# AERIAL PHOTO PAYLOAD A02

USER MANUAL

Revision: 1.0

2023

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# RECORD OF REVISION

| Revision No. | Content | Date |
|---|---|---|
| 1.0 | First issue | 2023-05-25 |
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# TABLE OF FIGURES



# LIST OF TABLES

# 1. SAFETY

The information that follows, together with local site regulations, should be studied by personnel concerned with the operation or maintenance of the equipment, to ensure awareness of potential hazards.

Switch off supplies before removing covers or disconnecting any RF cables, and before inspecting damaged cables or antennas.

Avoid standing in front of high-gain antennas (such as a dish) and never look into the open end of a waveguide or cable where strong RF power may be present.

Users are strongly recommended to return any equipment that requires RF servicing to Threod Systems OÜ.

**⚠ CAUTION**

CAUTION: This system contains MOS devices. Electro-Static Discharge (ESD) precautions should be employed to prevent accidental damage.

# 2. WARNINGS, CAUTIONS, AND NOTES

UAVs of any kind are dangerous and can cause serious injury. Please read, understand, and follow the cautions and instructions.

Throughout the manual warnings and cautions are used to highlight various important procedures. They are defined as:

**⚠ WARNING**

**AN OPERATING PROCEDURE, INSPECTION, REPAIR, OR MAINTENANCE PRACTICE, WHICH IF NOT CORRECTLY FOLLOWED, COULD RESULT IN PERSONAL INJURY, OR LOSS OF LIFE.**

**CAUTION**

AN OPERATING PROCEDURE, INSPECTION, REPAIR, OR MAINTENANCE PRACTICE, WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN DAMAGE OR DESTRUCTION OF EQUIPMENT.

**NOTICE**

An operating procedure, inspection, repair or maintenance condition, etc., which is deemed essential to highlight.

# 3. AERIAL PHOTO PAYLOAD (APP)

## 3.1 APP SET


Figure 1 APP set

| NR | DESCRIPTION |
|---|---|
| 1. | Camera |
| 2. | Base module |
| 3. | Rugged case |

# 3.2 APP PARTS

## 3.2.1 Camera Canon EOS M200


Figure 2 Camera

| | |
|---|---|
| Weight (full) | 1,1 kg (with base module) * |
| Dimension | L: 115 mm W:120 mm H: 135 mm* |
| Temp range | 0°C to 40°C |
| Sensor Type | CMOS* |
| Resolution | 6000 x 4000* |
| Effective Pixels | 24 megapixels* |
| Sensor Size | APS-C (22,3 x 14,9 mm) |
| Lens type | Manual Zoom lens* |
| Focal Length | 15-45 mm* |
| Lens Aperture | F3.5-6.3* |

*- standard camera and lens configuration

For power, the camera is using dummy battery module.

**NOTICE**

Be cautious with the camera lens, when the lens cover is removed. Any dust or fingerprints will affect picture quality.

**CAUTION**

Do not remove Lens, if not needed. By removing the lens you will expose the camera sensor.

## 3.2.2 Base Module

The base module connects the camera to the aircraft and is stabilized with a gyroscope. Communication between the camera and the base module is achieved via WIFI. The base module provides power for the camera, through the dummy battery module.

The WIFI frequency range is 2401-2495 MHz.

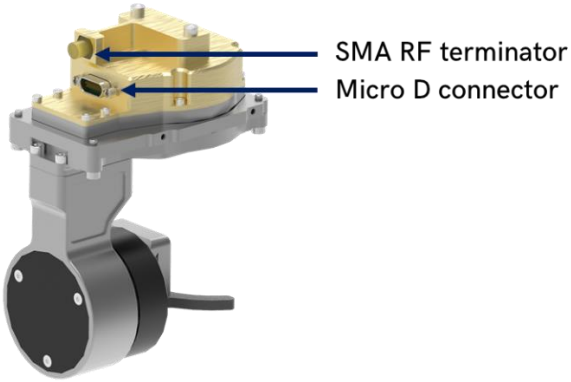



Figure 3 Base module

**NOTICE**

After powering on the aircraft, wait for 1 minute for the Base module to boot up before powering on the APP.

When using APP, change frequency to avoid base module WIFI interference.

