



FUTURE U.

Employee Guide: Drone Activity

Share your passion for aerospace innovation with the next generation of industry professionals!

This guide was created to help employees bring FUTURE U. resources to classrooms and prepare you to work with students in small and large-group settings. It provides tips and suggestions for employees to engage, explain, discuss, and effectively facilitate a drone activity to help students embrace their potential to make an impact and innovate for the future.

In advance of contacting an educator or after school program leader, please read this employee guide in its entirety. Also, please take a moment to contact your local BGE focal (<https://govops.web.boeing.com/index.aspx?com=5&id=18>) and let them know of your plans. BGE keeps track of employee community engagement activities at all sites and may have additional resources to offer for your visit with students.

ABOUT FUTURE U.

Boeing and Discovery Education have launched FUTURE U. to inspire and equip the next generation of STEM professionals in aerospace by providing standards-aligned, STEM-focused educational resources for middle and high school students. Through leveraging Boeing employee expertise and volunteerism, students have the opportunity to meet with real aerospace professionals and learn about the vast possibilities for careers in this arena.

Preparing for Your Visit

Once you have connected with an educator or after school program leader, you will want to work together to ensure a seamless visit. Set up some time together to discuss key details that will make your visit both smooth and successful.

A few items you may want to cover:

Pre-Visit Checklist

Thank them for their interest in the program and provide an overview of the program and activity ideas.

- Ask if there are any advance requirements or paperwork needed by the school office or afterschool club in order for you to visit.
- Learn about the setting of your visit, how many students you will be working with, and ask if there is anything that would be helpful to know in advance.
- Discuss how much time is available for your visit.
- Decide together which one of the activities will be used.
- Determine what the educator would like your role to be in facilitating the activity that day.
- Ask the educator to print and copy the student worksheets.

- Learn what technology will be available and use that to determine together how the activity will be facilitated.
- Explain the setup of the classroom to accommodate the drone challenge.
- Ask for any tips! Educators have a honed expertise for connecting with students. Consider your educator a valuable resource.

Preparation

- It is recommended that employees experiment with the drone before sharing it with students. This will allow you to build your background knowledge and explore what students will experience so that you are better able to anticipate any troubleshooting.
- Check with the educator about projection capabilities. In some cases, it may be easiest for you to send the PPT file and activities to the educator in advance. In other cases, you may be able to easily connect your laptop.
- Connect with the educator ahead of time to copy all handouts.
- Take a moment to read through the lesson directions, but don't worry about following all directions precisely. If student engagement leads you briefly in another direction, that's fine.

Listed below are examples of the different learning environments you may find yourself supporting.

Examples Include

Employee-led with educator support

As a guest in the classroom, an educator will likely work with you to setup the classroom and make initial introductions. Then, you may be taking more of a lead to run through the PPT to frame your time together. An educator may want the entire class to watch small groups work through the drone challenge. Or, they may have you work with the drone, and small groups of students, while they work on the drone activities we provided as part of this experience.

Employee-led with educator and volunteer support

You may find yourself attending a classroom visit with a colleague or find that the educator has other co-teachers or parent volunteers in attendance. This might be an opportunity have someone support you with the drone challenge and also have other adults working with small groups on the drone activities.

Virtual Participation

When a visit is requested by a group in an area not easily accessible to an employee, there may be an opportunity to participate virtually instead of going to the site. There are several free platforms, such as Google Hangout or Skype, or virtual conference programs that would allow you to share materials, visuals, and chat with students ahead of your visit.

Work with your assigned educator to determine the applicable items from the checklist above, along with which platform will be used to connect online. Download all software in advance and test your connection to the computer in advance of your presentation. You may want to ask the educator, based on the set up in their learning space, how you can help by sharing your screen and walking students through the directions.

Regardless of whether your visit is virtual or in-person, practice a couple of times in advance. Walk through the information you will be presenting, and time yourself to help work within the time you have available for your visit that day.

