

STEM Flights LESSON PLAN

AVIATION v. AEROSPACE: What IS the Difference?

Grades: 6-12

Topic: Aviation and Aerospace

Focus Area: STEM Career Pathways

Lesson Description: Students will explore Aviation and Aerospace to learn about the fundamental concepts surrounding both areas of focus. Students will learn about how an aircraft flies, explore the earth's atmosphere, experiment with atmospheric pressure, and discuss possible career pathways related to both fields.

Student Objectives: Students will be able to identify the difference and connection between Aviation and Aerospace by connecting the concepts to aircraft, flight, and our atmosphere.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions</p> <p>Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence Science knowledge is based upon logical and conceptual connections between evidence and explanations</p>	<p>P S2.A: Forces and Motion</p> <ul style="list-style-type: none"> The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. 	<p>Stability and Change</p> <ul style="list-style-type: none"> Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at difference scales

5E Model of Instruction: NGSS

ENGAGE:

Post these questions to begin the lesson and explain that students will discover answers to these questions throughout the lesson. Have students hypothesize and discuss possible answers before beginning the lesson:

1. How does an aircraft fly?
2. How does the atmosphere relate to aviation and aerospace?
3. How can you differentiate between aviation and aerospace?

EXPLORE - *Exploring Flight*

Have students create their own paper airplanes either individually or in teams. Have a contest to see which plane goes the furthest and evaluate the winning plane. What made it so successful? Have students focus on how and why the paper airplanes flew (or didn't fly) and have them discuss how Forces of Motion contribute to their paper planes and flight.

Have students connect this learning to actual aircraft; both airplanes and spacecraft. How do those aircraft take flight? Does it make a difference where the aircraft flies?

Tip: Have students create a note catcher that helps to organize what they learn throughout the lesson

Next, watch this video and have students discuss how it connects to the flight of their paper airplanes
[How Do Airplanes Actually Fly? - TED Ed with Raymond Adkins](#)

EXPLORE PT. 2 - *Atmospheric Investigation*

Example Script: "Have you ever wondered why commercial aircraft fly at the altitude that they do? Or wonder what would happen if they went higher into space? Our Atmosphere plays a large role in how high an airplane can go. The atmosphere also has a direct connection to identifying the principles of Aviation and Aerospace. Let's learn more about the layers of the atmosphere."

Refer to this video to expand on the physics of flight and discover how aerodynamic lift generates the force needed for planes to fly
[Layers of the Atmosphere - Embry-Riddle Aeronautical University Flight Department](#)

After learning about the layers of the atmosphere, why do you think it is important for airplanes to stay within the Stratosphere and Troposphere? What makes it possible for spacecrafts to travel into the exosphere?

(temperature, air pressure, weather, altitude, etc)

View this page to learn more about the [Layers of the Atmosphere](#)

Take the student exploration one step further. Have them access the [Zoom Earth](#) Atmospheric Pressure Forecast Map to get current

data on Atmospheric Pressure. Discuss how this links to flight patterns for pilots. Continue the investigation by having them compare weekly how the Atmospheric Pressure changes along with weather patterns.

EXPLAIN

After learning about the layers of the atmosphere, why do you think it is important for airplanes to stay within the Stratosphere and Troposphere? What makes it possible for spacecrafts to travel into the exosphere?

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View this page to learn more about the [Layers of the Atmosphere](#)

[Download the 'Layers of the Atmosphere' PDF to share with students](#)

ELABORATE - *What IS the difference between Aviation and Aerospace?*

Aviation refers to the flying, operation, and maintenance of aircraft that flies inside of Earth's Atmosphere (stratosphere/troposphere)

Aerospace refers to the engineering and science of flying in Earth's atmosphere and outer space. It is the area of technology and business that deals with space travel. The words aeronautics and spaceflight are responsible for the name aerospace. It is the area of space that includes the Earth's atmosphere and the universe beyond.

[Differences Between Aerospace and Aviation](#)

EVALUATE

For their final task of the lesson, have students collaborate to develop their own Atmospheric Diagrams using the PDF as a model. Have them label the range of aircraft and include any additional information they learned from the lesson.

Materials Required for This Lesson Plan:

<ul style="list-style-type: none"> • Paper to create paper airplanes 	<ul style="list-style-type: none"> • Materials to create an atmospheric diagram (construction paper, scissors, glue, markers) 	<ul style="list-style-type: none"> • Computer Access for Students 	<ul style="list-style-type: none"> • Technology to Display Videos for Educator
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Vocabulary Terms:

Aviation	Aerospace	Atmosphere	Stratosphere	Troposphere	Exosphere
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CONNECT YOUR LEARNING

How does this connect to our world?

Aviation and Aerospace are two industries at the center of our world. Without these technological advances and the engineering to develop these aircraft, life would be very different. Airplanes are responsible for importing goods, providing military protection, and allows for travel that makes it possible to see the world. Aerospace has advanced our knowledge about space significantly over the last sixty years and will continue to create access to the world of space exploration.

CAREER PATHWAY EXPLORATION

At STEM Flights, we believe that STEM Career Exploration at an early age can help to shape a student's future. We encourage all educators to allow their students to view the links below and explore the different career pathways available in these fields.

What Career Pathways Can You Explore in Aviation and Aerospace? Here are just a few:

Aviation:

- Pilot (Commercial, Agriculture, Helicopter, etc.)
- Military Flight Instructor
- Airport Manager
- Air Traffic Controller
- Aviation Maintenance or Mechanic
- Safety Inspector

Aerospace:

- Aerospace Engineer
- Astronaut
- Rocket Scientist
- Research Scientist
- Systems Engineering

Check out these resources to explore more:

- [Aviation Related STEM Careers](#)
- [Aviation and Space Careers - FAA](#)
- [Careers in Aerospace](#)

Additional FREE Resources and Activities Related to STEM, Aviation, and Aerospace

- [Future U Lesson Plans - Discovery Ed & Boeing](#)
- [NASA's Educator Guide to Aeronautical Activities for Students \(All Hands-On\)](#)
- [NASA- The Dynamics of Flight](#)
- [Teach Engineering Lesson Plans and Experiments](#)
- [USA Science & Engineering Festival Lesson Plan Library](#)