## 3.2.3 Rugged Case

| | |
|---|---|
| Weight (full) | 2,27 kg |
| Dimension (outer) | L: 220 mm W:160 mm H: 145 mm |
| Temp range | -30°C to 90°C |
| IP code | IP67 |

# 4. INSTALLATION

## 4.1 ASSEMBLY

Make sure that the aircraft is powered off. If a different payload is attached, then remove it from the aircraft.

Before attaching the APP, connect first the SMA connector (tighten with SMA torq wrench) and then the Micro D connector (1/16" Hex).

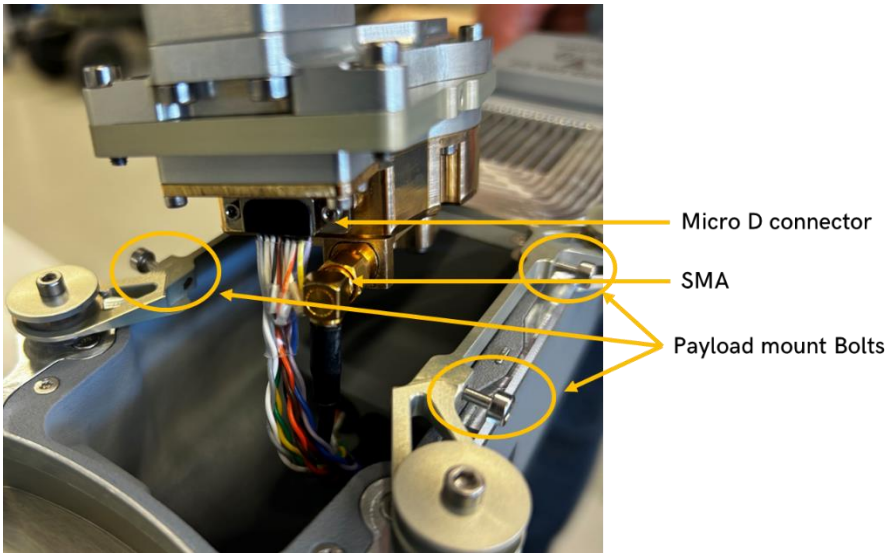



Figure 4 Payload connectors

Attach the APP to the payload mount and tighten 4 bolts (2.5 mm HEX).

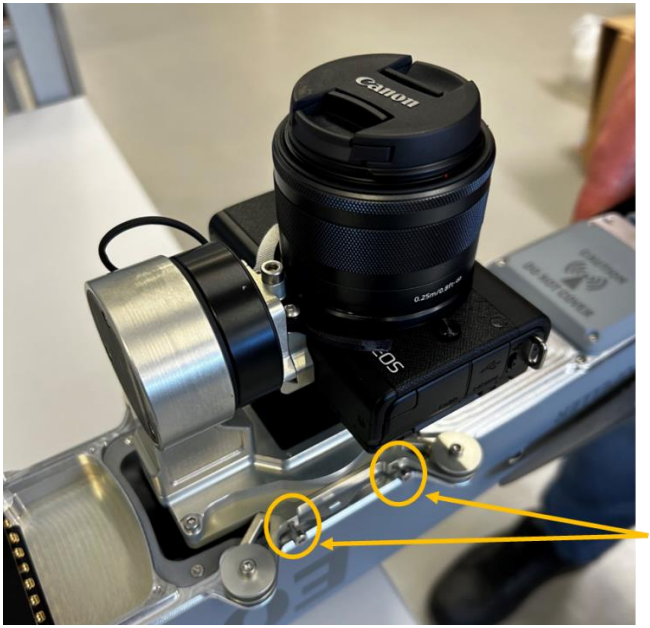



Figure 5 Attached APP

# 4.2 DISASSEMBLY

Cover the camera lens and disassemble the aircraft. Untighten 4 bolts (2.5 mm HEX).