The Day of Your Visit

Many community centers and schools will require visitors to sign in and out at the main office and wear a visitor pass. Be sure to arrive early enough to find the office. To ensure an efficient sign-in, have your ID ready, and have a printout of the activity you will be facilitating on hand for reference when you need it.

Before Students Arrive

- Setup the classroom or allocated space with the community features in 6 foot x 6 foot area. You may want to take it off with painter's tape.
- Place the community features within the taped area. You will want to tape them down.
- Anchor the drone in the middle of the map with the 6 feet of string.

Presenting to Students

The Discovery Education resources have been designed to follow the below agenda. However, every group is unique and different factors, like available timeframe, will affect the exact nature of how FUTURE U. resources are used.

- Step 1: Volunteer Introduction with PPT (5–10-minutes)
- Step 2: Drone Challenge/Drone Activities (40 minutes)
- Step 3: Wrap-up (2–3 minutes)

Step 1: Volunteer Introduction

Take a few minutes to introduce yourself. Start off by telling students your name and why you are visiting their class. Use the PPT to help with an ice breaker activity and to show any visuals about your work. Tell them about your experience with STEM and aerospace, what your interests were at their age, and what inspired you to pursue the career you have today. Explain to them what you will be learning together and be sure to keep things brief, friendly, and relatable.

Students are going to be very interested and curious with having a special guest and will likely have a lot of questions! Work with the educator to determine the best method for inviting students to ask questions before, during, and throughout the activity. It's easy to lose time in the beginning!

Drone Challenge/Drone Activities

Assign small groups 4–6 six students. They can count-off or the educator can help assign groups by their table number or existing group structures already in place.

Groups not working directly with the drone can either watch or sit and work on different hands-on activities from the packet provided in this guide.

Invite the first group to fly the drone (other groups will be in their small groups working on different activities).

Randomly distribute a challenge card to the group and work with them to plan their course and learn the controls of the drone. Each students should have a chance to work through the challenge. Work with the educator to set a timer for each group to have enough time to work with you. Ten minutes should be enough time for groups to work with you through the challenge. Repeat with the next group.

Challenge Cards

Challenge 1:

Drones may one day be delivering your pizza! Navigate the drone from the pizza store to the school.

Challenge 2:

A movie studio wants an aerial shot of a city landmark. Chart a course that allows you to move across the landmark a few times to make sure you get the perfect shot!

Challenge 3:

Life-saving medicine may get to people faster than they can get to the hospital. Fly your drone from the hospital to the foothills to help a hiker in need of an EpiPen!

Challenge 4:

You are on a road trip and ran out of gas! Navigate the drone from the gas station to your car so you can be back on your way!

Step 3: Wrap-up PPT

There is a slide included to wrap up some key learnings from the day. You could also choose to close the experience more informally by thanking students for inviting you to share your work in aerospace!

Drone Activities

Two activities are included in this guide for students to investigate flight while you are working with the drone.

Experimenting with Helicopters

Students will investigate how model helicopters spin.

Simon Says

Students will practice Roll, Yaw, and Pitch playing Simon Says with a paper plane.

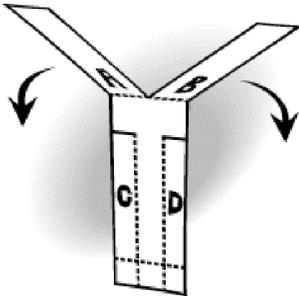
Objective: Students will investigate how model helicopters spin.

Materials:

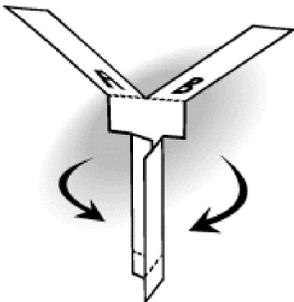
- Helicopter pattern
- Pencil
- Scissors
- Paper Clips
- Crayons or Markers (to decorate)

Procedure:

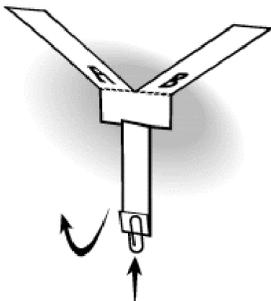
1. On the helicopter pattern worksheet cut along the solid lines.
2. Fold piece A towards you, and piece B away from you.



