



PLTW Flight and Space Virtual Learning

8th Grade/Airfoils

May 8, 2020



8th Grade/Flight and Space
Lesson: May 8, 2020
Day 2 of 2

**Objective/Learning Target:
Students will understand the shape of airfoils and how
they affect the lift of an aircraft.**

Warm-Ups:

Complete the following diagram on your [Cornell Notes](#) or notebook paper.

- Draw a picture of an airfoil
- Label:
 - angle of attack
 - Camber-
 - Chord-
 - Leading Edge-
 - Trailing Edge-

Lesson Introduction/Background Information:

Now that you know the basic concepts of aerodynamics, including definitions, Newton's Laws of Motion, airfoils, and forces acting on an airplane during flight, you will put that knowledge to use in designing an airfoil.

Practice:

Open [NASA Foil Simulator](#)

1. Click on the Reset button. This will return all settings to default. In the second box under the Reset button, click on the drop-down arrow and select Shape/Angle for the Input. Change the value for Angle to 0. Be sure to press Enter.
2. Launch the probe by clicking on the down arrow to the right of Output. Select Probe.
3. Click on the word Velocity. You should now see the probe. Using the slider bar under the Velocity gauge, move the probe so that it is on the first wind line directly under the thickest portion of the airfoil.
4. Record the velocity at that point in the table below. Then click on Pressure and record the value.
5. Move the probe using the vertical slider bar to the left of the Pressure gauge. Place the probe one wind line above the airfoil. Do not move the probe left or right.

Practice:

6. Record the velocity and pressure at that point.

Control	Above the Wing	Below the Wing
Velocity		
Pressure		

- In this configuration, is there lift?
- If so, how much?
- Why?

7. Change the Camber (wing curvature) to 1.0.

8. Move the probe and record the appropriate data in the data table below.

Camber at 1.0	Above the Wing	Below the Wing
Velocity		
Pressure		

Practice:

- In this configuration, is there lift?
- If so, how much?
- Why?

9. Change the Camber back to zero and change the Angle of Attack to 10.
10. Fill in the data table below.

Angle at 10	Above the Wing	Below the Wing
Velocity		
Pressure		

- In this configuration, is there lift?
- If so, how much?
- Why?

Practice:

11. Leave the Angle of Attack at 10 and change the speed to 150 (change input mode to flight test).

Angle at 10 Speed at 150	Above the Wing	Below the Wing
Velocity		
Pressure		

- In this configuration, is there lift?
- If so, how much?
- Why?

Self-Assessment:

In your notes, explain what you think the best airfoil design would be for a plane that you would want to own. Why is it the best choice?

Extend Your Learning/Continued Practice:

Learn more about [Symmetrical airfoils](#).

Learn more about Airfoil Design.