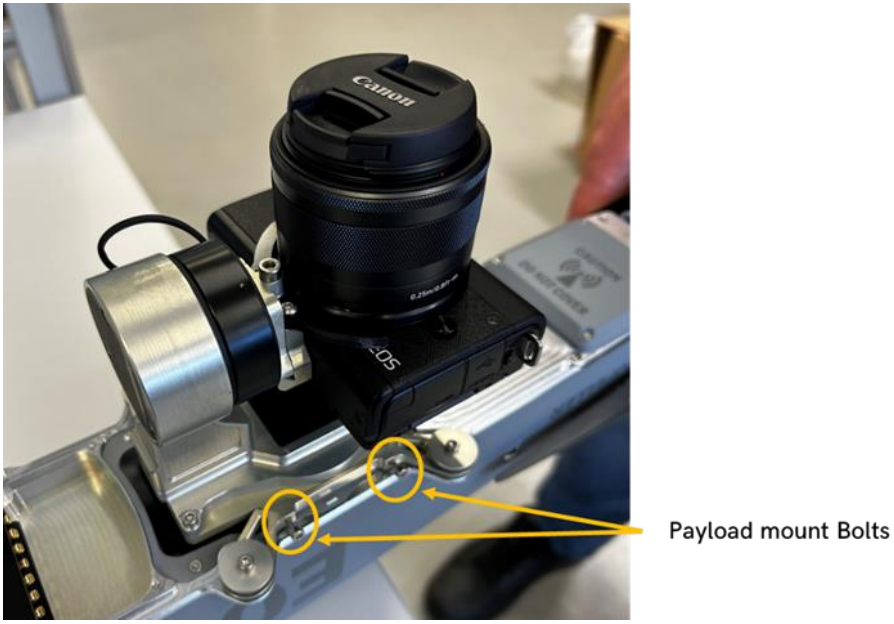



Figure 6 APP disassembly from payload mount

Disconnect the Micro D connector (1/16" Hex) first and then the SMA connector with the SMA torque wrench.