3. Fold C and D into the center so that they overlap one another.



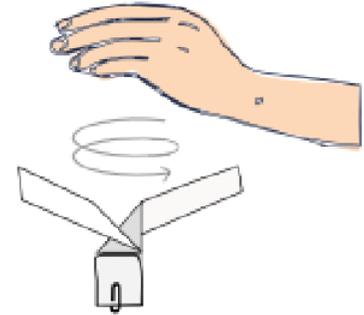
4. Fold the bottom up about 2 cm and attach a paper clip.



5. Holding the helicopter by the paper clip, throw it as far and high as you can—it will spin throughout its flight!

Why does the helicopter spin?

As _____ pulls your paper helicopter down, air _____ up against the blades, bending them up. Because the blades are slanted slightly, some of that push becomes a sideways push. And because you have two blades that are pointed in opposite directions, the two opposing pushes of air cause the helicopter to spin.



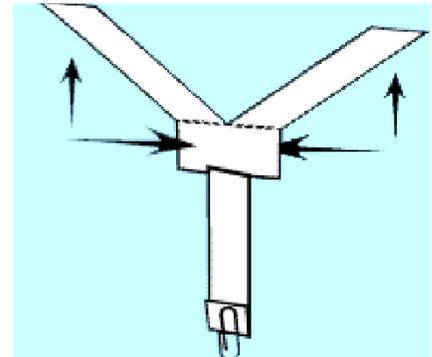
When helicopters fly, lift is produced by the pressure differences caused by the shape of rotating blades; this is the same way lift is produced by aircraft wings. The rapidly moving air over the top of the blade creates low pressure; the air beneath the blade is moving slower, so it creates higher pressure. High pressure under the rotor blades creates lift, which causes the aircraft to rise. Therefore, there is a greater _____ to produce lift.

