SWENext Newsletter - K-8

In this edition:

What is Aerospace Engineering?

Have you ever looked at an airplane and wondered, "Who came up with that idea, and how do we know it is safe?" Aerospace Engineers design the planes we ride. They make sure they are safe, too!

Aerospace Engineers design, make and test things like aircrafts, satellites, space shuttles, cars and missiles. Aerospace Engineers also work on clean energy like windmills.

The things that Aerospace Engineers make can go really fast. Because these things can go fast, Aerospace Engineers make sure that they are also safe. Some Aerospace Engineers will use computers to help them decide if their designs will work, so sometimes the Aerospace Engineer will be working in an office at a computer. At other times, they will be working in a production shop where their design is being made.

Aerospace Engineering Spotlight

Meet Lindsey, a third year Aerospace Engineering student in Alabama

Lindsey is studying to earn her bachelor's degree in Aerospace Engineering from Auburn University in Alabama! She worked at Lockheed Martin in

Marietta, Georgia during the summer of 2019 as
an Operations Analysis Intern. There, she worked on the computer to decide if the aircraft designs were safe or not.

What made you decide to become an Aerospace Engineer?
Have you heard of the Hubble Space Telescope? I learned about it at a Girl Scout Camp, where we learned about science and engineering. As a kid, I would spend hours looking at pictures that the telescope took. I dreamed of being able to build something that could explore the stars and galaxies. When I looked into college, I was afraid that Aerospace Engineering was not going to be a good idea. I later learned that we are in the golden age of the space industry. I love that I can live out my childhood dream, while also knowing that there are lots of jobs for me when I graduate.

Can you describe some fun projects you are a part of?
I am the Testing Lead of the Auburn University Rocketry Association. This organization builds rockets for two competitions. One contest is called the NASA Student Launch Initiative. We launch our rocket a mile high into the sky, which is 5,280 feet. Another contest that we compete in is called the Spaceport America Cup. In this competition, we launch our rocket up to 30,000 feet into the sky!

For an entire year, we all worked really hard to build our rocket. The rocket we built was about 11 feet tall. Inside, we put a small rover that could leave the rocket once it landed. The rover is supposed to drive for 10 feet and launch a smaller rocket. We drove 24 hours from Auburn, Alabama all the way to Las Cruces, New Mexico to compete in the Spaceport America Cup. It was so cool to see our rocket launch higher than 10,000 feet into the air and land safely. This is a very exciting project that I am glad I got to work on. Seeing our hard work pay off was the most beautiful, exciting, and worthwhile thing I have been a part of since staring college.

Meet Margarita, an Aerospace Engineering Senior in Texas

Margarita is an Aerospace Engineering student in her fourth year at the University of Texas. She plans to graduate in May 2020. Margarita worked at Boeing in Huntsville, Alabama, during the summer of 2019 as a Test Engineer Intern. There, she worked on the Space Launch System called Artemis. She checked for leaks inside of the rocket's engine and tested the safety of its liquid hydrogen tank.

What did you know about Aerospace Engineering when you were a child?
I did not know anything about engineering at all when I was a kid. My mom was only sixteen when I was born and did not go to school past the ninth grade. We emigrated from El Salvador to the U.S., and I had to work really hard to learn English so that I

could do well in school. That was my biggest focus. I did not have much time to learn about anything else.

How is cultural diversity a good thing for Aerospace Engineering?
It is really important that we have cultural diversity in Aerospace Engineering. Women can bring a lot of good changes and ideas. People from different cultures can also help develop a more global engineering perspective. Growing up as a Hispanic woman in America has helped me understand my communities. Both my Salvadoran culture and American culture taught me to help my communities.

Can you tell us about fun projects you have been a part of?
The coolest mission that is going to happen in 2024 is Artemis 4 when the first female astronaut gets to step foot on the Moon. The ultimate goal is to be able to achieve a manned mission to Mars. I got to be part of this project when I interned at Boeing. I worked on the Space Launch System known as Artemis 1. I ran different tests to make sure that the spacecraft was safe. I even got to do a leak check inside the engine section. I am happy to have been given this opportunity to work on this rocket because the goal is to launch it next year to orbit around the moon. Then Boeing plans to launch it to Mars in 2028.