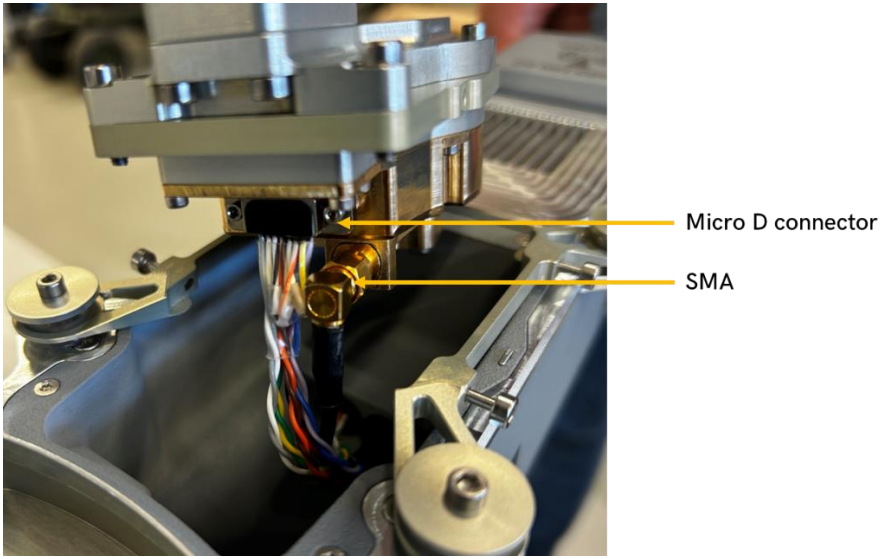



Figure 7 APP connectors disconnection

# 5. USAGE

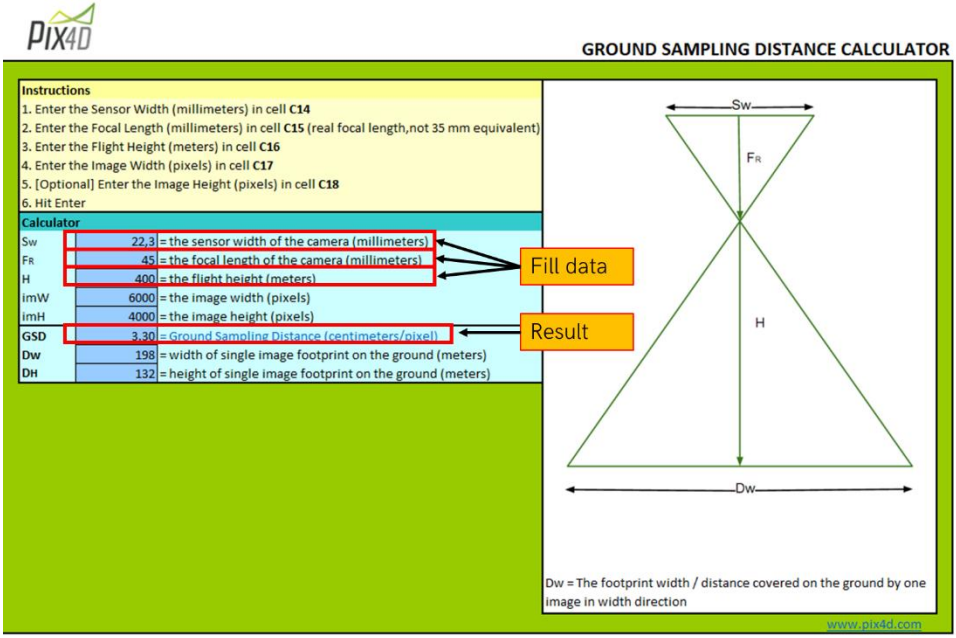
**Table 1 Mapping mission checklist**

| | Action | Check |
|---|---|---|
| 1 | Calculate the focal length | ☐ |
| 2 | Plan mission (mapping mission must have side wind) | ☐ |
| 3 | Power on aircraft | ☐ |
| 4 | Change aircraft and GDT frequency | ☐ |
| 5 | After connection with the aircraft, wait for 1 minute and power ON the Payload | ☐ |
| 6 | REFRESH the camera status | ☐ |
| 7 | Unlock the lens from the transport position | ☐ |
| 8 | Set the focal length and fix it | ☐ |
| 9 | Make sure that lens does not touch the ground, and remove the lens cover | ☐ |
| 10 | REFRESH camera status and set the Shutter speed | ☐ |
| 11 | Set payload in STOW position and take TEST SHOOT on ground | ☐ |
| 12 | Photo payload ready for take-off | ☐ |
| 13 | Take a TEST SHOOT before the mission at mission altitude | ☐ |
| 14 | START SHOOTING if the test shoot was sharp | ☐ |
| 15 | After finishing the mission in the target area, STOP SHOOTING | ☐ |
| 16 | Make sure that gimbal is in STOW before landing | ☐ |
| 17 | After landing download the last log file | ☐ |
| 18 | Copy Pictures from the payload memory card | ☐ |

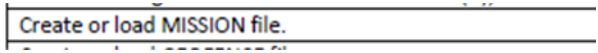
Steps are followed using Table 1 Mapping mission checklist and combined with the Flight Logbook.

1. Calculate the focal length

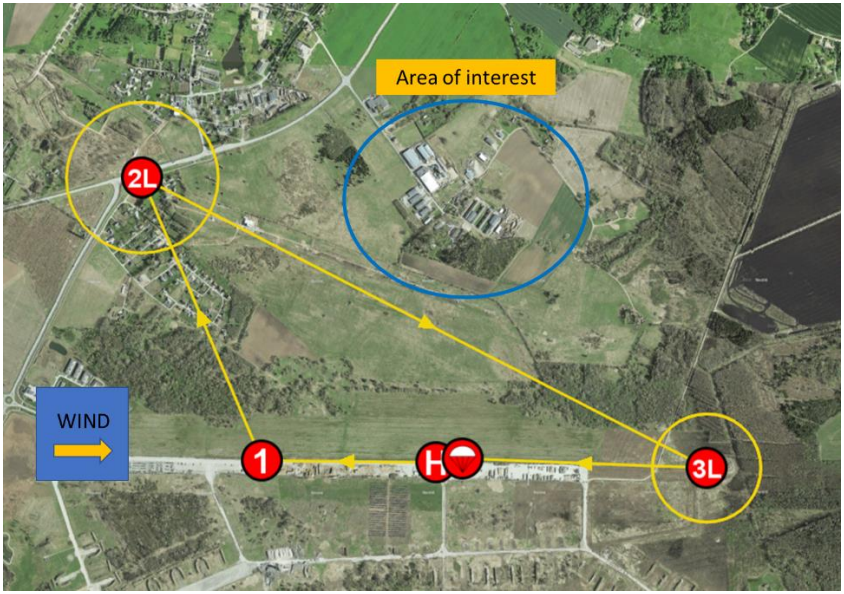
https://support.pix4d.com/hc/en-us/articles/202560249-TOOLS-GSD-calculator



