



Mission 3: Pre-Flight Check		Time Frame: 60-90 minutes	
<p>Mission Goal: Students will learn how to conduct a pre-flight check of CodeAIR.</p> <p>Learning Targets</p> <ul style="list-style-type: none"> I can control CodeAIR's lighting system. I can program the speaker to add sounds. I can program the onboard lighting system to show the colors of the international <i>Aircraft Position Lighting</i> scheme. 		<p>Key Concepts</p> <ul style="list-style-type: none"> To slow down computer code, which runs very quickly, you need a delay. In Python, use a <code>sleep()</code> function to slow down the action. You can use editor shortcuts to copy and paste code. A loop, like the <i>while True:</i> statement or <i>for</i> loop, repeats a block of indented code. CodeAIR has a speaker that produces beeps in different frequencies and duration. CodeAIR has 8 pixel LEDs that can light up any color. They are numbered 0-7. 	
<p>Assessment Opportunities</p> <ul style="list-style-type: none"> Quiz after Objective 2 Quiz after Objective 4 Quiz after Objective 7 Complete the program <i>CycleLEDs</i> Complete the program <i>Melody</i> Complete the program <i>SkyLights</i> Complete the program <i>RunningLights</i> Mission 3 Assignment Mission 3 Review questions 		<p>Success Criteria</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use a loop to repeat a block of indented code <input type="checkbox"/> Use the speaker to play music <input type="checkbox"/> Control the pixel LEDs <input type="checkbox"/> <i>RunningLights</i> works correctly and runs without errors <input type="checkbox"/> Complete Mission 3 Assignment 	
Standards			
CSTA Standards Grades 9-10	CSTA Standards Grades 11-12	AI4K12 Standards Grades 9-12	
<ul style="list-style-type: none"> 3A-CS-01 3A-CS-02 3A-CS-03 3A-DA-11 3A-AP-15 3A-AP-16 3A-AP-21 	<ul style="list-style-type: none"> 3B-AP-11 3B-AP-15 3B-AP-22 3B-AP-23 		
<p>Student Materials</p> <ul style="list-style-type: none"> Laptop/computer with Chrome browser CodeAIR drone and USB cable CodeAIR Mission 3 Assignment CodeAIR Flying Guide 		<p>Teacher Resources</p> <ul style="list-style-type: none"> CodeAIR Mission 3 Assignment Answers CodeAIR Mission 3 Review Questions CodeAIR Flying Guide 	
Vocabulary			
Pre-flight Checks	Going through a detailed checklist before every flight. The list includes lighting systems, safety devices, control surfaces, engines and navigation sensors.		
Embedded systems programming	Writing code that goes in a tiny microcontroller embedded in an electronic device.		
Sequence	Code that runs one line at a time, in order; sequential.		
Sleep	Controlling the pace of code execution by using a delay timing tool.		



While loop	A statement that tells Python to repeat a block of code indented beneath it as long as the given condition is true.
Condition	An expression that evaluates to True or False (Boolean).
Infinite loop	Repeat a block of code while a condition is always True – doesn't end.
Constants	Named values that don't change during program execution. Constants are usually defined at the top of program code, just below imports.
Scientific pitch notation	A method of specifying musical pitch by combining a musical note name (A-G) and a number identifying the pitch's octave (0-9).
RGB color	Digital colors made up of (RED, GREEN, BLUE) light. The three colors each have a brightness from 0-255 to create many colors. The values of each color are stored in a list or tuple.
Pixel LEDs	Multi-colored LEDs that can be controlled by the CPU; also known as NeoPixels.
Range	A sequence of numbers you can iterate over. When the range() function is used, the iteration starts at the first number (or default 0) and stops one integer before the last number. seq = range(5) will iterate over 0, 1, 2, 3, and 4.
Iteration (iterating)	Repeating, or iterating, through a sequence of some kind. Examples of a sequence are a range of numbers, a range of colors, a list or a tuple.
For loop	A way to perform iteration.
Standard Navigation Lights	An international standard color scheme to indicate the orientation of the craft. Helpful for anti-collision. The lights are solid (not flashing) and positioned as follows: <ul style="list-style-type: none"> • Green for starboard side (right) • Red for port side (left) • White for the backend, or tail

