



FLYABILITY
ELIOS 2
USER MANUAL

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1 Before starting

This manual refers to the following documents, which the user must read and understand fully:

- ELIOS 2 Original Instructions – certification compliance, safety guidelines and checklists
- ELIOS 2 Smart Battery Guidelines – safety guidelines

2 ELIOS 2 system description

The Flyability ELIOS 2 was developed explicitly as a flying platform capable of entering confined and cluttered environments.

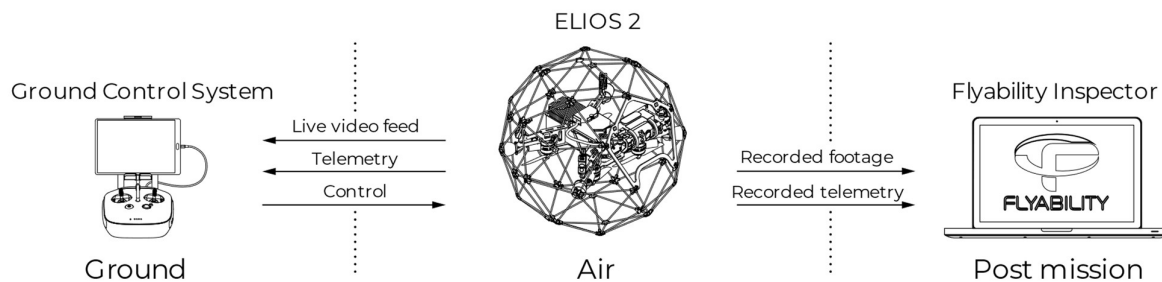


Figure 2.1: System overview

The operator will enjoy full control of Elios through the Ground Control System (GCS). A tablet allows the operator to monitor a live video feed transmitted by ELIOS 2. The Flyability Inspector post-mission analysis software provides a simple solution to visualize the recorded video, the thermal video, and the aircraft telemetry.

2.1 ELIOS 2 overview

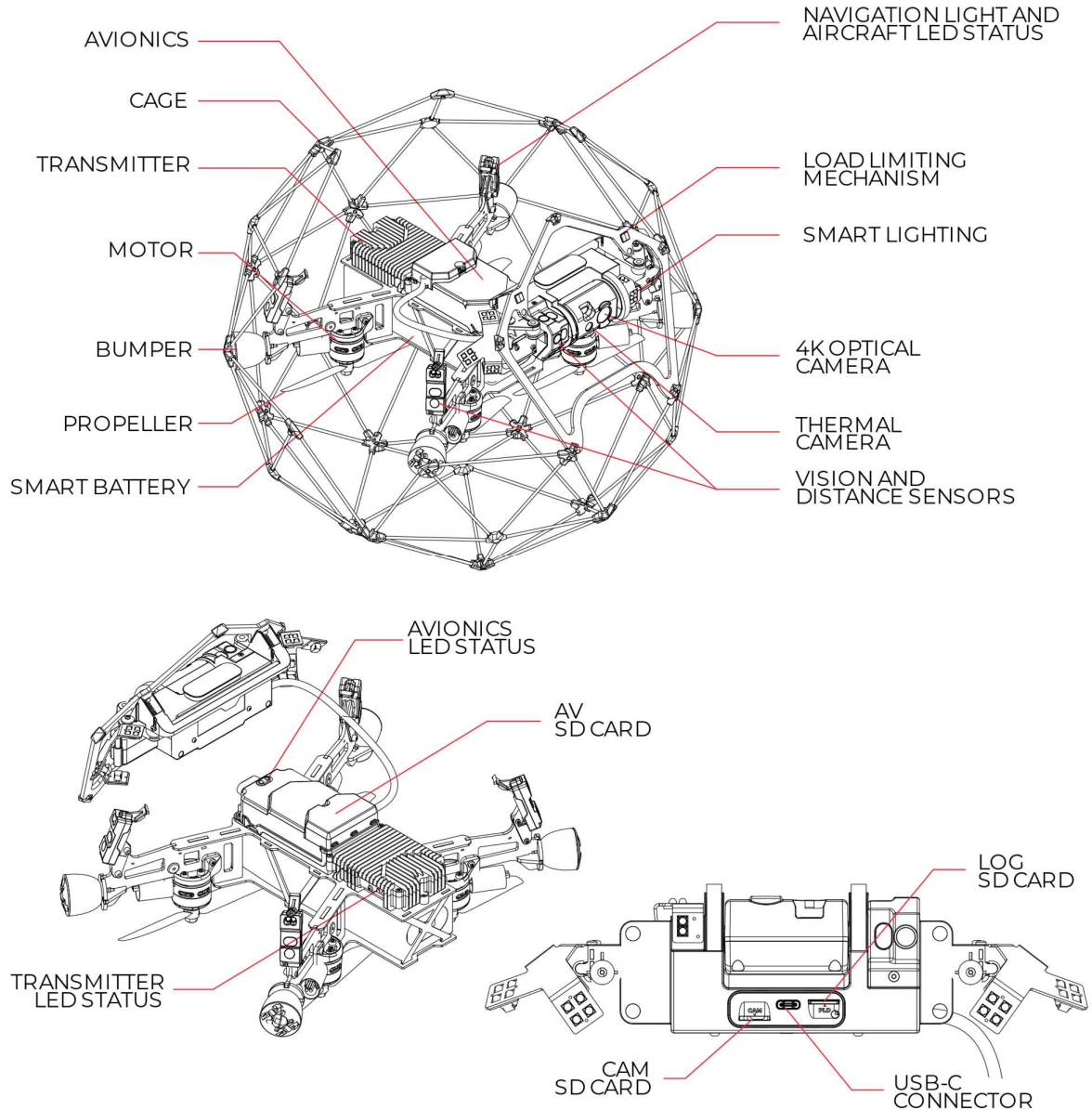


Figure 2.2: Elios overview

PROTECTIVE CAGE

A protective cage surrounds ELIOS 2. The cage is preventing collisions between the propellers and humans, assets, or other obstacles.

LOAD LIMITING MECHANISM

The Load Limiting Mechanism (LLM) is a spring-loaded frame passively pivoting whenever the camera collides into something. It enhances the ruggedness of ELIOS 2 greatly and protect its payload.

BUMPER

Designed to absorb energy, the Bumper links the inner frame to the cage.

MOTORS AND PROPELLERS

Four propellers create the thrust required to fly and to maneuver the aircraft. The motors have fast reversing capability allowing the aircraft to sustain external perturbations. Two motors spin clockwise, and the two others spin counter-clockwise

AVIONICS

The avionics are the brain of the ELIOS 2. On top of its flight control role, the Avionics coordinate all ELIOS 2 sub-systems.

TRANSMITTER

The transmitter offers a reliable wireless link between the GCS and ELIOS 2. It handles the video transmission, the pilot controls, and the telemetry between the aircraft and the ground control system.

4K OPTICAL CAMERA

ELIOS 2 embeds a 4K optical camera. Its 4K (2160p 30fps), FHD (1080p 30fps) footage and 12.3MP still images are recorded onto the CAM SD card. The camera transmits a FHD (1080p) live video feed to the GCS.

The camera is mounted on a servo motor, allowing it to tilt up or down.



DO NOT TILT THE CAMERA BY HAND, AS THIS MAY DAMAGE THE SERVO MOTOR.

The full 4K optical camera is fully automated. The user can compensate the Exposure Value through the EV settings to get a brighter or darker image at will.

The 4K optical camera allows to record video in two different resolutions:

- 4K UHD: 3840 x 2160 at 30 fps, data-rate 600MB/min
- FHD 1080p: 1920 x 1080 at 30 fps, data-rate: 100MB/min

The video recording automatically starts when the drone is armed and stops when the drone is disarmed. Provided that there is enough available space on the CAM SD card.

The 4K optical camera allows the user to take 12MP 4000x3000 still images with the POI button. It is important to note that max 35 images can be taken during single flight when in 4K UHD mode. There is no limitation when in FHD mode

The resolution of the still images is always 12MP, regardless of the video recording mode.

THERMAL CAMERA

The FLIR LEPTON thermal camera is coaxially mounted next to the video camera and can also be tilted up and down. The thermal camera recording automatically starts when the drone is armed and stops when the drone is disarmed. The footage is saved in the LOG SD card and can be reviewed using Flyability Inspector. The pilot can also display the live video feed from the thermal camera during flight.

CAM SD CARD

The CAM SD card records the video footage and still images from the 4K optical camera while Elios is flying.

Please only use the provided SD card, as this has been tested to ensure it meets writing speed requirements and will ensure the proper recording of the inspection footage.

Required file system: exFAT

Recommended capacity: 64GB or 128GB

LOG SD CARD

The LOG SD card records the thermal video footage as well as the aircraft's telemetry data. The telemetry information contains parameters such as camera pitch angle and drone altitude, and can be reviewed using the Flyability Inspector software.

Please only use the provided SD card, as this has been tested to ensure it meets writing speed requirements. Note that the drone is not able to fly without a LOG SD card.

Required file system: FAT32

Recommended capacity: max 32GB

AV SD CARD

The AV SD card all the aircraft's telemetry data and internal states. This SD card acts as a black-box and can be used by Flyability support and R&D team to diagnose any issue or incident with the ELIOS 2 system. It is also through the AV SD card that the ELIOS 2 system upgrades its firmware. Please only use the provided SD card, as this has been tested to ensure it meets writing speed requirements.

Required file system: FAT32

Recommended capacity: max 32GB

USB-C CONNECTOR

To ease the access of the inspection footage recorded on the aircraft, ELIOS 2 embeds a USB-C port allowing to read and write the content of the CAM SD card as well as the LOG SD card.

SMART BATTERY

A fast swappable Smart LiPo battery powers the aircraft, providing up to 10 minutes of flight time.

VISION AND DISTANCE SENSORS

To help stabilize the drone, ELIOS has 7 pairs of Vision and distance sensors.

VISION SENSORS

These are specialized cameras which sense the velocity of the aircraft with respect to surrounding objects, the vision sensors are a crucial element to ensure the stability of ELIOS 2

DISTANCE SENSOR

By measuring the distance to nearby objects, these sensor further stabilize the drone. They are also used to make 2D measurements on the camera footage, and for the Distance Lock flight mode

SMART ONBOARD LIGHTING

ELIOS 2 has a smart lighting system composed of 9 LED panels. The panels can be controlled independently to offer the best lighting to the inspection footage. The intensity of each panel is adjusted depending on the pitch of the Camera head to ensure optimal lighting, while saving battery capacity and flight time.

NAVIGATION LIGHT AND AIRCRAFT STATUS LED

To help the pilot during Line of Sight (LOS) operations, while airborne, the ELIOS 2 has red and green Navigation lights to help improve orientation awareness. The Red LED is located on the left, and the Green LED on the right side of the aircraft.

In some cases these lights also provide additional information on the Aircraft status.

AVIONICS LED STATUS

Gives information about the status of the avionics.

TRANSMITTER LED STATUS

Gives information about the status of the transmitter.