Meet Marissa, an Aerospace Engineering Senior in Michigan

Marissa is studying Aerospace Engineering at Western Michigan University in Kalamazoo, Michigan. She is president of her SWE section at her university. Marissa plans to graduate in May 2020.

What kind of challenges have you faced as a woman studying Aerospace Engineering?
I grew up in a small town in the Midwest without a lot of industry and in a family that did not talk much about engineering. I did not understand what engineering was when I signed up for it. On top of that, I am a Mexican girl from a low income family, and many of my classmates do not look like me. They also do not understand the hard things that I have been through. Many of them acted like they knew engineering was where they belonged. This made learning engineering really hard. I felt like I did not fit in. I was not even sure that I would make it through a year. I later learned that this feeling is called Imposter Syndrome. A lot of women in STEM, not just engineering, feel it! Learning that I was not alone made me feel a lot better. I met people who helped me learn. I talk to my friends and teachers who always remind me that I can do anything! It has not been easy, but I am learning to believe in myself more. I am now more willing to accept that I am in engineering

because I am just as smart, innovative, and hard working as the students that I am working and learning with.

Can you tell us about what it is like to be an Aerospace Engineering Student?
During this semester, I work in the mornings. Then every afternoon, I have classes. After class is over, I go to my clubs, which are my favorite parts of my day! On Mondays I go to SWE. I am the president of my school's section. I get to lead meetings, organize events for our section, and help to build a community for women in engineering on my campus! On Tuesdays, Wednesdays, and Fridays I have WALI, which stands for Western Aerospace Launch Initiative, which is my school's student-run CubeSat Team. A CubeSat is a miniature satellite often used for research and launched as a secondary payload on larger launch vehicles. I am the Power System Lead for our team. Even though I am not an Electrical Engineer, I have been able to learn a lot about how power systems work, and how they work with the other systems on the satellite. The work I have done with this team has helped me learn the basics of Systems Engineering and that I want to work on spacecraft once I graduate!

Did you know that January 17th is Kid Inventor's Day?

What do earmuffs, TVs and water skis have in common? All three have been invented by kids! There are thousands of kids who invent games, toys, and really important tools that make our lives easier each year.

January 17th is special because we celebrate the inventions kids have come up with. This day is chosen because it is Benjamin Franklin's birthday. While Benjamin Franklin is known for being one of our founding fathers, he was also a famous inventor! In fact, he invented the first swimming flippers about 300 years ago when he was just 12 years old. Lots of people celebrate Kid Inventor's Day by reading about it, writing about it, and inventing their own designs! What are YOU going to do for Kid Inventor's Day in 2020?

2020 SWENext Awards Season – Apply Now

Do you live within a couple of hours of **Buffalo or Des Moines**? Are you willing to travel to one of these cities with your friends? If so, read on!

We are excited to announce the 2020 SWENext STEM-in-Action Award.

The **SWENext STEM in Action Award** recognizes girls in **grades 6-12** who are actively interested in STEM and doing something in their community about it (for example, raising awareness, mentoring students, participating in SWENext, etc.). STEM in Action Award recipients will attend the DesignLab event where they will meet women engineers, learn about careers in engineering, learn how to be a role model and watch the DesignLab presentations. They will also receive a certificate during the

awards ceremony.

You must attend the DesignLab event in order to receive the award. See the dates of the event below.

We are using a rolling application process which means we will review your application and determine the award within two weeks of your application. Apply early so you can save your seat at the DesignLab event! Learn more and apply today!

The DesignLab Event in Buffalo will be held on March 28, 2020.
STEM in Action Award Application Deadline: March 1, 2020 - **STEM in Action Application**

The DesignLab Event in Des Moines will be held on April 18, 2020.
STEM in Action Award Application Deadline: March 22, 2020 - **STEM in Action Application**

Hands-On Aerospace Engineering Challenge

Aerospace Engineering is the branch of engineering focused on the design, construction, and testing of aircraft and spacecraft. It is broken into two major overlapping disciplines: Aeronautical Engineering (for vehicles that stay within Earth's atmosphere) and Astronautical Engineering (for vehicles that travel beyond Earth's atmosphere).