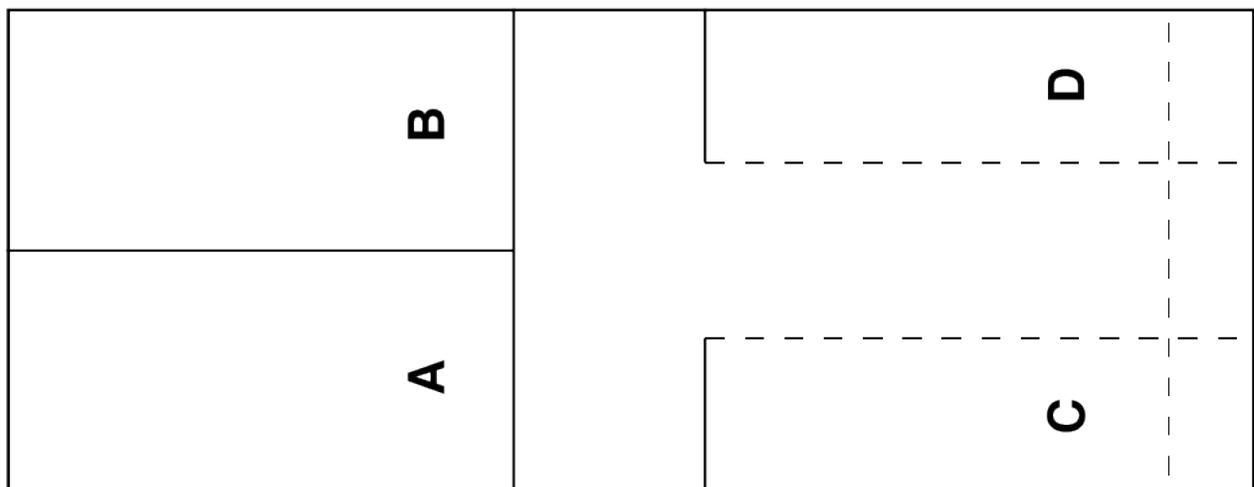
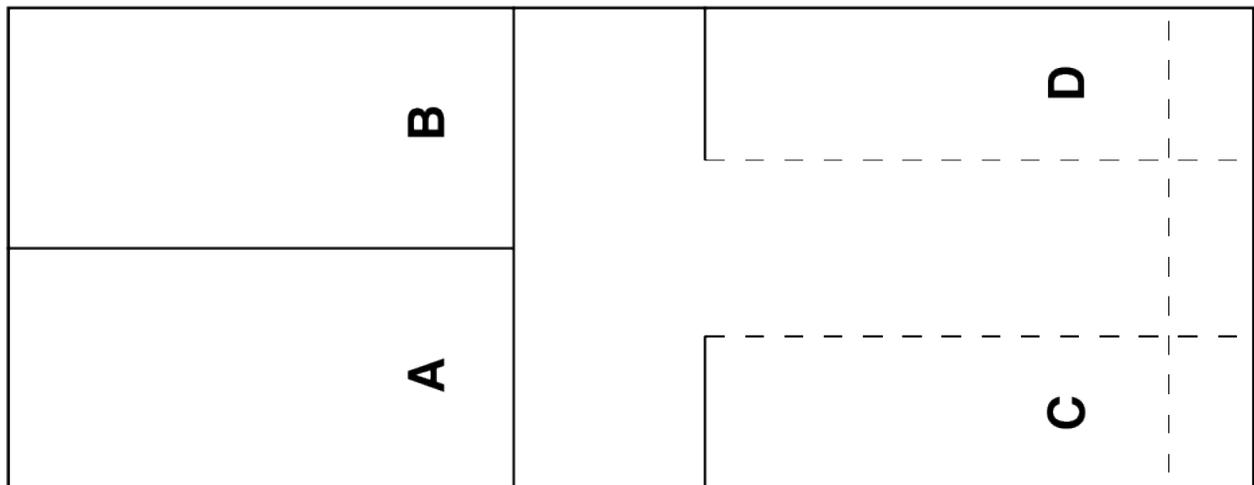
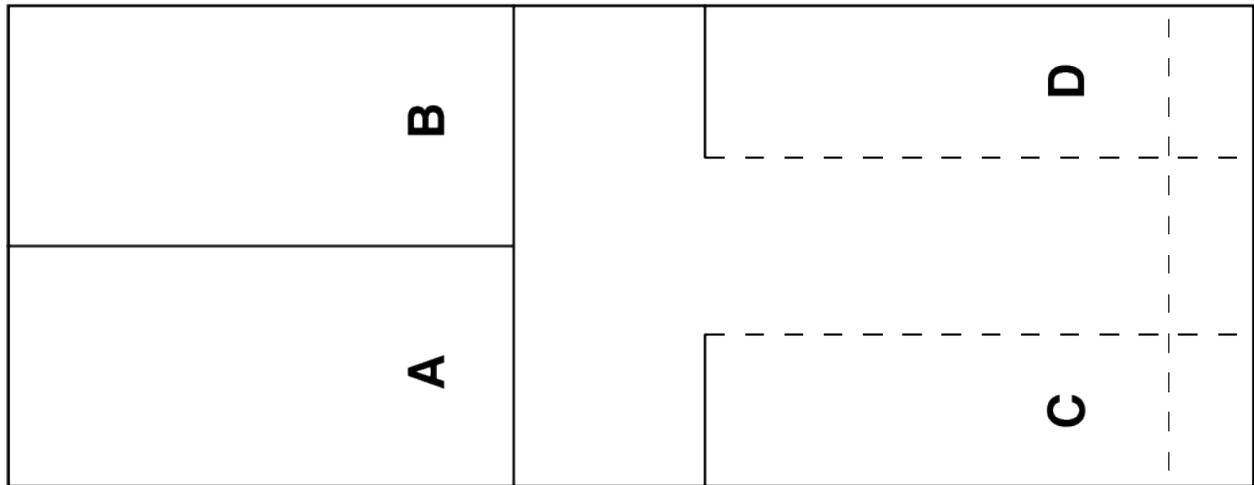
Since the paper models have no motor, they only have one source of lift. The paper helicopter will begin to slow down after it is thrown, so this will simulate the pilot's adjustment of the thrust. As the paper helicopter models fall, they will spin, imitating the rotation of the rotor blades of a helicopter. Because there is no thrust to produce upward movement, the helicopter will not fly upward, but the spin will reduce the rate of fall by producing lift, resisting the force of gravity. This will simulate the pilot's adjustment of the rotor speed.