2.2 Ground Control System

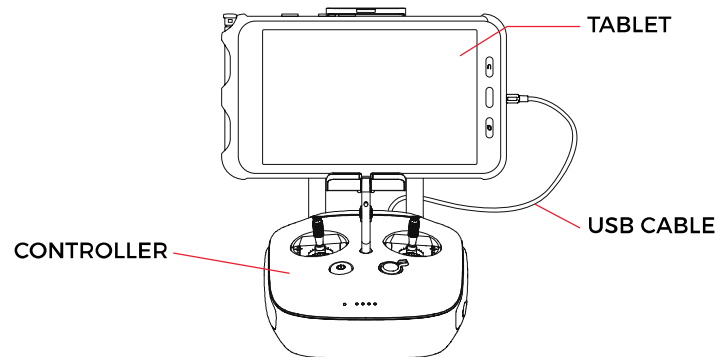


Figure 2.3: GCS overview

2.2.1 Tablet

The tablet provides a visual interface with the Aircraft and controller. It displays the live video feed transmitted by Elios, and important flight parameters. The Samsung Galaxy Tab Active2 Wi-Fi (T390) tablet with the pre-installed cockpit app comes standard with every ELIOS 2 system.

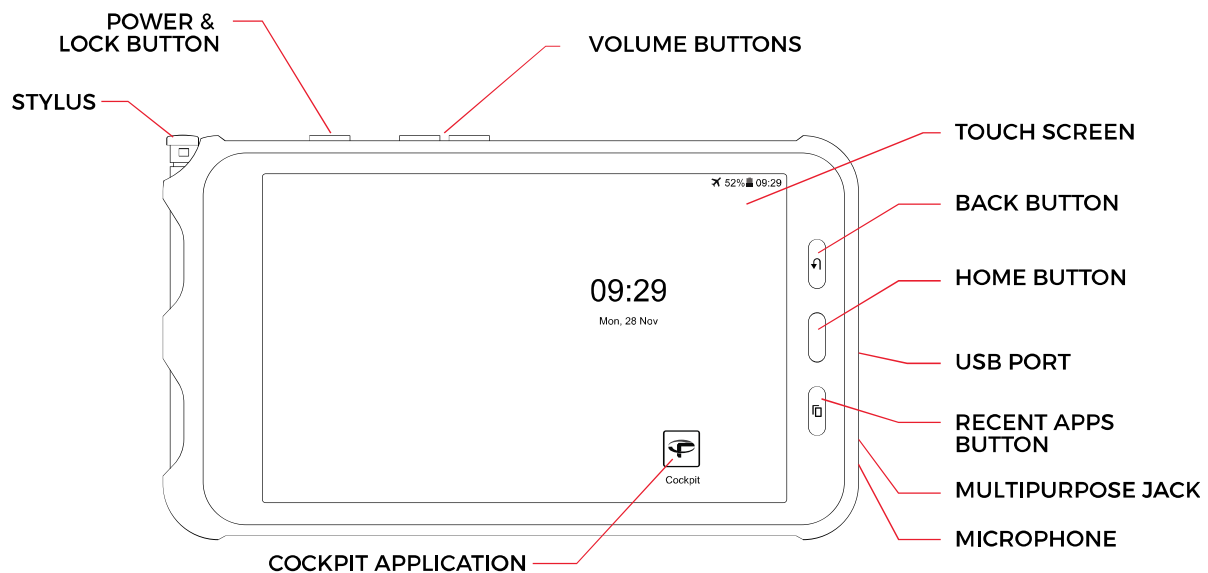


Figure 2.4: Tablet overview

POWER & LOCK BUTTON

Long press powers on/off the tablet, Short press lock the screen

HOME BUTTON

Press to return to the main menu

BACK BUTTON

Press to cancel the action or go back to the previous step

RECENT APP BUTTON

Press to display recently opened apps

TOUCH SCREEN

Display information and allow the user to interact with the applications

STYLUS

Allows precise operation on the touchscreen. Useful while wearing gloves.

USB PORT

Used as a communication port with the controller, and to recharge the tablet's battery

MULTIPURPOSE JACK

All the user to connect a headset to get better audio or add a microphone.

MICROPHONE

Records the surrounding sounds, such as the voice of the inspector for reporting.

COCKPIT APPLICATION

This app is developed by Flyability and functions as an interface with the aircraft. It displays the video stream from the aircraft, as well as essential flight parameters and settings. For a complete overview of its functions, please refer to the Flyability Cockpit User Manual.

2.2.2 Controller

The controller gives the pilot full control of the aircraft. It is also used to change the camera and lighting settings.

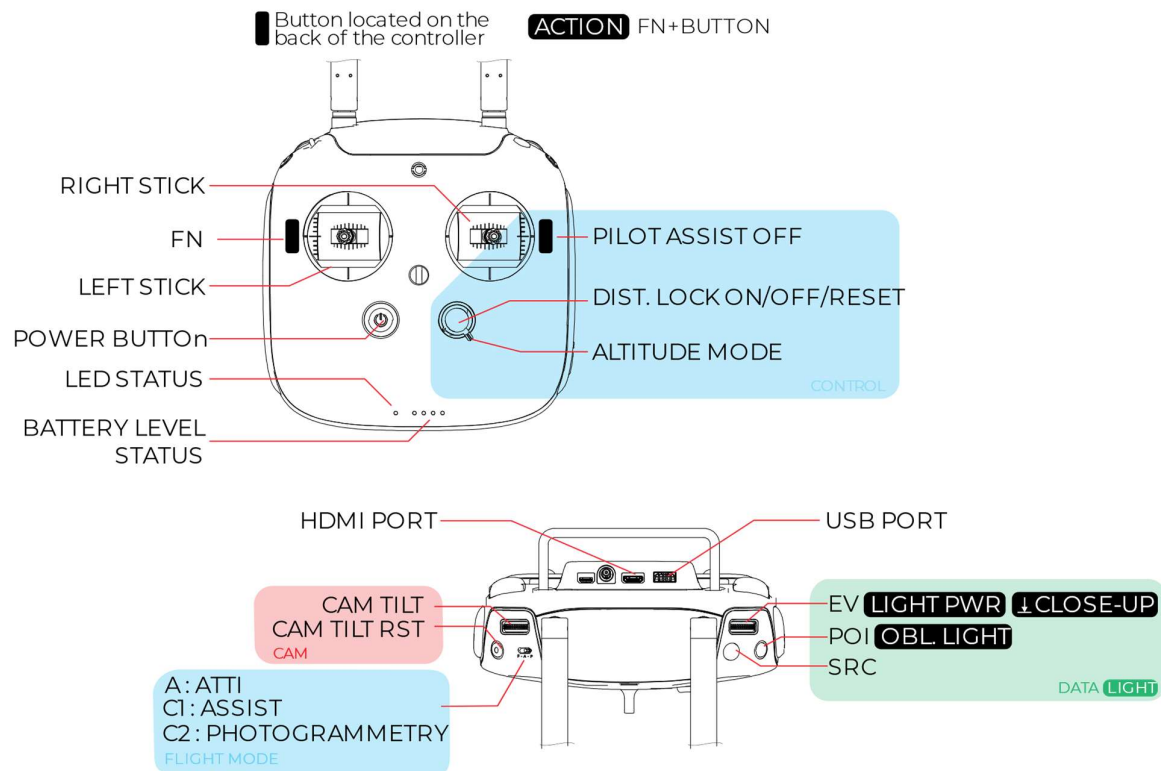


Figure 2.5: Pilot controller overview

The controller is set to Mode 2 by default consult the Cockpit App manual for information on how to switch to other stick mapping mode.

LEFT STICK

In mode 2 (default) controls the aircraft altitude and yaw.

RIGHT STICK

In mode 2 (default) controls the aircraft horizontal motion (forward/backward, left/right).

The more you push a control stick away from its center, the faster the aircraft will follow the command. Give gentle and measured inputs to avoid any jerky and uncontrollable behavior changes. While flying, always keep your fingers on both control sticks to improve the reaction time and feeling for the controls.

POWER BUTTON

Turns the Controller on/off and displays the battery level of the controller. Tap once to view the battery level, tap again, and hold to turn on or off.

STATUS INDICATOR

Indicates the connection status between the controller and Elios:

- Solid red: Controller is on, set as Master but not connected to the aircraft
- Blinks blue: Controller is attempting to bind to the aircraft
- Solid green: Controller is set as Master and connected to the aircraft

- Solid purple: Controller is on, set as Slave, but not connected to the aircraft
- Solid cyan: Controller is set as Slave and connected to the aircraft
- Blinks red: Error. Use DJI GO ("before P4") for further troubleshooting.



BATTERY LEVEL INDICATOR

Displays the controller's battery level. Each LED corresponds to a 25% remaining charge.

DISTANCE LOCK

- Short press: activates the distance lock mode. If a distance has been previously set and is within $\pm 500\text{mm}$ from the current front distance, the aircraft will use this value. If not, the aircraft will use the current front distance value.
- Long press: activates the distance lock mode and resets the distance value to the current front distance.
- The set lock distance can be increased or decreased with the "forward/backward" control stick.

ALTITUDE MODE

Up: **MANUAL THRUST CONTROL** mode, gives direct control over the thrust

Down: **ALTITUDE CONTROL** mode, the altitude is automatically maintained.

An onboard pressure sensor measures the altitude of the drone. In some cases, the pressure in an environment will not be stable, and ELIOS 2 will not be able to maintain a constant altitude. To have better control, the pilot can disable the Automatic Altitude Control mode to have direct control on the motors' thrust, called Manual Thrust Control. In this case, instead of controlling the height, the up/down stick will regulate the thrust power. Operating in Manual Thrust Control mode is not covered by the warranty.

CAM TILT

Controls the tilt of the camera:

- Clockwise, the camera looks upward.
- Counterclockwise, the camera looks downward.

CAM TILT RST

Horizontally levels the camera when pressed

FN BUTTON

Press and hold this button to use secondary functions of other buttons

EV | LIGHTING PWR | FRT LIGHT WHEEL

Wheel:

- Default: scrolling sets the EV of the camera, pressing the wheel resets EV to 0
- While the FN button is pressed the wheel sets the onboard lighting intensity

- While the FN button is pressed, pressing on the wheel turns on automatic or off the Close up panel LEDs

FLIGHT MODE SWITCH

This 3 position switch selects the flight mode of the drone.

POI BUTTON

Press to take a 12MP still image. This will also create a Point Of Interest which can be reviewed after the flight in the Flyability Inspector software.

SRC BUTTON

Switches the video feed between the 4K optical camera and Thermal camera. Both cameras will continue to record continuously, regardless of the feed setting.

PILOT ASSIST OFF

When pressed, aircraft disables the Vision and distance sensors. In this state, the ELIOS 2 is stabilized only by the IMUs on board accelerometers and gyroscopes.

USB PORT

Connection to the provided tablet

HDMI PORT

Offers the possibility to connect an external screen to the GCS

POWER PORT

Connect to the controller charger to charge the internal battery of the controller.

