	Environmental Analysis Teaching and Research Laboratory	Date: 6/27/2022	Number: X
	Standard Operating Procedure	Title: Mavic 2	
	Approved By: TBD	Revision Date: June 28, 2022	

1. Scope and Application

1.1 This SOP details the step-by-step process of proper usage of the DJI Mavic Pro? drone.

1.2 The application of this SOP are for obtaining image data useful for modeling outdoor spaces.

1.3 The images obtained from the drone are used in Reality Capture, a Photogrammetry software application for Windows. Ultra-realistic 3D models can be created through 100s-1000s of photos.

2. Summary of Method

2.1 This SOP provides instructions to power, control, take images, and transfer images from the DJI Mavic Pro drone.

2.2 This SOP also details how to troubleshoot common issues with the drone.

Contents

3.   Acknowledgements

4.   Definitions

4.1 Term1: is...

5.   Biases and Interferences

5.1 Biases and interferences can come from...

6.   Health and Safety

6.1 Improper usage of the drone may result in personal injury, damage to expensive drone equipment, violation of FAA regulations

Safety and Personnnel Protective Equipment

6.2 Make sure you have been trained...

6.3 Never touch propellers when spinning. Batteries may be hot after use, exercise caution when removing.

7.   Personnel & Training Responsibilities

7.1 Researchers training is required before this the procedures in this method can be used...

7.2 Researchers using this SOP should be trained for the following SOPs:

- SOP01 Laboratory Safety

- SOP02 Field Safety

8.   Required Materials and Apparati

8.1 Item 1 w/catalog number!

8.2 Item 2

9.   Reagents and Standards

10.   Estimated Time

10.1 This procedure requires roughly 1-2 hours. 10-20 minutes for setup, 10-20 minutes for drone flying. Flying at lower elevations takes more time to complete flight plan. Repeat 2-3x if multiple flight elevations are required. Charging the drone batteries and remote takes x time.

11.   Pre-flight Setup

11.1 The following sections (12. Preparing Drone Camera - 16. Calibrating Sensors) are a summary of page 6-7 in the Mavic Pro User Manual (step-by-step pre-flight setup of the drone).

11.2 Pages 8-9 in the Manual have aircraft and remote controller diagrams that detail the anatomy of the drone and functionality of the remote control buttons. See pages for further assistance if needed and helpful infographics.

11.3 Before flight, ensure that the following have been completed in order:

- batteries charged (remote controller, drone, phone w/ DJI app downloaded)

- micro SD card has enough space (> 2 GB)

- remove camera cover, attach propellers

- turn on drone, connect remote

- calibrate drone

- follow steps on DJI app for instructions

11.4 If issues arise, the DJI app and the description of the flight status indicator (colored LEDs on drone) on pg. 12 of manual are additional resources.

12.   Preparing Drone Camera

12.1 Remove plastic camera cover (aka "gimbal cover") and gimbal clamp from camera.

13.   Attaching Propellers

13.1 Unfold the two front arms, then the two rear arms.

13.2 Two propellers are marked (have a white ring on the middle joint of the propeller blades) while the other two propellers are unmarked (no white ring).

13.3 On the drone, look at the four motor joints. Two joints with a white ring must have marked propellers attached. The other two joints use unmarked propellers.

13.4 Insert and turn the propellors (clockwise for white ring/marked, counter-clockwise for unmarked). Check if properly fastened by top of propeller above motor joint and wiggling. See pg 27 in Mavic Pro Manual for further assistance if needed.

14. On/Off Power Drone

14.1 Press power button 1x, then a 2nd time holding for 2 seconds. Power button is the circle button located in the middle of the dorsal side of the drone

14.2 Perimeter of the power button should emit green light with four subsections. If full battery, whole perimeter of button should be green. The number of subsections lit indicates battery level.

15. Preparing Remote Controller

15.1 Unfold the mobile device clamps at bottom and antennas at top of controller. Insert the mobile device into the clamp. Attach USB connector to phone.

15.2 pgs 8-9 in Mavic Pro User Manual detail remote control button functionality. pg 40 for troubleshooting connecting remote control to drone.

16. Calibrating Sensors

16.1 Cameras are subject to impact in flight and this can affect the sensors on the drone. Calibration is to fix these sensor issues.

16.2 Follow the instructions on the DJI app. This involves horizontally rotating then vertically rotating the drone 360°. Repeat each rotation 2x. See pg. 55 on manual for infographics if needed.

17. Set Home

17.1 The Return to Home (RTH) button is located on the top left corner of the remote controller. It should have a circle and an H on it.

18. Battery

18.1 1 battery $\approx$ 20 minute flight plus the post-flight download of captured images.

18.2 Ensure multiple batteries (3 total) are charged. It is recommended after each flight to exchange batteries. Avoid draining the battery near/below 20% .

18.3 To exchange batteries, turn off drone, press the side buttons of the battery and remove.

19. Image Collection

19.1 Make sure there is an SD card with enough space (e.g. > 2 GB).

19.2 To remove SD card, turn the drone over, look for a tiny hatch. Open the hatch and stick the SD card inside. Micro USB Port location is located on pg. 8, number 12 on aircraft diagram in the manual.

20. Procedure- Flight Path

20.1 Prepare ...

21. Procedure- Manual Flying

22. Reality Capture Model Generation

23. QC/QA Criteria

24. Trouble Shooting

25. References

25.1 DJI Mavic Pro Manual. version Number??