



PLTW Flight and Space Virtual Learning

# 8th Grade/Balanced Forces

May 1, 2020



8th Grade/Flight and Space  
Lesson: May 1, 2020

**Objective/Learning Target:**  
**Students will learn about aerodynamics and balancing the forces on an airplane.**

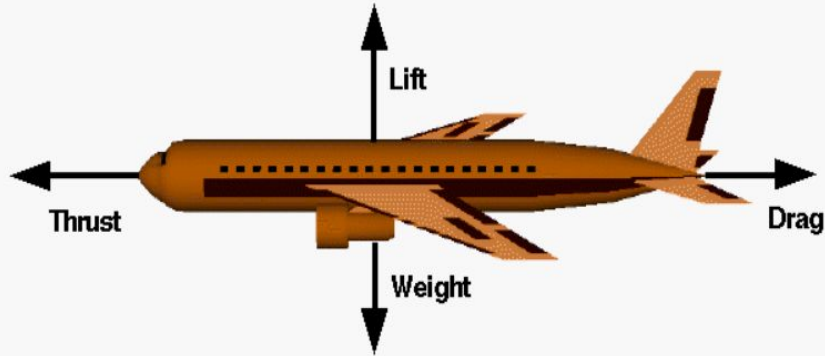
# Warm-Ups:

Practice what you know the forces of flight and the parts of an airplane on this Quizlet

[PLTW: Flight and Space](#)

# Lesson Introduction/Background Information:

Balanced forces on a plane result in cruising, a constant speed and direction of the plane. When the forces are unbalanced there is a resulting change in motion.



Flight Condition	Effect
Lift > Weight	Plane Rises
Weight > Lift	Plane Falls
Drag > Thrust	Plane Slows
Thrust > Drag	Plane Accelerates

# Practice:

Complete the questions below on [Cornell Notes](#), notebook paper, or the attached [Balanced Forces Worksheet](#).

Cruising Aircraft and Balanced Forces  
[Beginner's Guide to Aerodynamics](#)

Open the slides called [Airplane Cruise-Balanced Forces](#), [Forces on an Airplane](#), and [Aircraft Motion-Unbalanced Forces](#) (with text). Read the explanations on the four forces on an airplane and what happens when the forces are balanced or unbalanced. Using your own words answer the following questions.

# Practice:

1. Define force.
2. What are the four forces acting on an airplane?
3. How do each of the four forces act on an airplane in flight? (Which direction does each force push or pull on the airplane in flight?)
4. Define balanced and unbalanced.
5. In terms of the four forces acting on an airplane, what needs to happen so the forces are balanced? What do we call it when all four forces are balanced on an airplane?
6. You are traveling on an airplane and the pilot announces on the intercom that you have reached your cruising altitude of 32,000 feet. Explain what the pilot is telling you. (Include what is happening with the four forces on the airplane).

## Practice:

7. During a flight when we are cruising at a specific altitude, the four forces are balanced. At which points during a flight are the forces unbalanced?
8. Define Newton's First Law of Motion.
9. In your own words, explain how Newton's First Law of Motion explains the motion of a cruising airplane.
10. What are some ways the forces on an airplane can become unbalanced? (Name at least three).

# Self-Assessment:

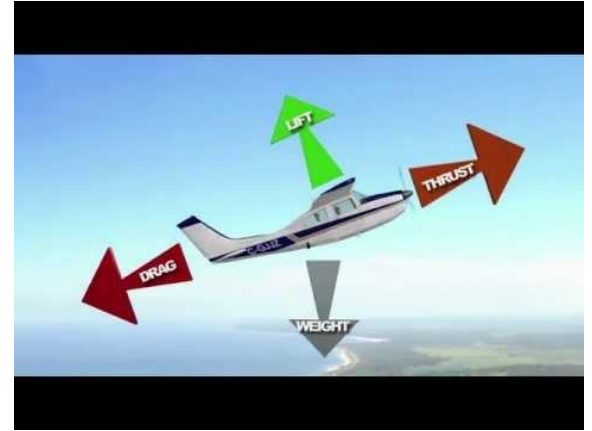
In your notes, describe what happens to the forces acting on an airplane during takeoff and landing.

Check your answers for the balanced forces questions here:  
[Balanced Forces Worksheet Answer Key](#)



# Extend Your Learning/Continued Practice:

See how the change in forces act on the airplane.



Here is more on [the forces of flight](#).