2.3 Camera operator GCS (option)

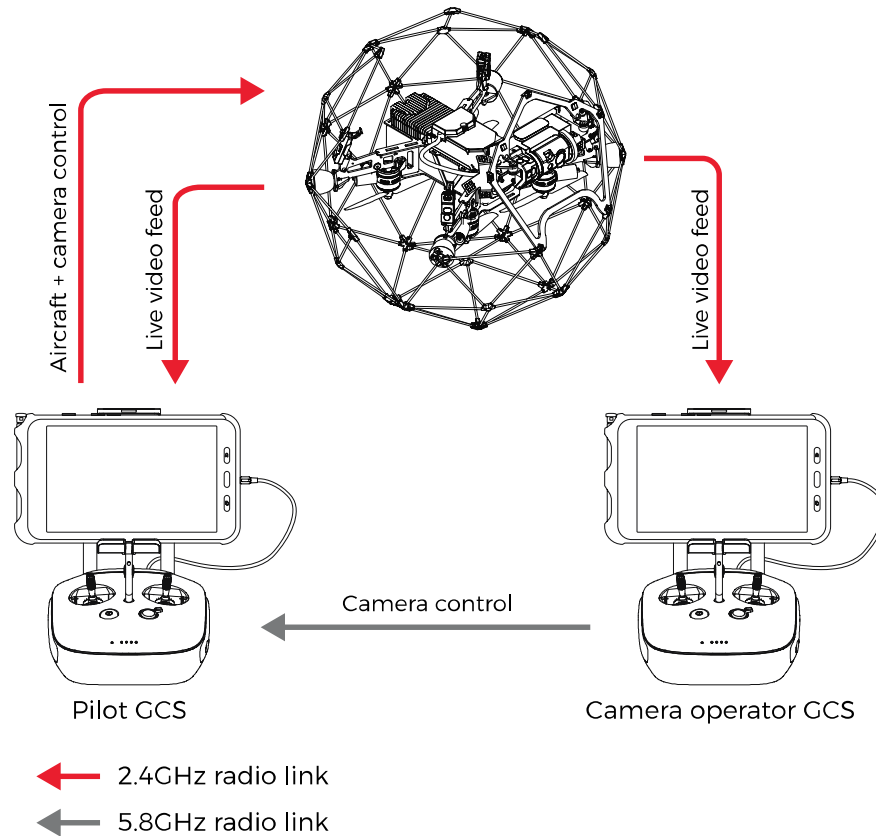


Figure 2.6: Camera operator overview

A camera operator can assist the pilot to act as a copilot relieving the pilot from all other tasks than piloting. In dual GCS mode, the pilot GCS controls the movement of the aircraft while the camera operator controls the camera settings, pitch angle, and lighting. At any time, the pilot can override the camera operator command.

Both the Pilot and Camera Operator GCS receive the live video feed directly from the drone. If the Camera operator GCS is used in combination with the Range Extender antenna module, then the Camera Operator must use the WIFI video stream directly from the Pilot GCS table. This can be enabled in the Cockpit App.

The buttons on the Camera Operator GCS, have the same functions as on the Pilot GCS, but all inputs which control the drone's flight are disabled. The only exception to this is that the Camera Operator is also capable of disarming the drone.

Any ELIOS GCS unit can be reconfigured by the user to serve as a camera operator unit. Refer to the Advanced Setup section for information on how to set this up.

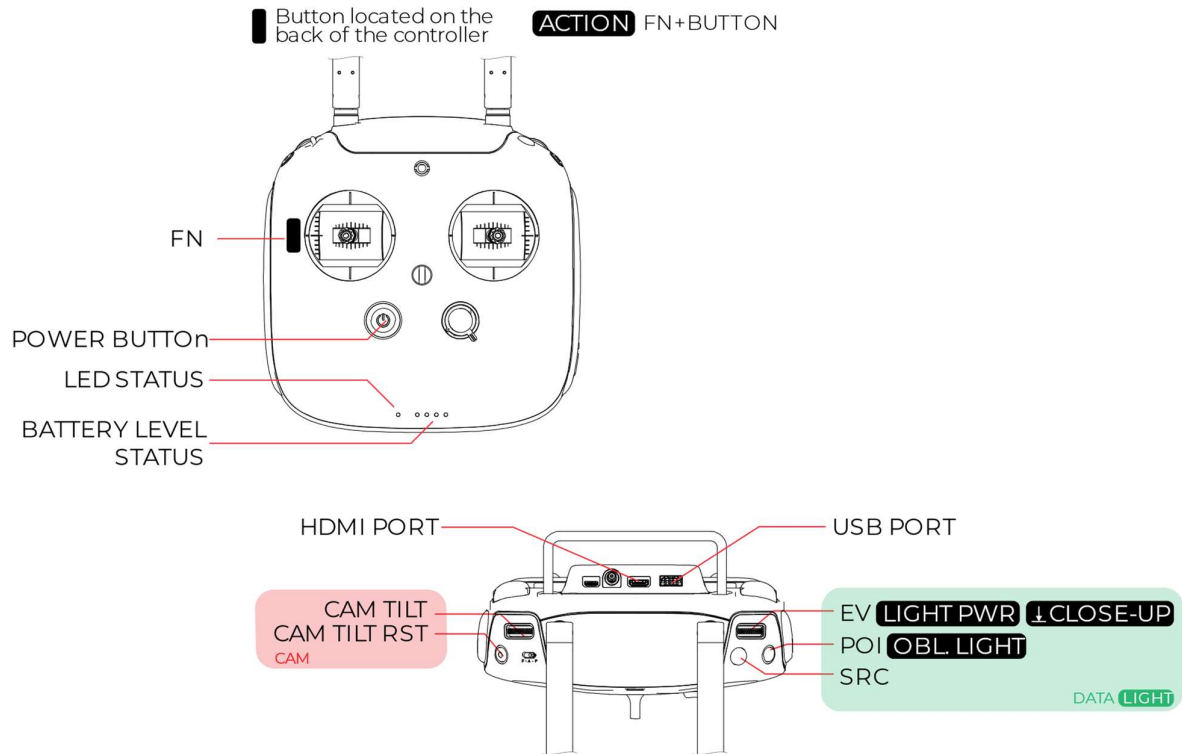


Figure 2.7: Camera operator controller overview

3 Setting up ELIOS 2

3.1 Insert the CAM and LOG SD cards

! PLEASE ONLY USE THE PROVIDED SD CARD TYPE, AS THIS HAS BEEN TESTED TO ENSURE IT MEETS WRITING SPEED REQUIREMENTS.

Place the two SD cards in their corresponding slots behind the aircraft payload module. Note that the drone will not be able to fly without a LOG SD card inserted.

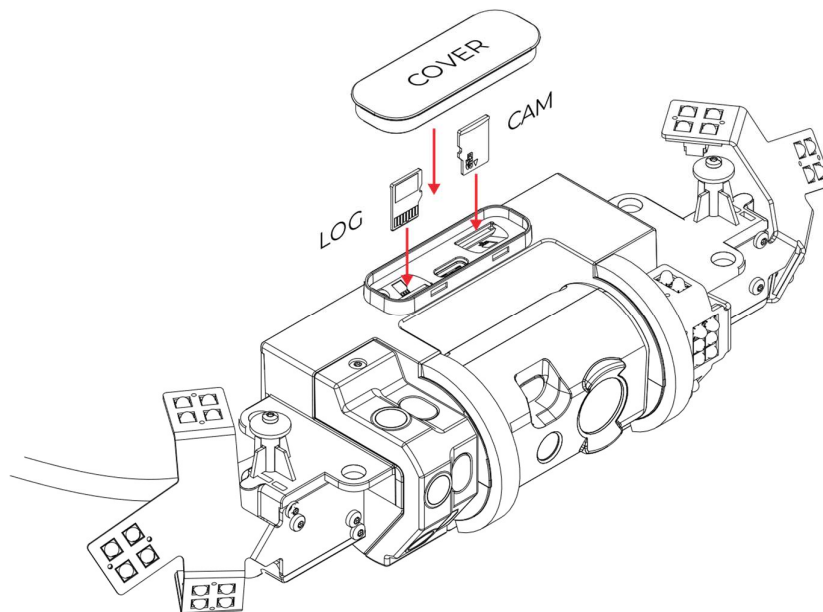


Figure 3.1: SD card mounting

3.2 Clean the camera lens and the Vision sensors

! BE CAREFUL NOT TO FORCE THE RED CAMERA HEAD, MOVING IT BY HAND MAY DAMAGE THE ACTUATOR.

Using the lens cleaner provided in the tool kit, follow these steps to properly clean the 4K optical camera lens and the Vision and distance sensors before **EACH** flight. It will improve the stability of the drone and improve the image quality and increase the value of the footage obtained during an inspection.

1. Using the brush side, remove all the dust from the lens.
2. Using the dry cleaner side, remove all the grease and fingerprints from the optics.

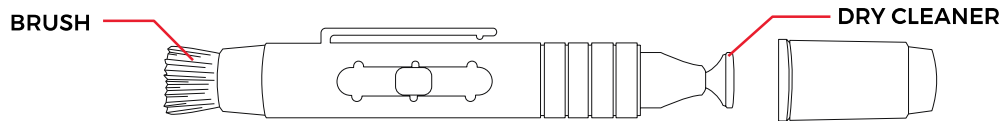


Figure 3.2: Lens cleaner overview

3.3 Insert and plug in the Battery

1. Slide the Battery into the Battery Holder.
2. Secure the battery by gently tightening the strap.
3. To plug in the battery, slide the yellow battery connector all the way into the ELIOS 2 Power connector.

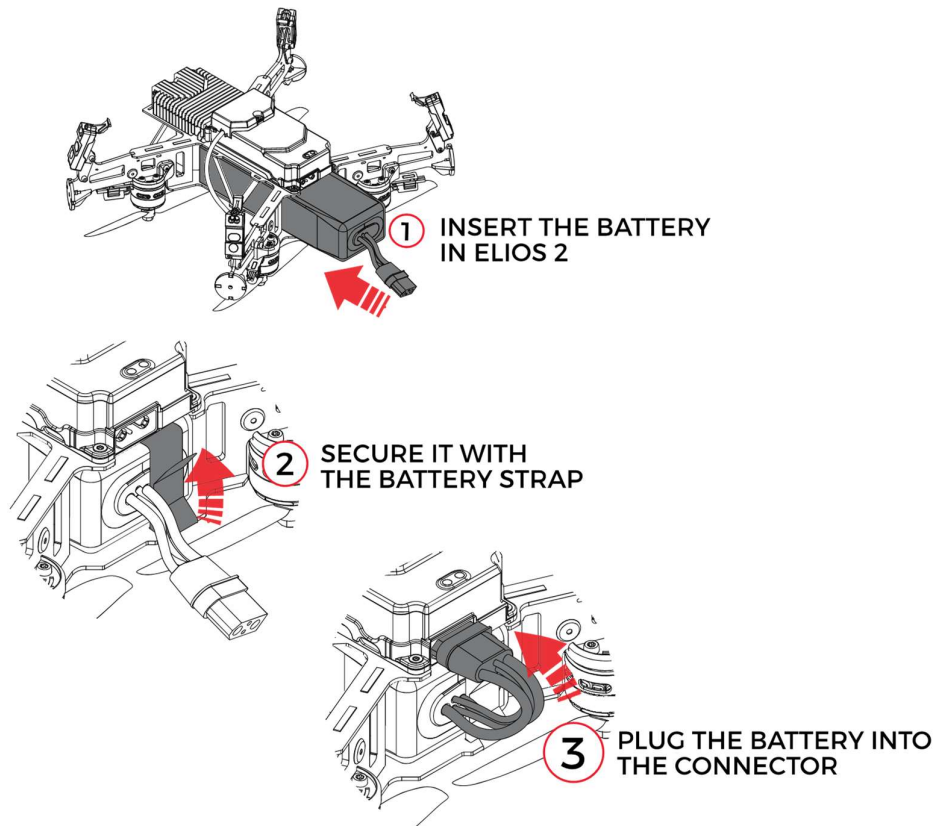


Figure 3.3: Battery insertion and connection

Once the battery is plugged in, ELIOS 2 is starting goes in standby – ready to fly.