Aerospace Engineering applies the fascinating science behind the forces of nature and the physical properties of aircraft, rockets and spacecraft. Aerospace Engineers design, develop and test aircraft, spacecraft and missiles, and supervise their manufacturing. Today we're going to build our very own rocket!

What You Will Need:

- Heavy paper, like construction paper or thin poster paper
- Scissors
- Pencil
- Drinking straw
- Scotch tape
- Ruler
- Clear space in which to launch your "rockets," such as a large room, hallway or outdoor area with no wind – **Never 'aim' your rockets at another person (or your dog)!**
- Measuring tape

Cut one piece of paper into four smaller rectangles, by cutting it in half lengthwise and widthwise. This will allow you to make four rockets.

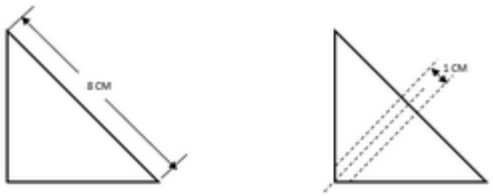
Wrap one of the paper rectangles around a pencil to form a cylinder, with the long edge of the paper along the length of the pencil. Tape the cylinder closed so it does not unravel (but do not tape it to the pencil).

Slide the cylinder off the pencil. Pinch one end of the cylinder shut and seal it with tape. (This is the "front" end of your rocket.) Leave the other end open.

This will be your first rocket, with no fins.

Make another paper rocket following the previous steps. Remember to pinch one end and tape it shut.

For this rocket, however, you will make fins. Cut out two right triangles (with a 90-degree angle in one corner) from another piece of paper. The long sides of the triangles should be about eight centimeters (about 3 1/8 inches). You will fold each triangle to make two fins, so you will have four fins total.

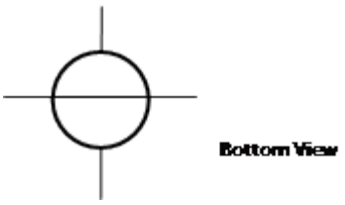


Draw a line that splits one triangle in half (from the 90-degree corner to the middle of the long side of the triangle). Draw two lines parallel to the first line (one on each side), about five millimeters away from it.

Now, fold the triangle up along these two lines. The result should be two triangles sticking up in the air (the fins), with a flat part connecting them in between.

Tape the flat part to the side of your cylinder, toward the open end (the base, or bottom, of your rocket).

Repeat these steps for the other triangle, and tape it to your cylinder on the opposite side of the first one. The result should be four fins that form a "+" shape when you look at the rocket from the bottom. If necessary, bend the fins so they are spaced out 90 degrees apart from one another.



With plenty of room in front of you—and no obstructions, such as furniture or people—prepare to launch your first rocket! Slide it over a drinking straw. Aim the straw forward, then blow into it as hard as you can. Watch your rocket as it flies. How far does it go? Does it fly straight, or does it tumble in midair?

Launch your rocket a few more times to see if it flies the same way. If you would like to

record your rocket flight distances, be sure to launch it from the same place each time, and measure to the landing spot with a tape measure.

Slide the second rocket onto the drinking straw and launch it. How far does this rocket go? How does its flight compare with your first finless rocket? Does it go farther? Does it tumble or does it fly straight? Do you think fins help the stability of your rocket?

Launch it a few more times. If you are measuring the flight distance of each rocket, use a tape measure and record how far it flew.

Try different numbers of fins. What happens if you only use two fins instead of four? Try different shapes for fins. What happens if you make semicircular fins instead of triangles? Try making the fins smaller or larger. Does that change how far it flies?

What other things could you change that might impact the design? What if the cylinder was shorter? What if the nose was cone shaped?

These are questions that real Aerospace Engineers work on to improve rocket design.

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