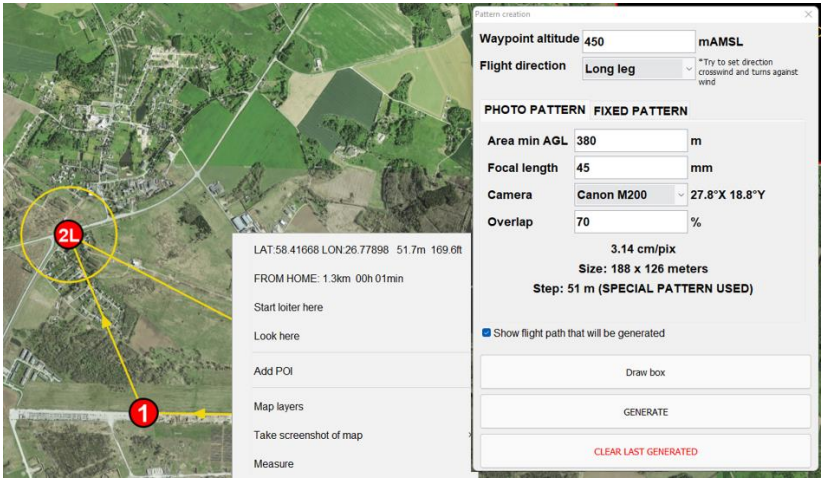

2. Plan Mission




Plan/draw mission plan. 2nd waypoint is loiter up to gain altitude (for this example 400 mAGL). Pay attention to the wind direction.




With right-click on the map, you can see the ground altitude above sea level (In this example it is 51.7 mAMSL). Add this to the mapping mission Waypoint altitude (~450 mAMSL).

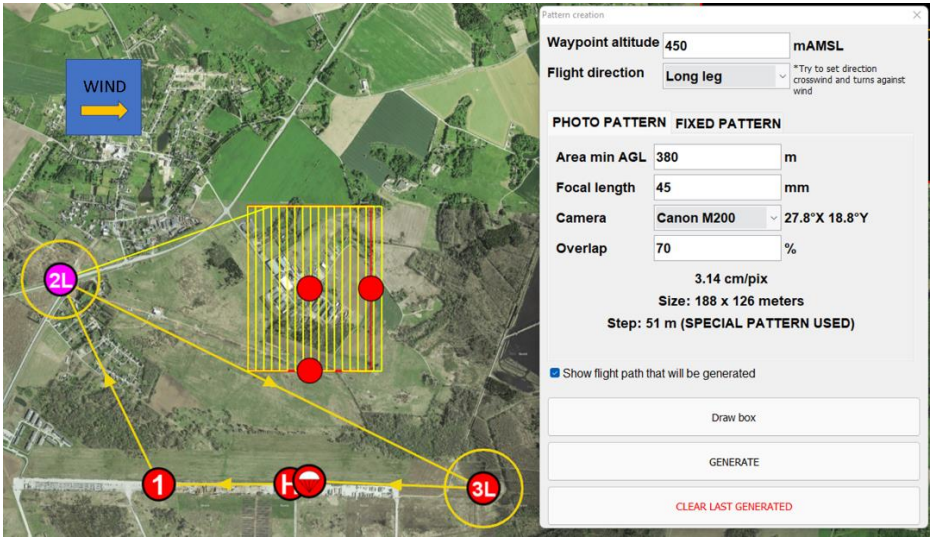


The minimum AGL of the area is defined by the highest elevation located in the interest area (in this example it is ~70 mAMSL). The area minimum AGL is necessary for mapping mission to ensure overlap.

Set overlap according to the following:

- 60% overlap in general cases.
- 80% overlap for agriculture fields and 85% overlap for forests and dense vegetation.