IF THE BATTERY STRAP IS NOT PROPERLY SECURED, THE BATTERY MAY SLIDE OUT DURING FLIGHT. THIS WILL SEVERELY AFFECT THE STABILITY OF THE DRONE AND CAN LEAD A CRASH.

After the flight, the battery can be removed in reverse order:

1. Unplug in the battery connector
2. Unstrap the battery

3. Remove the Battery from the drone



TO REMOVE THE BATTERY, DO NOT PULL ON THE CABLES. IT MAY DAMAGE THE BATTERY.

Refer to the *Battery Safety Guidelines* for more battery information and specifications.

3.4 Setting up the ground control system

MOUNT THE TABLET

To mount the GCS, follow these steps:

1. Put the antennas and the tablet holder in a vertical position.
2. Press the button on the side of the tablet holder to release the clamp.
3. Secure the Tablet inside the clamp.
4. Connect your tablet to the remote controller via the USB cable.

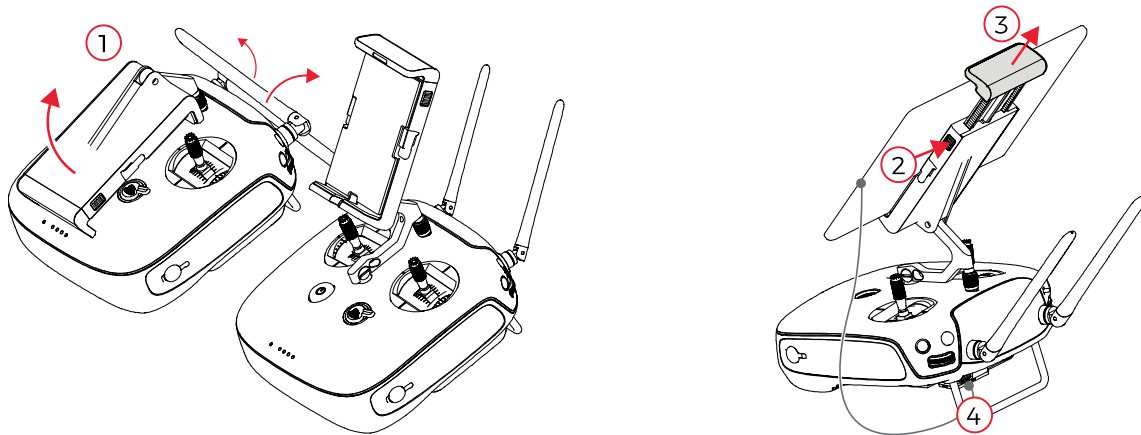


Figure 3.4: Assembly of the GCS

POWER ON THE CONTROLLER

To turn the controller on/off:

- press the power button once; it will display the battery level on the LED
- Press it again and hold

The controller will turn on; the same sequence can be used to turn it off again.

POWER ON THE TABLET

- To turn on/off the tablet, press and hold its power button.

RUN THE COCKPIT APP

- The cockpit app is used to view the live video and telemetry data from the drone.

4 Flying ELIOS 2

4.1 Arming



SPINNING PROPELLERS CAN CAUSE SERIOUS INJURIES. DO NOT HAVE ANY BODY PART INSIDE THE CAGE WHILE ARMING THE ROBOT. IN CASE OF DOUBT, READ THE SAFETY SECTION AND BE SURE YOU ARE FOLLOWING THE CHECKLISTS.

When the battery is connected, ELIOS 2 is switched on and in standby. The aircraft must be armed before take-off.

Place the 3 position switch of the GCS on the C1 position ASSIST MODE.

To arm ELIOS 2, perform the following arming sequence **in rapid succession**:

1. Place the left stick on the bottom right
2. Keeping the left stick down, slide it to the bottom left.
3. Slide back the left stick to the bottom right

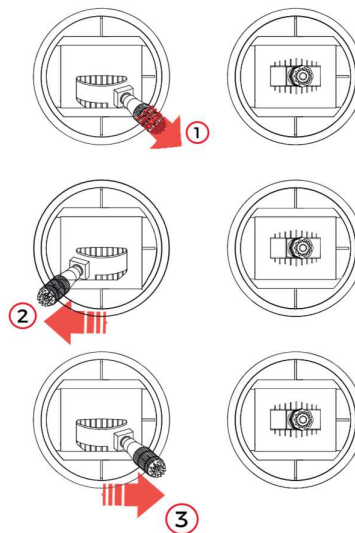


Figure 4.1: Arming sequence

Once armed, ELIOS 2 will power on its motors and be able to take off.

4.2 Disarming

Once Elios has landed on the ground or is safely held by an operator, you must stop the motors. To do so, disarm the drone with the following input:

1. Left and right stick down and to the center

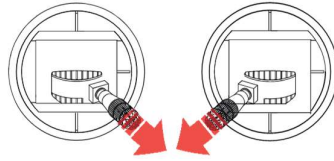


Figure 4.2: Disarming sequence



THE AIRCRAFT CAN ALSO BE DISARMED IN MID AIR, RESULTING IN A FREE-FALL. IF PERFORMED AT MORE THAN 1M ABOVE GROUND THIS WILL SERIOUSLY DAMAGE THE AIRCRAFT.

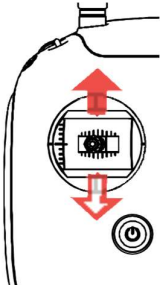
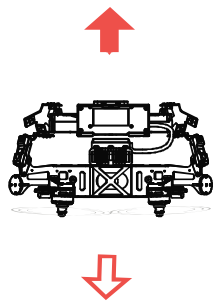
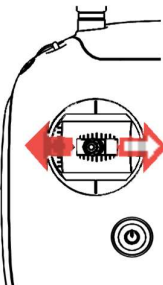
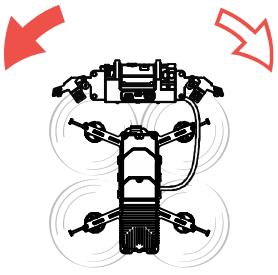


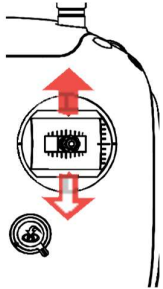
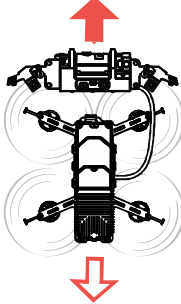
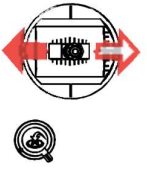
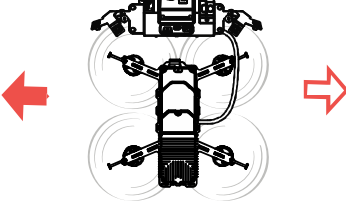
THE CAMERA OPERATOR CONTROLLER IS ALSO CAPABLE OF DISARMING ELIOS BY USING THE SAME SEQUENCE.

4.3 Aircraft control

ELIOS 2 orientation and flight direction are defined regarding its inner-frame.

By default, the control of Elios is mapped to the control sticks in mode 2. The setting can be changed to other modes via the Cockpit App.

Controller	Aircraft	Explanation
		<p>In Automatic Altitude control: Moving the left stick up and down changes Elios' altitude.</p> <p>Up increases altitude. Down decreases altitude. Centered Elios maintains its altitude.</p> <p>In Manual Thrust control: Moving the left stick up and down changes Elios' thrust.</p> <p>Up increases thrust Down decreases thrust</p> <p>In this mode, the pilot has to give constant inputs to maintain the aircraft at the desired altitude.</p>
		<p>Moving the left stick sideways controls the rotation (yaw) of the drone.</p> <p>Left makes the aircraft rotate counterclockwise. Right makes the aircraft rotate clockwise Centered, Elios maintains its orientation with a drift of max. 1°/minute.</p> <p>The pilot should remain aware of the heading at all times, as the right stick inputs are relative to the drone's heading, i.e. where the front of the drone is pointing.</p>

		<p>Moving the right stick up and down controls the pitch angle of Elios 2, making the aircraft go forward or backward.</p> <p>Up makes the aircraft going forward. Down makes the aircraft go backward. Centered, Elios 2 stays level.</p>
		<p>Moving the right stick left and right controls the bank angle of Elios, making the aircraft go to the left or the right.</p> <p>Left makes the aircraft go to the left Right makes the aircraft go to the right Centered, Elios stays put.</p>



**IN ASSIST MODE, THE DRONES SENSORS HELP IT STAY FIXED IN ONE PLACE.
IN ATTI MODE, THE PILOT MUST MAKE CONTINUOUS INPUTS TO CORRECT THE
DRIFT CAUSED BY SMALL TRIM ERRORS AND LOCAL AIR CURRENTS.**

4.4 Flight modes

ELIOS 2 offers multiple flights behavior depending on the condition it is flying in. It is essential that the pilot understands the differences between the several modes and when to use them.

4.4.1 Sensor Stabilized control – ASSIST (default)

Limitation: Far from objects, dusty or outdoor/sunny environments, clean metallic surfaces, or lack of features.

By default, ELIOS 2 is using its Vision and distance sensors coupled with its IMU (accelerometer, gyroscope, and magnetometer) to increase its stability close to surfaces or objects.

4.4.2 Attitude control – ATTI

Limitation: Unstable static pressure

If in one of the limitations cases listed above, the Vision and distance sensors may not work correctly. In this case, ELIOS 2 is not taking into account the Vision and distance sensors but only rely on its IMU and barometer. While in attitude control, the altitude of the aircraft is automatically handled by the barometer. The drone will not automatically remain in position in this mode, and will constantly drift due to local wind and turbulence effects.


When far from objects or flying in a clean metallic environment with little features, the ASSIST mode will not be able to work correctly and the flight control system will automatically switch to the ATTI control mode.

