

## Using Aviation to Teach STEM

### Take the boring out of science and math, use flight!

By Dr. Heather Gollnow

Over the years, I have done a ton of different activities to help promote aviation to the next generation. Promoting aviation has always been important to me. A big part of the reason I personally enjoy doing some of the activities I do is because I am a huge fan of science and math. Aviation is a natural fit for these subjects. Since I have a pretty strong background in education as well as science, math, and technology, I am often asked to help plan activities for school age children and young adults to learn more about flying and being a pilot. Most of the time, I turn it around and use aviation as a means to teach kids about the importance of science, technology, engineering, and math (STEM).

I would like for you to consider this approach when you are out in your own community, sharing aviation with others. Use aviation as an opportunity to get kids excited about STEM careers. Show adults how they can be a part of aviation using the skills they already have. I am not going to cite any statistics here, but I am sure many of you have seen the need for highly skilled technical professionals in the very near future. Aviation is an exciting means to get kids excited about subjects that can sometimes be boring or difficult to understand.

Please use some of these activities that I have provided as examples of how you can use aviation as a means to promote STEM careers in your community.

#### Science

There are a lot of different activities you can do with children, young adults, and even adults to use aviation as a means to teach about science. It's probably natural to think about the physical sciences when teaching about aviation—things like Bernoulli's Principle or Newton's Third Law when exploring the principles of flight.

There are many different areas of science that are involved in aviation than just the physical sciences. For example, aviation is a great way to explore atmospheric sciences and meteorology. Learning the different cloud types, or different forms of precipitation might seem a little dull on the surface to some kids. Put some of these topics within the context of aviation and it may attract more attention.

#### Activity

It's safe to say that when you think about aviation, you think about the sky. One fun activity teaches kids why the sky is blue and why it can change to red or orange during sunrise and sunset. You simply need a flashlight, clear two-liter pop bottle, a little milk, and water. First you need to fill the bottle about  $\frac{3}{4}$  full of water along with a teaspoon of milk and shake well. Prop up the flashlight so that it shines through the mixture in the bottle. Keep adding more milk until you see a blue light emitting from the mixture. Once you see the blue, you can keep adding

milk until there's a red or orange light shining through the mixture. You can explain to kids that the mixture is like the earth's atmosphere and the flashlight is like the sun. The particles that are in our atmosphere scatters the light so we see different colors at different times of the day. This is a fun activity that teaches kids a little about the atmosphere and that we need scientists to study and understand the atmosphere in order to keep people safe when flying!

#### Technology

Technology is absolutely everywhere in this day and age. There are probably very few career choices left where technology is not a large piece of it. Aviation is no exception. When you talk about technology in aviation, it's not just what websites you go to for weather reports, or using DUATS to file a flight plan. It's about advancing aviation and making aviation even better through technology.

Yes, the Internet is a great asset to promoting and learning about aviation. Social media allows student pilots to connect with flight instructors and more seasoned pilots all over the world. There are websites you can go to for weather reports, catch up on the latest FARs, and find an airplane to buy. These certainly are aspects of technology in aviation that can and should be shared.

What I am referring to here with regards to technology is the development of some new technological tool that can be used in order to further aviation. In this sense, technology and engineering have a very close relationship and many activities can be done to share both disciplines. Noise-cancelling technology, GPS & Satellite technology, and avionics technology are



all aspects of technology and engineering in aviation. I just recently attended an awards banquet where a young man was working with the Internet of Things (IoT) technology to build a system to make it easier to locate distressed aircraft. This is a perfect example of the blend of technology and engineering in aviation.

#### Activities

This area is very dependent on the skill level of those with whom you are working. One part of Internet technology that is really great is social media. Through social media, I get to follow many aviation leaders, such as Chuck Yaeger, Buzz Aldrin, and Scott Kelly, who is spending a year in space. Sharing this with young adults who may be using social media is a great way to use technology to share aviation.

Mobile technology is also at the forefront of aviation, with GPS systems, weather apps, and more. Showing kids how to develop mobile apps or even simple simulators can introduce young adults to the need for technology in a pilot training environment.

When thinking more about the engineering side, your mind might be drawn to engineers who design and build airplanes. It's important for young adults to see that this is not the only type of engineering out there that's related to aviation. Engineers are needed to find a solution to everyday problems. One fun activity is to build an egg carton helicopter. I found some really good instructions on this website. I won't provide them here since it's somewhat lengthy <http://www.howweelearn.com/flying-egg-carton-helicopter>. This is a great activity to teach about systems, creating something new, analyzing a specific situation to make it perform better, and working with a team of people to improve something.

#### Mathematics

Math is another discipline that is a part of our everyday lives. It's widely known that many of our country's youth struggle with math at a basic level. Aviation is filled with math and is an excellent source of real-world examples of its application. This is another discipline that's going to vary with the skill-level of those



with whom you are working. You can use math in aviation to teach simple navigation, time, speed, rates, and can get into more complicated operations such as compression ratio, glide ratio, air-fuel ratio, or calculating center of gravity. Even some aviation mathematics courses teach converting binary to decimal, an example of technology and math in aviation.

#### Activities

Math is a fun discipline to teach through aviation. In my past experience, I have taught middle school students how to use math to calculate the distance between two points, speed, time, fuel calculations, cardinal headings, and aeronautical decision-making.

There are still lots of paper sectionals out there, and I often accept expired ones as donations for this specific activity so that I have enough for everyone to work in pairs. It's best to find sectionals for the geographic area you are in as it drums up some excitement when kids can find landmarks they already know. To begin, we pick an airport on a sectional as a starting point and pick a destination. Using a plotter, we draw a straight line between the two points. I use this as an opportunity to explain how we look outside at the landmarks as we are flying to make sure that we are staying on course throughout the flight.

After the route is drawn on the sec-

Using aviation as a means to teach the principles of science, technology, engineering, and math can enhance learning by keeping kids interested and excited. Above, Duane Esse used his airplane to teach about the aerodynamics of flight. Previous page: Grade school students learned about geography using flight as a theme.

tional, you can easily start walking them through how to use the legend to determine the distance between the two points, given a particular speed, the length of time the flight will take, explaining the differences between airspeed and ground-speed, etc. This activity doesn't take long, maybe 20 minutes, but it's a great way to show kids how math is relevant to aviation.

There are so many great ways to strengthen STEM skills in children and young adults. Relevant and exciting activities are necessary to keep kids interested in these disciplines. Aviation has proven for me to be an effective way to teach children and young adults about science, technology, engineering, and math. One search on the Internet shows that there are tons of great activities out there to teach these disciplines. If you are not already, I urge you to get involved with your local school, youth groups, etc. to teach youth about STEM through aviation. Share this article with a teacher or youth leader you know. Our future workforce depends on it! 