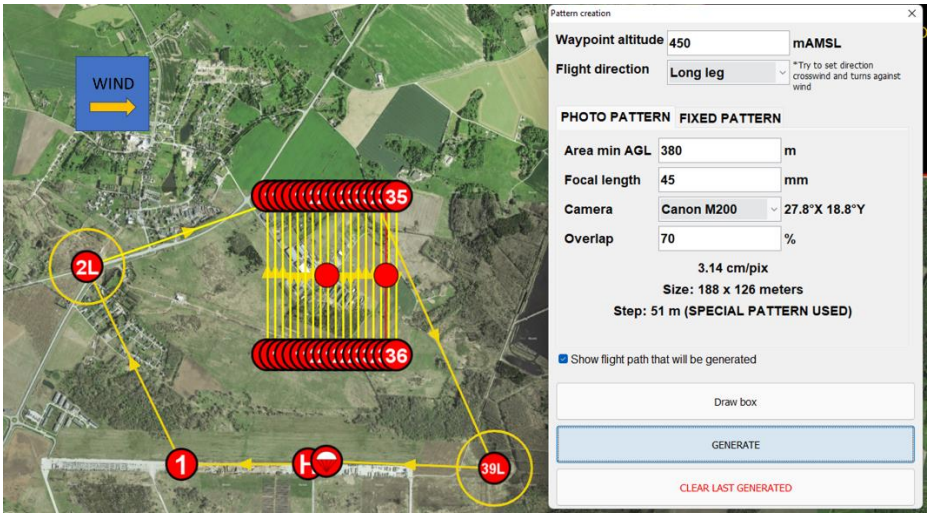
Click on the 2nd waypoint to continue the mission planning by drawing a box over the area of interest. To adjust the size and angle for the mapping mission, click on the red dots and edit. For the mission, crosswind is preferred as it provides equal ground speed between waypoints. Be prepared to adjust the mission profile over area of interest, based on weather conditions.




Next, click GENERATE, which will generate the mapping mission waypoints.

If GENERATE was clicked accidentally, click it once more. This will generate a second mapping mission over the previous. With CLEAR LAST GENERATED, the last generated mapping mission can be deleted.

The mapping mission is now complete.




3. Power on the UAV

| |
|---|
| Cover pitot & POWER ON the UAV. Check gimbal LAUNCH POSITION. |

4. Create connection, change UAV and GDT frequency.

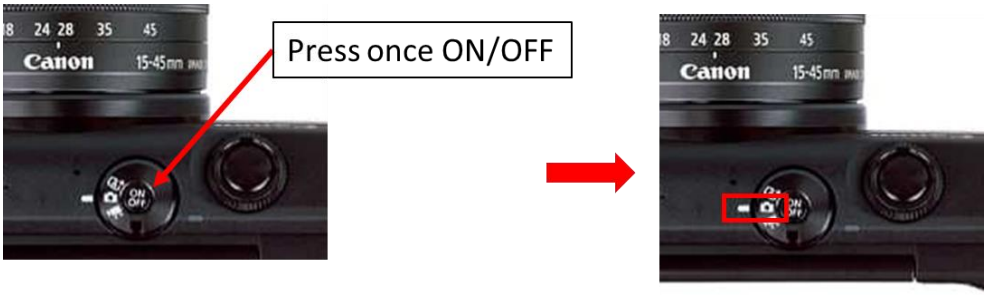
It is necessary to change the frequency to higher or lower from 2401-2495 MHz to prevent interference with the WIFI signal.

| |
|---|
| Create connection. |

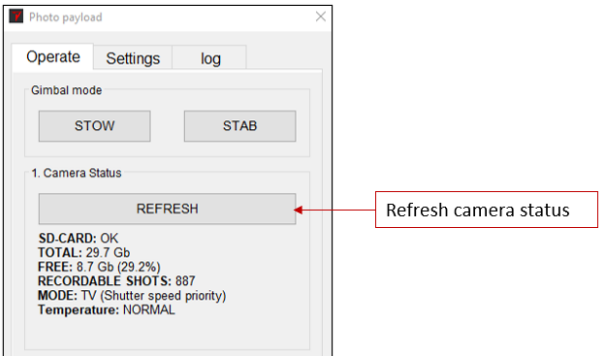
5. Power on the Payload and select TV mode.