Dust and sunlight have a significant impact on the proper functioning of the ASSIST stabilization. However, ELIOS 2 is not always able to recognize the errors induced by those perturbations. It is the pilot duty to assess that the stabilization will not work in the given environment and be ready to disable it.

4.4.3 Manual thrust control – MAN

Gusts of wind or natural draft may disturb the static pressure measured by the barometer due to the Venturi effect and affects the accuracy of the Altitude Control mode. The pilot can disable the Altitude control by switching to Manual Thrust Control. In this case, the Altitude joystick directly controls the throttle. The climb and descent speeds are not limited in this flight mode, which can easily lead to extremely hard collisions.

Switching to Manual thrust within 10 seconds after arming the drone will engage "Unstick Mode" This allows the pilot to make more aggressive motor inputs, and can be used if the drone has become wedged in a tight space.

 **CONTROLLING THE ELIOS 2 IN MANUAL THRUST IS DIFFICULT AND REQUIRES PROPER PILOT TRAINING. FLYING IN MANUAL THRUST IS NOT COVERED BY THE WARRANTY**

4.4.4 Sport mode – SPORT

If flying in a windy environment, ELIOS 2 allows the pilot to boost its airspeed, increasing the wind resilience of the aircraft. Using SPORT mode will automatically switch on ATTI mode.

 **CONTROLLING THE ELIOS 2 IN SPORT MODE IS DIFFICULT AND REQUIRES PROPER PILOT TRAINING. FLYING IN SPORT MODE IS NOT COVERED BY THE WARRANTY**

4.4.5 Photogrammetry mode – ASSIST PHOTOG.

To be used when creating photogrammetry models. This mode helps the pilot with a smoother flight. The yaw rotation rate is slower and camera tilt moves in increments to reduce motion blur and ensure overlap. The camera tilt is limited to the cage free range. Most camera and lighting settings can not be modified manually to ensure similarity between images. Gridlines are overlaid over the image to help with maintaining overlap between passes.

4.4.6 How to use the flight control modes

Mode	Flight mode	Activation	When to use it
ASSIT	ASSIST	3 position switch -> C1	Indoor, close to surfaces
ATTI	ATTI	Automatic	Far from surfaces or too even surfaces
ATTI	ATTI	3 position switch -> A OR Press and hold PILOT ASSIST OFF	In dusty, outdoor or sunny environments
ATTI MAN	ATTI + MAN	Manual Thrust switch	In dusty, outdoor or sunny environments and unstable static pressure
SPORT	ATTI + SPORT	Double press and hold PILOT ASSIST OFF	In windy environments
SPORT MAN	ATTI + SPORT + MAN	Double press and hold PILOT ASSIST OFF + Manual Thrust switch	In windy environments and unstable static pressure
ASSIST PHOTOG.	ASSIST + PHOTOGRAMMETRY	3 position switch -> C2	Photogrammetry models
ATTI PHOTOG.	ATTI + PHOTOGRAMMETRY	3 position switch -> C2 + Press and hold PILOT ASSIST OFF	In dusty, outdoor or sunny environments
ATTI PHOTOG.	ATTI + PHOTOGRAMMETRY	Automatic	Far from surfaces or too even surfaces

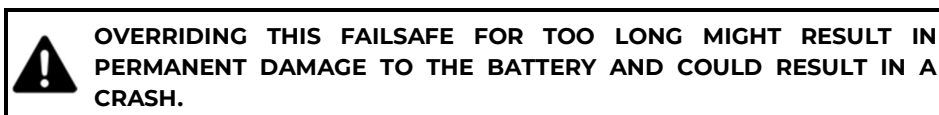
4.5 Failsafe

LOSS OF COMMUNICATION

If the communication link between the aircraft and the GCS is lost, ELIOS 2 will automatically enter the emergency landing mode. It will maintain altitude for 15 seconds and then slowly descend and land on the ground. Once on the ground, the motors will be shut down after 30 seconds and the drone will remain in standby mode. If at any time the communication link is re-established, flight may be resumed.

BATTERY LEVEL CRITICAL

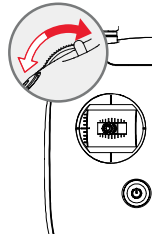
If the battery reaches a critical level, ELIOS 2 will automatically enter the emergency landing mode, and the aircraft will slowly descend. The pilot is still able to override this descent. However, to prevent any accident or damage to the battery, the drone should be landed and turned off within 30sec.



4.6 Camera Control

The following control inputs can be made either by the Pilot of Camera Operator.

The left wheel of the Controller allows you to change the pitch of the cameras.

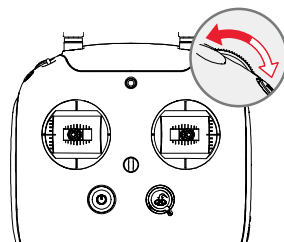


The left dial controls Elios camera's pitch.

Counter-clockwise makes the camera look downwards.
Clockwise makes the camera look upwards.
Centered, the camera will keep its current pitch.

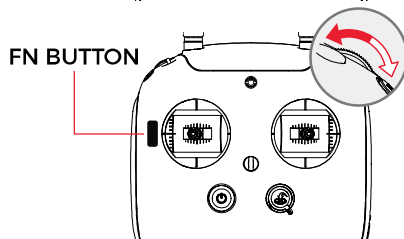
It is possible to reset the camera position to level with the red "Camera home" button.

While flying, you can set several different parameters on the Full HD optical camera.



The right wheel sets the camera's exposure value (in automatic mode), or the camera's exposure time (in the manual low ISO mode and manual high ISO mode).

Clockwise increases brightness.
Counter-clockwise decreases brightness.
 Pressing the wheel resets the brightness to 0EV

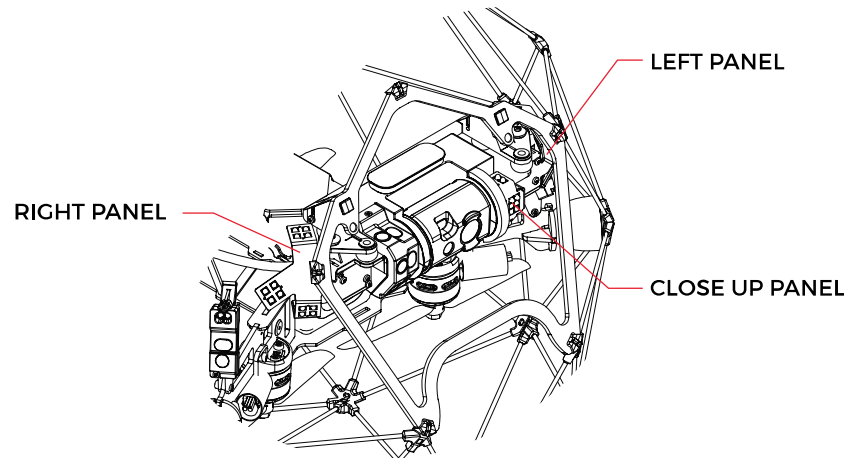


■ Button located on the back of the controller

With the FN button on the back side of the controller is pressed, the right dial sets the onboard lighting LED's power.

Clockwise increases light intensity.
Counterclockwise decrease light intensity.

4.7 Lighting controls



ELIOS 2 has a smart lighting system composed of 9 LED panels. The panels can be controlled independently to offer the best lighting for the inspection footage. The intensity of each panel is adjusted automatically according to the pitch of the Camera head to ensure the optimal lighting, while saving battery capacity and flight time.

The Smart onboard lighting is clustered as followed:

- Left light panel with 4 LED clusters
- Right light panel with 4 LED clusters
- Close-up panel with 1 LED cluster

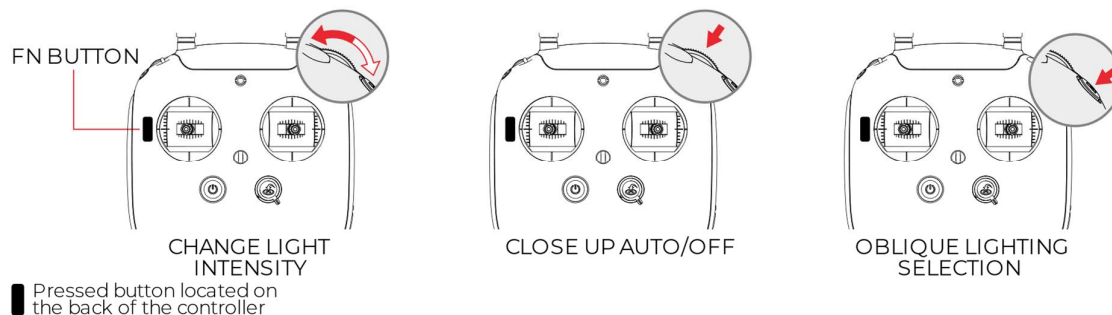
The Smart onboard lighting has 3 settings:

- Normal – all the panels are lit.
- Dust proof light – left and right light panels are lit, the Close-up panel is off.
- Oblique lighting – Left or right are lit individually offering improved depth perception of defects such as pitting or cracks.

The intensity of all panels can be controlled in flight via the GSC.

DUST PROOF LIGHT/CLOSE UP LIGHT

In automatic mode, the Close up light will be only be turned on when the measured distance to an object is below 90cm. This avoids creating a shadow in the center of the image. The close up light can also be turned on or off manually. Use the menu in the Cockpit app to switch from automatic to manual mode.



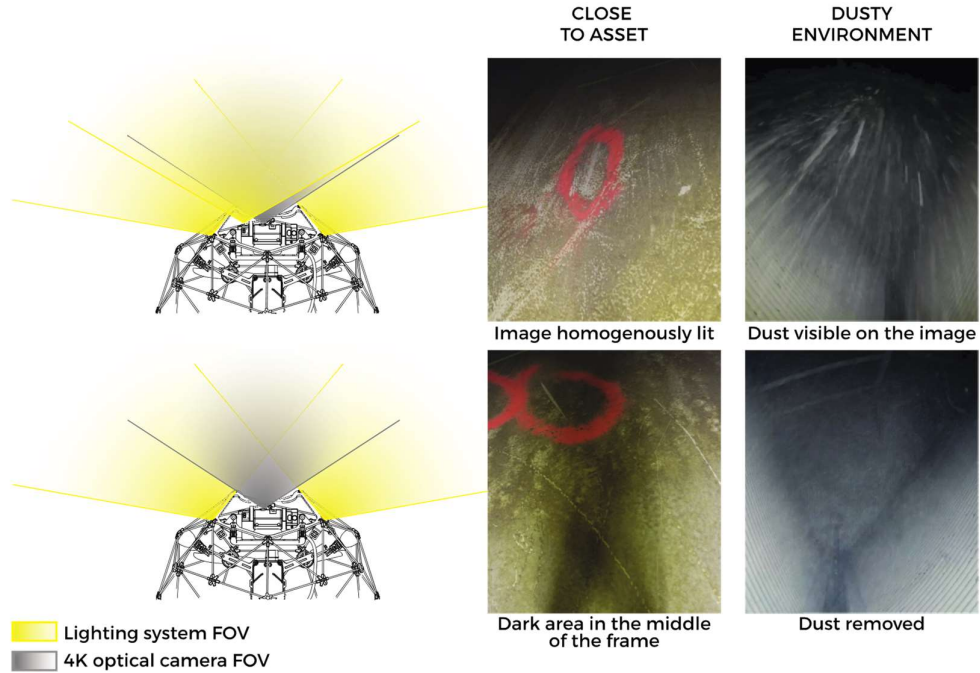


Figure 3: (left) with the Close-up light on – No dust removal, (right) Close-up light off – dust removal

OBLIQUE LIGHTING

The side panels can also be lit individually. If the drone is simultaneously positioned at a shallow angle to a surface then it will create shadows which greatly accentuate deformations and holes.

