



STEMpack: Aerospace Engineering



Lesson 1: Introduction to Aerospace Engineering

Through this curriculum students will embark on experiments that utilize introductory physics and engineering concepts to construct aerospace engineering apparatuses. There are seven lessons in total (12 hours of instruction). Each of these lessons is designed to encourage perseverance and inquisition throughout the experimentation process. It is imperative to establish a collaborative, supportive class environment from the beginning of class meetings. Students will feel more comfortable navigating troubleshooting, iteration, and frustrations surrounding the experiment process in a relaxed, encouraging classroom.

In lesson 1 students are introduced to engineering and learn how they interact with components of engineering every day without realizing it. Building an elementary understanding and enthusiasm for engineering will help students envision themselves as engineers throughout the following lessons and experiments.

Learning Objectives

Students will

- Learn that aerospace engineers work on all aspects of how we travel through the atmosphere and outer space
 - Ensure that students master this concept: In lesson 2 students will construct their own hot air balloons as an example of how aerospace engineering encompasses more than space exploration.
- Learn that engineers solve everyday problems and that many different types of people can be engineers

Materials

- 1 sheet of paper per student
- Colorful markers or colored pencils

Time

1 hour

PART I: OVERVIEW AND INTRODUCTIONS (10 MINUTES)

Welcome students to the classroom and instruct them to decorate their own name tent for their desk (fold the paper in half lengthwise to make the tent). Names should be printed in large letters so students can read each other's names from across the room. While students are completing their tents you can explain that today you will be introducing aerospace engineering.

When students have finished, ask them to share their names, what they want to be when they grow up, and why.

PART II: WHAT IS AN ENGINEER? (10 MINUTES)

Ask students to take a few minutes to think about engineering. What do they think it is? What do they think engineers do? What kind of person becomes an engineer? Why would someone want to become an engineer? Give students 5 minutes to write down their answers and 5 minutes to share answers.

Teacher tip: Keep students engaged by presenting the curriculum through a variety of modalities. Here would be a great place to show a video that illustrates how engineering is necessary in everyday life. Be sure to choose videos that are inclusive and fun!

Internet resources are a great way to find videos and content to share with the group. However, use caution regarding what you choose to share with your cohort, and preview it to make sure it's appropriate for kids. AAUW recommends that you always start with government websites. For example, NASA and the National Science Foundation are good places to begin your research. Look for additional activities or find engaging videos for your students to watch.

PART III: WHAT IS AEROSPACE? (10 MINUTES)

Have students call out what they think the answer might be. Some of them may be familiar with this word or have general ideas. Then provide them with the definition of aerospace:

1. Of or relating to Earth's atmosphere and the space beyond
2. Of or relating to the science or technology of flight

PART IV: WHAT IS AEROSPACE ENGINEERING? (20 MINUTES)

Provide students with the definition of aerospace engineering and either write the following definition at the front of the classroom or have a handout for each student. Choose a volunteer to read each of the following bullets:

Aerospace engineering is the branch of engineering that deals with the design, development, testing, and production of

- Aircraft and related systems operating in the Earth's atmosphere (aeronautical engineering)
- Spacecraft missiles, rocket-propulsion systems, and other equipment operating beyond the Earth's atmosphere (astronautical engineering)

Keep in mind that you are providing an elementary introduction to this concept. What is important is that students realize that aerospace engineers have many functions.

Now that students have a basic understanding ask them what kinds of jobs or projects would require an aerospace engineer. This activity will help students differentiate between types of engineering and illustrate the depth and variety of STEM careers overall. Students may not know the titles/types of jobs that would require an aerospace engineer, so come prepared with a list of titles and corresponding job descriptions.

Choosing volunteers to help read instructions or help with materials will keep students active and give everyone a chance to participate.

You can make this more interactive by printing pictures of individuals working various engineering jobs (ensure that you are diverse and inclusive in your choices of who embodies engineering in these photos) and passing out the titles of the jobs to students, allowing them to play a matching game at the front of the classroom.

You can play this as a team game while students race to identify as many correctly as possible in a matter of seconds, or you can play this individually and go over the answers as a class once each student has placed their guess with the photo of their choice or written down their answer on a piece of paper, which they will grade.

Whatever activity you decide to complete, watch how your students engage and what they seem to enjoy or not enjoy so that you can continue to design interactive lesson plans that will reiterate the curriculum through adhering to the different learning styles present in your cohort.

In lessons 3, 4, and 5 students will learn about how planes fly and how material choice and design affect the aerodynamics of planes. This lesson will help acquaint them with the many roles that work collectively within aerospace engineering.

Lesson 6 will provide students with the opportunity to construct and launch their own rockets, showcasing what they have learned about design, aerodynamics, physics, and successful engineering.

PART V: CLOSING (10 MINUTES)

As an option you can close class with a fun video depicting students of the same age participating in STEM, female engineers, or specifically aerospace engineers. It may be helpful for students to see the variety among engineering specialties. For example, what kind of engineer works on the construction of bridges? How about roller-coasters? The goal is to get the students excited about the curriculum and see engineering as a career that they could pursue.

Try to close the lesson with at least one discussion or reflection question for the students.

Guiding Discussion Questions

- What does an aerospace engineer do?
- Name a component of aeronautical engineering.
- What is the difference between aeronautical engineering and astronautical engineering?
- How has engineering helped you today?