Before powering on the APP, wait for 1 minute for Base Module to boot up after powering the aircraft.

| |
|---|
| Payload test (STAB mode, both sensors, lenses are clean, RESET DRIFT). |



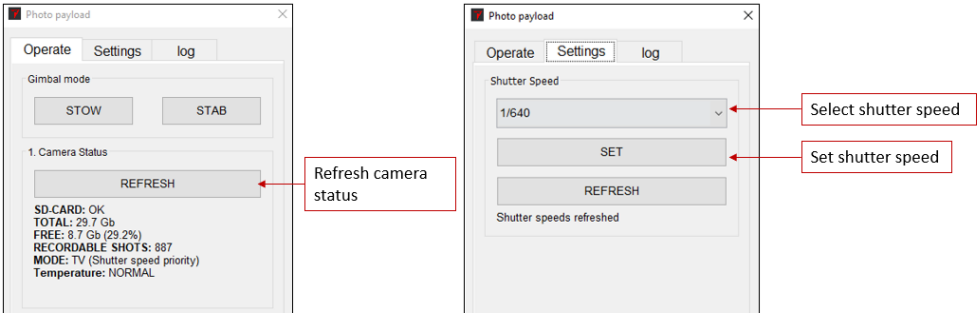

6. Check the payload status.



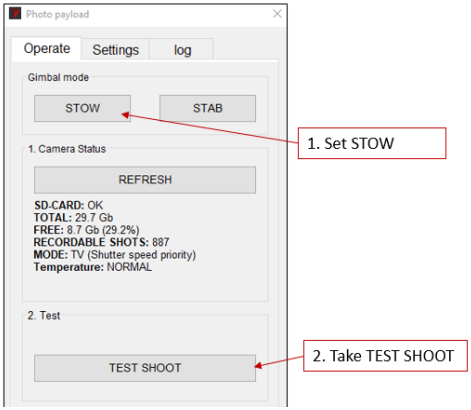

7. Unlock the lens from its transport position.
8. Set the focal length and fix it (for this example focal length was 45)


9. Make sure that lens does not touch the ground and remove the lens cover.
10. REFRESH the camera status and set the Shutter speed.

With low light conditions, use a longer Shutter speed.




11. Set Payload in the STOW position and take a TEST SHOOT on the ground.

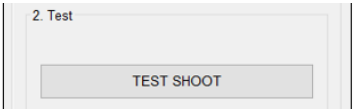


12. The payload is ready for take-off.

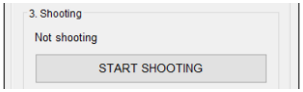
Make sure take-off area is clear for take-off.

13. Take another TEST SHOOT before the mission at the mission altitude.

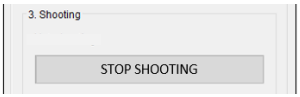
After reaching the mission altitude (in this example 400 mAGL), take a test shoot (it may be necessary to hold the aircraft in a MANUAL LOITER).




14. Start SHOOTING if the TEST SHOOT was sharp.




15. Stop SHOOTING, when the mission is finished.

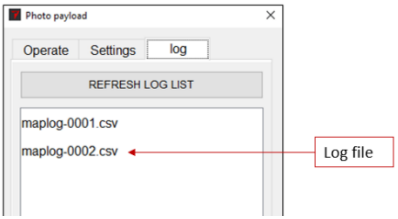



16. Ensure that the gimbal is in the STOW position before landing.

Confirm site is clear for landing.

17. After landing, download the last LOG file.

After landing, make sure UAV is DISARMED.




18. Copy the pictures from the payload memory card.

Retrieve videos & logs.

# 6. MAINTENANCE

| | Each use | Monthly | Yearly |
|---|---|---|---|
| Check contacts | x | x | x |
| Clean contacts with contact cleaner | | x | x |
| Check lens | x | x | x |

## 6.1 CHECK AND CLEAN CONTACTS

Before and after each use of the equipment, the user should ensure that all the contacts are clean and that there is no moisture or particles inside them. In case there is any dirt in the connectors, the user should clean the connectors thoroughly with the supplied contact cleaner.

The user should also clean all the contacts and equipment generally before storing it for longer periods and periodically during normal operations (once a month).

## 6.2 CHECK LENS

Before and after each use of the equipment, the user should ensure that the lens is clean and without scratches. In case there is any dirt or fingerprints on the lens, use the optics cleaning tools to clean the lens.

# 7. NOTES