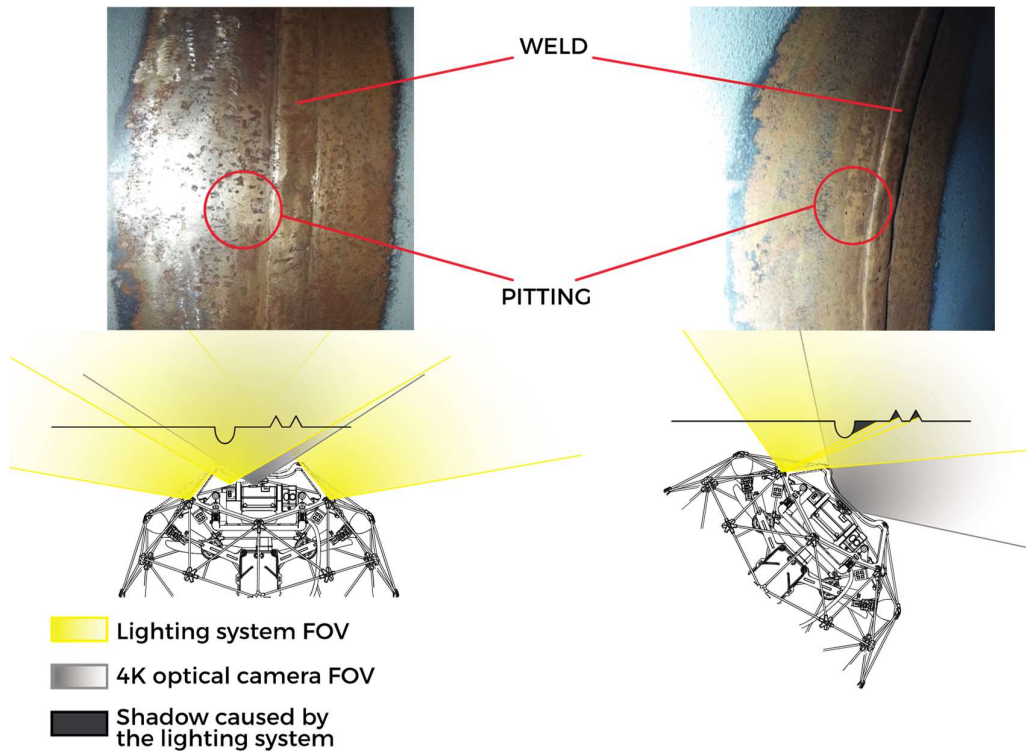


Figure 4: (left) oblique light not used – the surface appeared quite flat. (right) Oblique light in use highlighting relief. In this case, pitting and weld.

STROBE LIGHTING

This feature makes all lights flash simultaneously 30 times per second, every time an image is taken by the video camera. When this setting is enabled, the lighting is 60% more powerful and uses 80% less power. As a result, your ELIOS 2 will fly longer, and deliver brighter and sharper images with less motion blur. It also reduces rolling shutter effect and therefore improves photogrammetry results.



WITH STROBE LIGHTING ENABLED, THE LIGHTS WILL FLASH AT 30HZ AND MIGHT CREATE DISCOMFORT, DIZZINESS AND PUT EPILEPTIC PERSONS AT RISK.

4.8 2D measurements

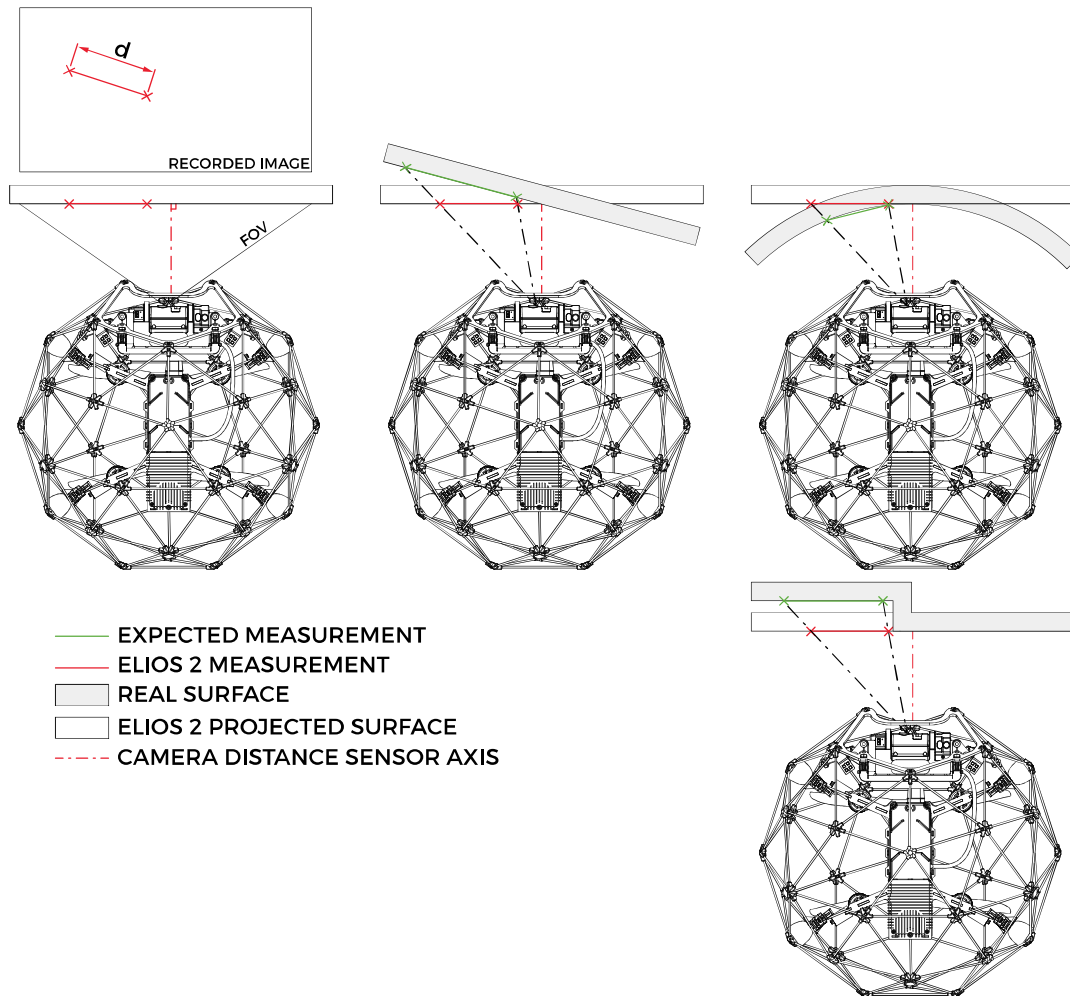
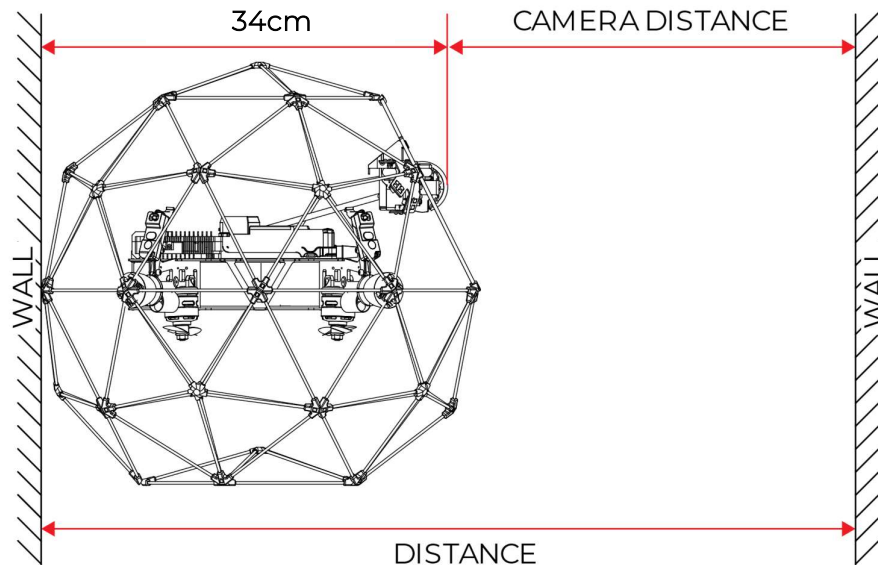


Figure 5 Example showing the limitation of the 2D measurement considering the geometric constraints

Limitation: The feature to measure needs to be on a flat surface perpendicular to the Camera optical axis. The accuracy of the measurement is $\pm 10\%$ of the measured length with a maximum of $\pm 5\text{mm}$ accuracy.

Thanks to its Camera distance sensor, ELIOS 2 is capable of measuring the size of a feature on a flat surface using the post-processing software Flyability Inspector.

4.9 Distance measurement



ELIOS two can be used to measure distance between two walls. By placing the aircraft back against one of the walls, the distance between the two walls is given by:

$$\text{Distance} = \text{Camera distance} + 34\text{cm}$$

4.10 Distance lock

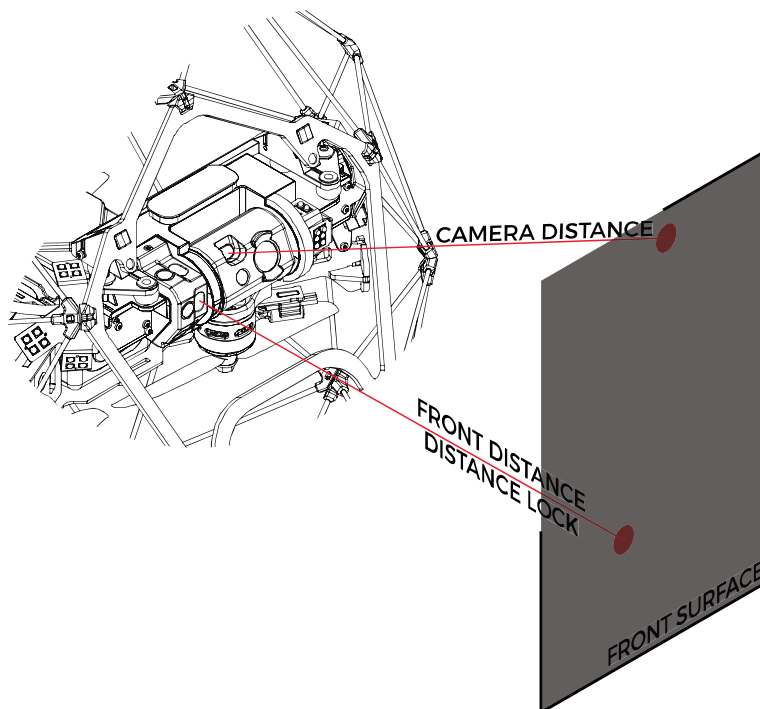


Figure 6 The camera distance sensor follows the camera head pitch. The Front distance sensor is fixed on the payload frame.

