Lesson 8: Drone Programming 2 - Navigation

Key Concepts:

- Drone Programming
- Navigation

Objectives:

- Cadets will learn to program and autonomously navigate a drone.

Instructor Background: Grades 5-12+

Time: 1 hour

Supplies:

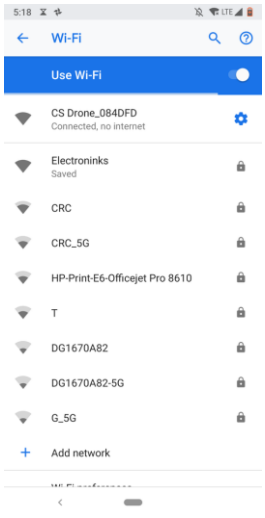
1. Circuit Scribe Drone Builder Kit
2. iOS or Android-enabled Device
3. CS Pilot App

Instructions:

Connect your Drone to your Phone

Power your Drone with the button on the bottom. Make sure the Drone's battery is fully charged.

Pull up your device's Wi-Fi settings. Connect to the "CS Drone" Wi-Fi network that your powered Drone is using. When your Wi-Fi app says you are connected, switch out of the settings and open the CS Pilot App.



INSTRUCTOR TIP:

If you are having trouble connecting to your Drone try the following troubleshooting steps:

Try these steps if your Drone's Wi-Fi is not showing up:

- Make sure your Drone's battery is fully charged and plugged in correctly (the charger will have a lit red LED when the Drone battery is charging. It will turn off when the battery is fully charged ~20m).
- Make sure the Drone is powered correctly (the red light will flash).
- Turn off auto-connect in your Wi-Fi preferences.
- Close the CS Pilot app.
- Turn Wi-Fi off and back on.
- If your Wi-Fi hasn't shown up, try power cycling the Drone (turn off, unplug the battery, wait 15 seconds, plug it back in and turn the battery back on).
- Open the CS Pilot app.

Launch the Pilot App and select "Program Mode"

Once you are connected over Wi-Fi, launch the app and select "Program Mode", the red LED on the Drone should flash rapidly and then turn solid. Now your Drone is connected and ready to be programmed!

INSTRUCTOR TIP:

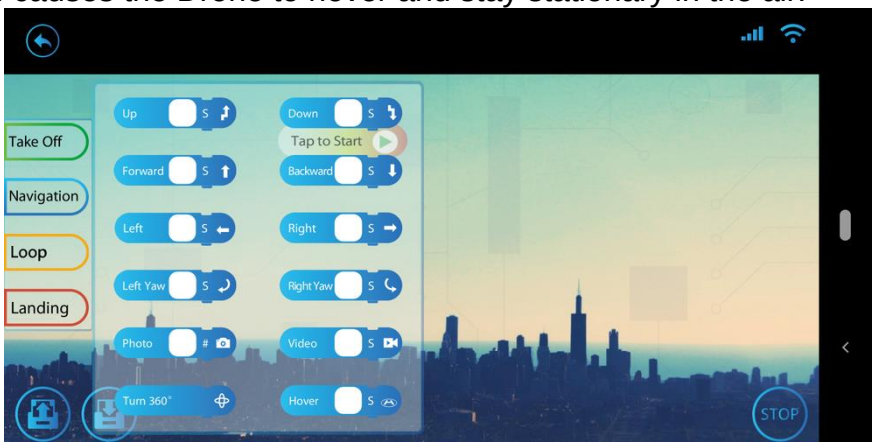
If your Drone disconnects during programming (i.e. your Drone's LED is flashing red, but your Wi-Fi on your device says it is still connected), try switching to "Pilot" mode. Once the LED stops flashing red and turns solid, you are connected and can switch back to programming mode.

Explore the Navigation Window

By using the building blocks in the navigation menu, you can program the Drone to autonomously navigate! Programs are limited to 30 seconds of flight time. Navigation blocks are very simple to use.

- Up/Down/Forward/Backward/Left/Right: moves the Drone in the corresponding direction for however many seconds are input. 1 second/ ~60cm.
- Left Yaw/Right Yaw: turns the Drone for however many seconds are input. 1 second/ ~90°.
- Photo: takes a specified number of photos using the Drone's forward facing camera and save them to the app's photo roll.

- Video: takes a video for a specified number of seconds using the Drone's forward-facing camera and save them to the apps photo roll.
- Turn: turns the Drone a complete 360°. 1 second/ ~360°.
- Hover: causes the Drone to hover and stay stationary in the air.



Write your First Autonomous Program

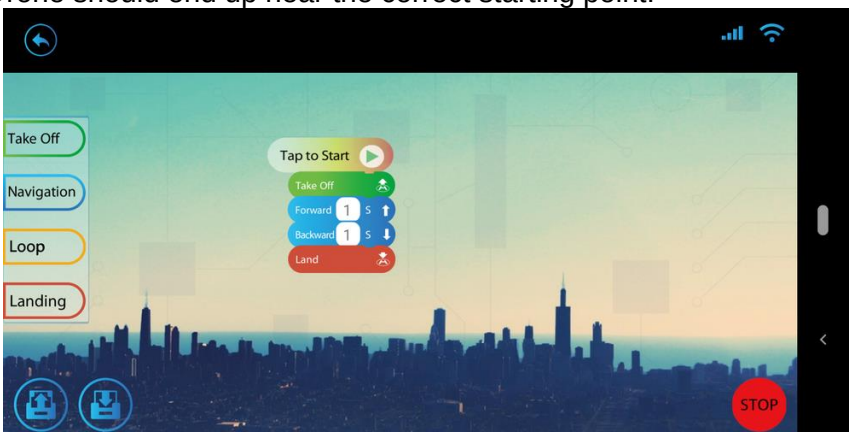
Now that we understand what each navigation command does, let's write our first simple autonomous Drone program!

1. First, open the "Take Off" menu and drag a Take Off block onto the screen.
2. Next, open the "Navigation" menu and drag a forward and backward block onto the screen.
3. Finally, open the "Landing" menu and drag a Land block on screen.

Now connect your blocks.

1. First, we will connect the "Take Off" block to the "Tap to Start" block.
2. Then, we will connect the "Forward" and the "Backward" blocks.
3. Finally the "Land" block.

Once all your blocks are connected change the inputs for the "Forward" and "Backward" blocks to 1 second each. This code will cause your Drone to fly forward ~60 cm and then fly backwards ~60 cm. Your Drone should end up near the correct starting point!



INSTRUCTOR TIP:
Be sure and review the instructor lesson about setting up a safe classroom flying experience before allowing students to fly the Drone in the classroom.

Box Challenge!

Now that you have gotten acquainted with programming your Drone to autonomously navigate, let's try and complete a challenge! The challenge is simple, have your Drone fly in a box pattern. The Drone should remain in your class' flying area and should end up roughly where you began. There are multiple ways to complete the challenge; can you code more than one?

Class Discussion
Offer the cadets a question and answer session after the activities. Once all of the cadets' questions are answered, begin to review the discussions as a whole class.