Why doesn't the paper helicopter simply move sideways through the air?

That's because there are two blades, each getting the same push, but in opposite directions. The two opposing thrusts work together to cause the toy to spin.

On the diagram above, circle the forces that are pushing the blades in opposite directions causing the helicopter to spin.



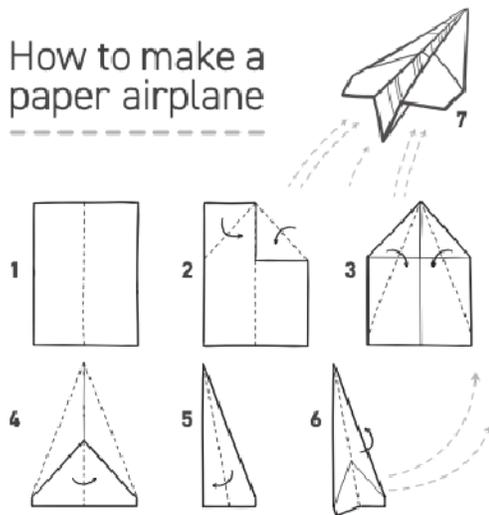


Objective: Students will practice Roll, Yaw, and Pitch playing Simon Says with a paper plane.

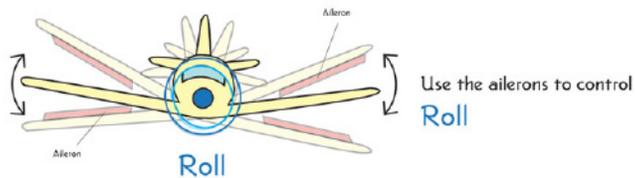
Materials:

- Paper

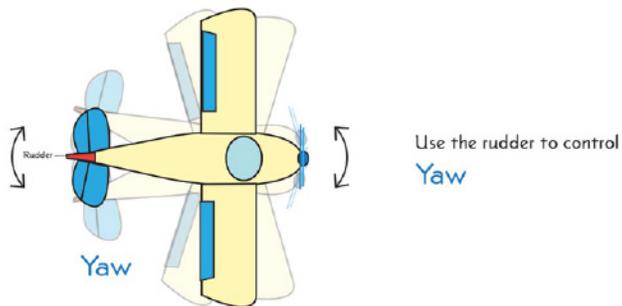
First, build an airplane using paper from recycling or paper in the classroom.



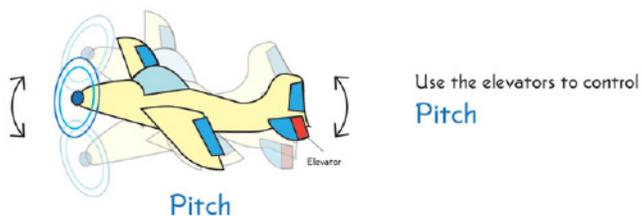
Next, practice moving your airplane into the different positions illustrated below.



Circular movement of the body



Nose moves side to side



Nose or tail up

Play!

One person is designated Simon, the others are the players.

Standing in front of the group, Simon tells players what they must do.

The players must only obey commands that begin with the words "Simon Says." If Simon says, "Simon says pitch," then players must make their paper airplane make a pitch motion. If Simon says, "Yaw", and students move their plane, they are out. You can only move your plane if Simon Says!

Play until one player is left and they can act as Simon for the next round.