Limitation: The surface can't be too thin or be a reflective surface.

Thanks to its multiple vision and distance sensors, ELIOS 2 is able to fix its distance with regard to a surface. The distance is set from the Front distance sensor. Hence, the distance always represents the horizontal distance between the front of the aircraft and the surface independently from the camera orientation.

4.11 Flight data logging and video recording

4.11.1 Data logging

LOG SD CARD

As soon as the battery is plugged in, ELIOS 2 is turned on it starts to record data onto the LOG SD card. The LOG files can be read with the Flyability Inspector software in order to access the Thermal Camera footage and flight parameters such as altitude, heading, and POIs. The drone can not fly without a LOG SD card.

AV SD CARD

The Avionics LOG files contain the flight information such as sensor values, internal aircraft states, and even controller inputs from the pilot. It is the black box of the drone. This data can be downloaded and sent to Flyability engineers to analyze malfunctions should they occur, but they are not readable for the end user. Old files are automatically overwritten after 20 flights. The drone can not fly without an AV SD card.

4.11.2 Video recording

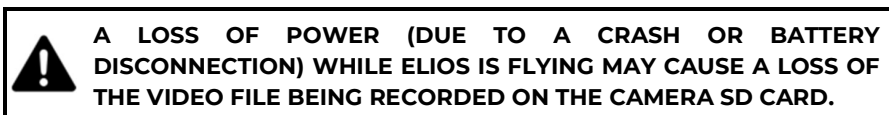
The video recording starts as soon as Elios is armed and stops when Elios is disarmed, provided that the CAM SD card is inserted with enough free space. The video as well as still images are saved onto the CAM SD card.

4.11.3 Tablet Backup Recording

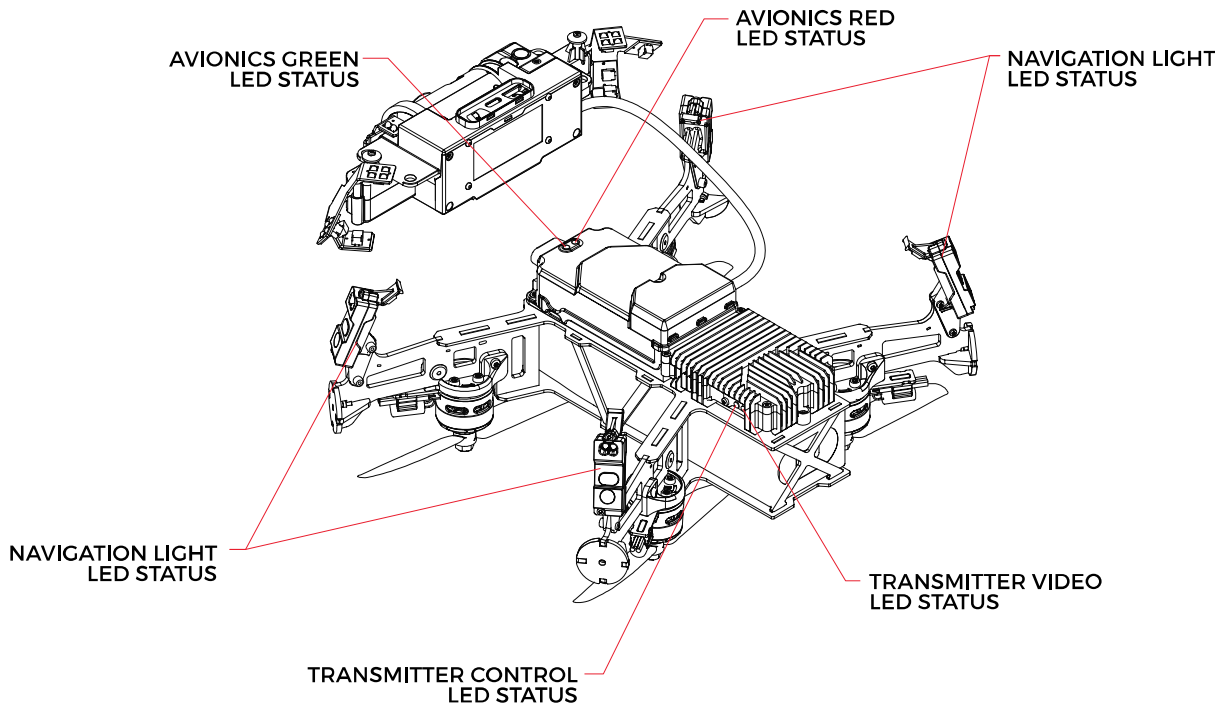
The video stream received by the tablet can be saved to create a low-quality backup of the flight video as well as some telemetry data, preventing a complete loss of data in case of an accident.

COCKPIT BACKUP RECORDER

This feature can be turned on in the settings menu of the Cockpit App. It records a video file with the received video stream and creates a subtitle file (.srt) with the telemetry data.



5 Status LEDs



5.1 Avionics LED status

SOLID GREEN

Data logging working properly.

BLINKING RED

Avionics ON and working correctly – ready to fly.

5.2 Navigation light LED status

On top of navigation helpers, while flying, the lights also give the Aircraft status.

5.2.1 Aircraft idle

LEDS CIRCLING YELLOW

ELIOS 2 ready, waiting for the GCS to connect.

LEDS CIRCLING GREEN

ELIOS 2 connected to GCS, ready to fly.

LED SOLID RED

The motor on the corresponding LED appears not to work correctly. Restart the aircraft. If the problem persists, contact Flyability.

LEDS BLINKING YELLOW SLOWLY

ELIOS 2 is starting and arming its propulsion system within the next 3 seconds. Do not have any body part or other objects inside the cage. The pilot or the camera operator can still cancel the arming by performing the disarming sequence.

LED BLINKING YELLOW FAST

After a flight, ELIOS 2 is saving the inspection footage. Do **NOT** turn off the aircraft!
OR

Drone is initiating camera feed. The drone cannot be armed during this time.

OR

ELIOS 2 is upgrading its firmware. Do **NOT** turn off the aircraft!

LEDS BLINKING RED

ELIOS 2 has an error, check Cockpit application for further diagnosis.

5.2.2 Aircraft flying

LEFT LEDS RED, RIGHT LEDS GREEN

ELIOS 2 airborne and flying correctly.

LEDS BLINKING YELLOW

ELIOS 2 battery is low

5.3 Transmitter LED status

Gives information about the status of the transmitter.

5.3.1 Right LED

BLINKS RED

Link button pressed. Air System is attempting to link with the Ground System

BLINKS GREEN

Signal detected but not linked to the ground control system

SOLID GREEN

Successfully linked to the ground control system

SOLID RED

No signal detected, ensure ground control system is on.

5.3.2 Left LED

SOLID GREEN

Video from the camera is well received by the transmitter

SOLID RED

Error

6 Application – Cockpit

6.1 Overview and setup

Cockpit is the Flyability official application used to pilot the ELIOS 1 and ELIOS 2 systems.

Its primary use is to serve as a cockpit, allowing the pilot to view the video feed from the aircraft, and enabling FPV flights.

In addition, a dashboard with a useful flight and camera telemetry is shown to the pilot.

6.1.1 First-time installation

6.1.1.1 SYSTEM REQUIREMENTS

Cockpit is developed and tested work on Samsung Tab A and Active 2 tablets, running Android 8. Other tablets and operating system versions are not guaranteed to work.

6.1.1.2 GET THE APPLICATION

The application is distributed as a standard Android application file (.apk), available on www.flyability.com.

Using the USB connection of your tablet, copy the APK file to a place you can browse to, using a file explorer on the tablet. An alternate solution is to copy the file on an SD card, especially for Mac users.

From Cockpit 1.2 onwards, an automatic updater is available to keep you up to date when new releases are available and make them installable at the click of a button.

Note: some tablets do not have file explorers provided; you may get a free one on the Google Play store.

6.1.1.3 ALLOW UNKNOWN SOURCES IN ANDROID

Go to the settings screen on your Android tablet.

Based on your tablet brand, the architecture of settings menus may vary and may not be exactly named as in this manual. However, the steps are similar and may just bear different names on your specific model of tablet.

Go to Lock screen and Security.

Verify that “Unknown sources” is enabled. A warning may appear about application security concerns; you can acknowledge it.

6.1.1.4 INSTALL THE APPLICATION

Using the file explorer on your tablet, browse to the APK file location you have just copied from your computer. Tap the file to run the software installer. Some confirmations about access to specific features may appear; you can acknowledge without concerns.

A Flyability icon should now be available in your application menu and your home screen!

6.1.2 Updating an already installed application

Updates to an already installed application can be done in two different ways.

6.1.2.1 INTERNET UPDATE PROCESS

Be sure your device has Internet access. As you start Cockpit, the availability of updates is checked.

Should a more recent version be available, you will be notified and prompted to proceed with the update or decline it. If you proceed, download of the newer installation file begins automatically.

Please note, at the next time you will connect your aircraft to the system, the application will prompt you to perform a firmware upgrade. Read the [Aircraft firmware upgrade](#) section for more details on that process.

6.1.2.2 MANUAL UPDATE

Follow the steps noted in the "[Installing the application for the first time](#)" section.

6.1.3 Setting up the remote controller

If you already used a remote controller with your tablet, typically with the DJI GO app, some setup is necessary to enable Cockpit to recognize it without other applications taking over the connection.

6.1.3.1 RESET DEFAULT APPLICATION FOR THE CONTROLLER

You can skip this step if you never used the remote controller on your tablet since purchase or latest factory reset.

Each time the remote controller is plugged and turned on, the tablet runs the default assigned app to handle it, and other compatible apps will not see it. The default app must be reset in such cases.

