pass this test they can put their car into the wind tunnel, turn it on, and take note of how it interacts with the air that is moving through the tunnel.

You can either create a “start” and “finish” line inside the tunnel and have the student’s time how long their car can last inside the tunnel without it being moved to the finish line. Or you can have the students clip their car to something inside the tunnel and just observe how it interacts.