New Python Code

<code>from time import sleep</code>	Import the time library to access built-in timing functions like sleep
<code>leds.set(0, 0)</code>	Turn off an led; use a brightness of 0
<code>leds.set(0, 50)</code> <code>sleep(1)</code> <code>leds.set(0, 0)</code> <code>sleep(1)</code>	Blink an LED for 1 second intervals.
<code>while True:</code>	Infinite loop (instruction ends with a colon (:)) and block underneath is indented)
<code>speaker.beep(frequency, duration)</code> <code>speaker.beep(440, 200)</code>	Play a note (or sound) using CodeAIR's speaker In this example, the frequency is 400 and the duration is 200 ms
<code>D5 = 587</code>	Constant definition
<code>leds.set_status(50)</code>	A single LED positioned near the USB connector. The command needs a single argument for brightness.



<pre>COLOR_LIST = (BLACK, BROWN, RED, ORANGE, YELLOW, GREEN, BLUE, PURPLE, GRAY, WHITE, CYAN, MAGENTA, PINK, LIGHT_GRAY, DARK_GREEN, DARK_BLUE)</pre>	Standard color definitions that are included in the codeair library from the colors module.
<pre>pixels.set(num, color) pixels.set(0, RED)</pre>	Set a pixel LED to a specific color In this example, pixel 0 is set to RED
<pre>pixels.set(0, BLACK)</pre>	Turn off a pixel LED. Here, color names are in ALL CAPS because they are included in the pre-defined COLOR_LIST.
<pre>for n in range(8):</pre>	For loop that starts at 0 and goes up to but not including the ending value. In this example, the iteration would be 0, 1, 2, 3, 4, 5, 6 and 7.
<pre>for color in (RED, GREEN, BLUE): for n in range(8): pixels.set(n, color) sleep(0.05)</pre>	Loop for turning pixels red, then green, then blue.
<pre>pixels.set(TOP_FRONT_LEFT, RED)</pre>	Pixels can be designated with a number or constant for position: BOTTOM_FRONT_LEFT, BOTTOM_FRONT_RIGHT, BOTTOM_REAR_LEFT, BOTTOM_REAR_RIGHT, TOP_FRONT_LEFT, TOP_FRONT_RIGHT, TOP_REAR_RIGHT, BOTTOM_REAR_RIGHT
<pre>pixels.fill(WHITE, brightness=50)</pre>	Turns all 8 pixels WHITE at brightness 50. This code is much shorter than turning on all 8 pixels individually.
<pre>sleep(1.0) pixels.fill(WHITE, brightness=50) sleep(0.02)</pre>	Strobe

Teacher Notes

- The assignment document follows the mission and is a place for guided notes. You can print the document for the students (PDF) or assign it digitally through your LMS (doc).
- If you or your students have trouble running code, follow the CodeAIR Flying Guide. The CodeAIR must be connected and turned on, even if you are not flying the drone.
- Review questions can be used as a class review, made into a Kahoot!, or used to create an exam in your learning management system.
- Extensions and cross-curricular projects are included to enhance the concepts in the mission. You can use the extensions to extend students' programming experience. A remix is not explicitly planned, but you can add one as an option to give students additional learning. A remix is planned after Mission 3.

Extensions

- Use the LEDs and pixel LEDs to display a light show. Add music.
- Discuss abstraction and how it is used in the hardware of CodeAIR.
- Have students do a code review. In the code review, students should select a loop to evaluate and discuss the efficiency, correctness and clarity of the loop.

Cross-Curricular

- **SCIENCE:** Pixel LEDs use red, green and blue lights to make colors. Research how light produces color.
- **MATH:** Use math skills to plan a light show with specific timing: how long to sleep, and how long to display the lights.
- **LANGUAGE ARTS:** Compare and contrast the different types of loops.