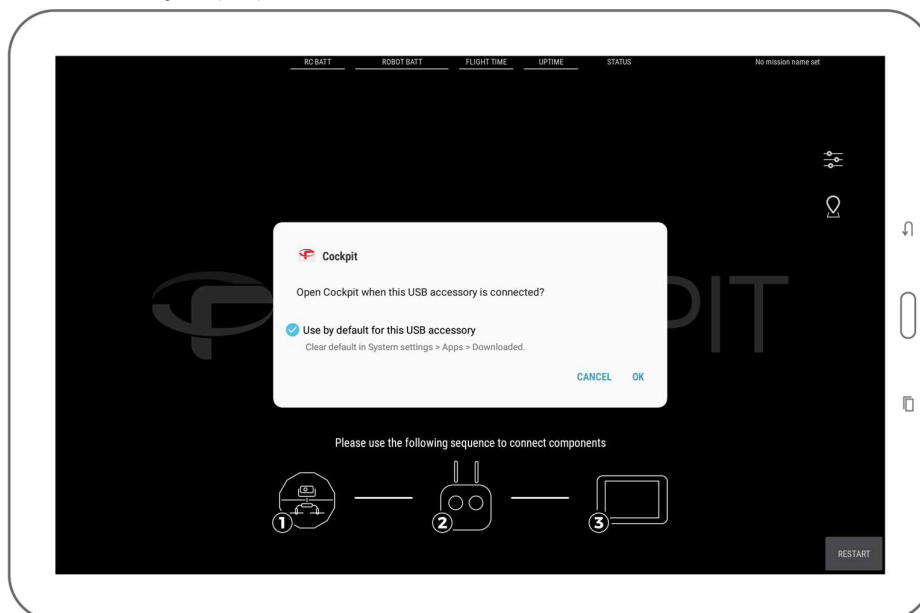
Open the Settings menu of your tablet.

1. Go to Applications.
2. Open Applications Manager.
3. In the list of apps, locate DJI GO or the one you have used before. Tap it.
4. In the next screen, select Set as default (the name is ambiguous).
5. In the next screen, tap Clear defaults.
6. The default application for the remote controller is now reset.

6.1.3.2 SET COCKPIT AS DEFAULT APPLICATION

Turn the remote controller on, make sure it has enough battery, and plug a USB cable between the full-size USB port of the controller and the micro-USB port of the tablet (or USB-C if applicable).

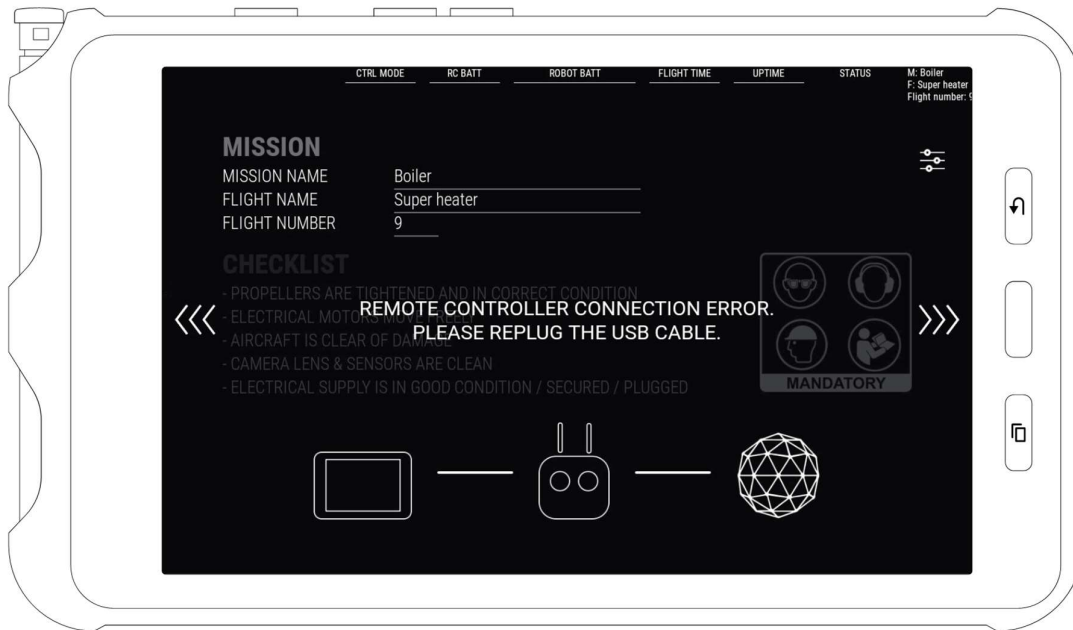
If multiple applications able to handle the controller are present, a popup window asks you to pick one. Depending on the tablet models, another option, "Just once" or "Always" is selectable. A checkbox mentioning "Always use" can alternately be proposed.



It is recommended to choose Always / Use by default, as you can later perform the actions in the section above to reset the defaults.

6.1.3.3 REMOTE CONTROLLER CONNECTION ERROR

Upon connection, the tablet may fail to recognize the Remote Controller. In this case, the user is asked to unplug and re-plug the USB cable to re-initialize the connection.



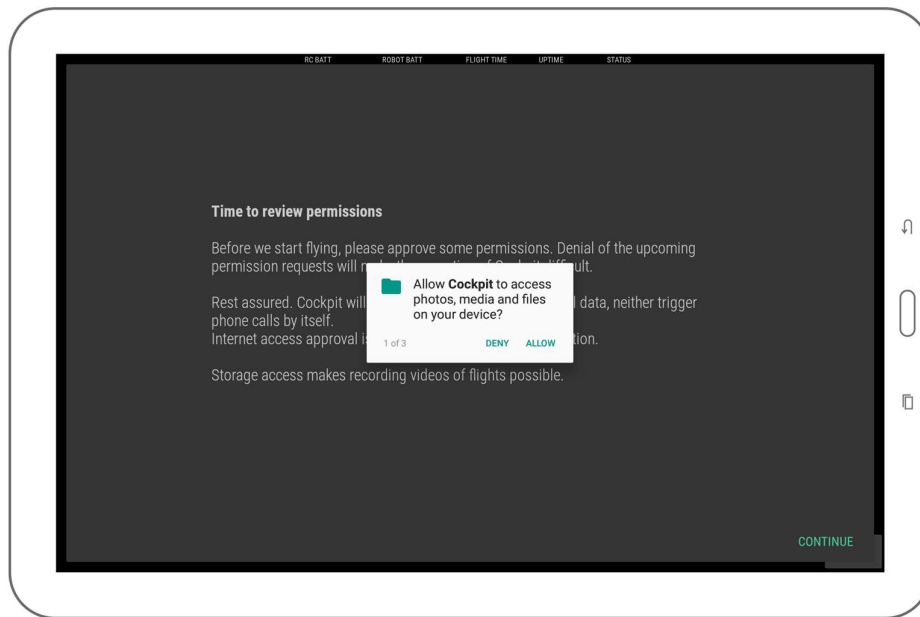
6.1.4 First launch

Upon a fresh install or unboxing of your Flyability aircraft, steps that are specific to the first launch may be encountered.

Please be patient when the application starts for the first time. Initialization of long-standing components should take place; this is normal behavior. Some of the long procedures run during the first launch only.

6.1.4.1 AUTHORIZATIONS

Be sure to accept all requested Android system authorizations.

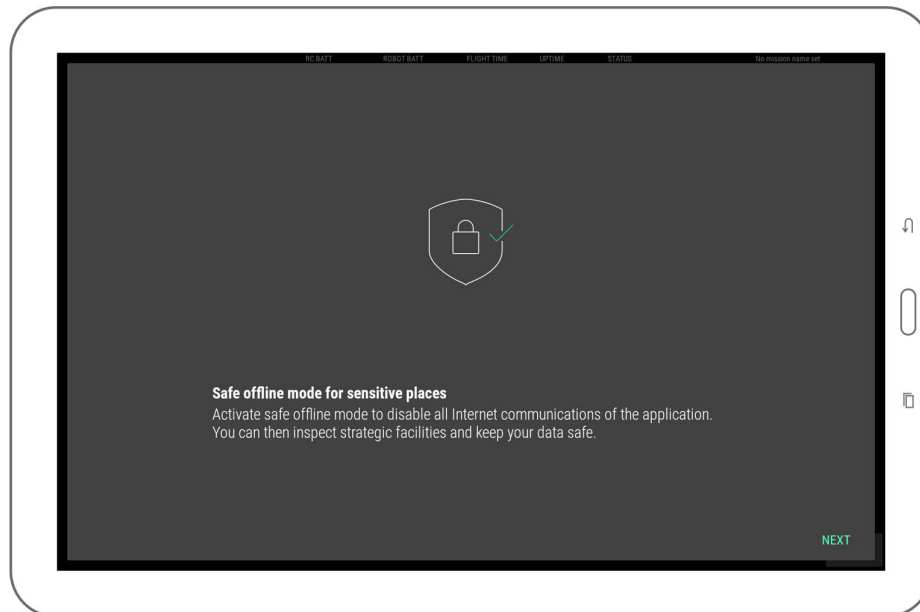


Cockpit keeps your data safe.

- It will never initiate paid phone calls or contact paid services on its own
- It will never upload videos, flight logs, data from the Android device. The only data that is uploaded is minimal aircraft identification data for servicing purposes, for the sole use of Flyability. A safe offline mode is available to block such data transfers if this is a concern.

6.1.4.2 NEW FEATURES

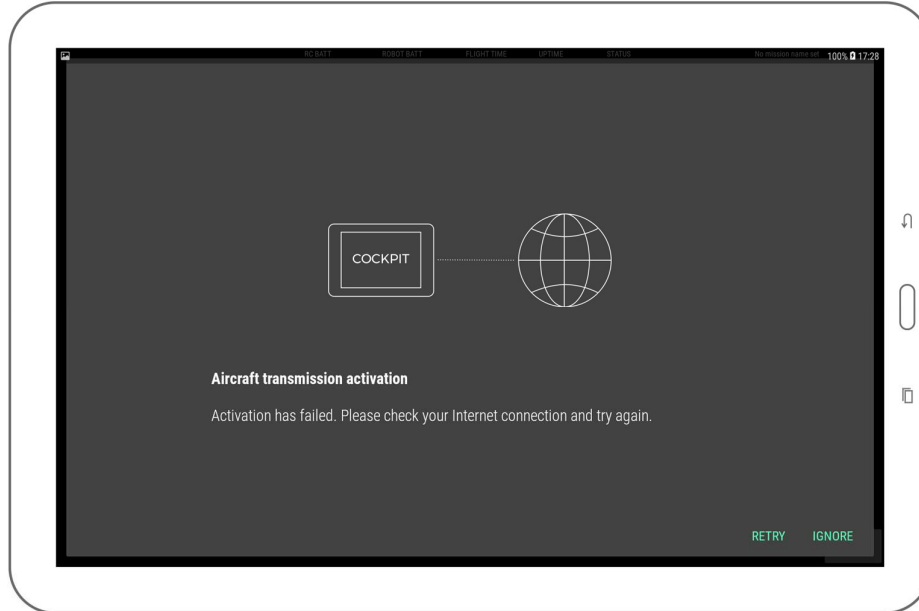
Every new version of Cockpit presents its newly added features in a slideshow. Read through to understand and get acquainted with the latest improvements of the application.



6.1.4.3 TRANSMISSION ACTIVATION

The transmission system must be activated one time. Afterward, there is no more need to activate it even after app upgrades. If purchased from Flyability, you receive your tablet with Cockpit pre-installed and

activated. When removing Cockpit from the tablet completely you don't need to re-activate manually as long as your tablet has internet connection while doing the install. Else, it will prompt you to re-activate.

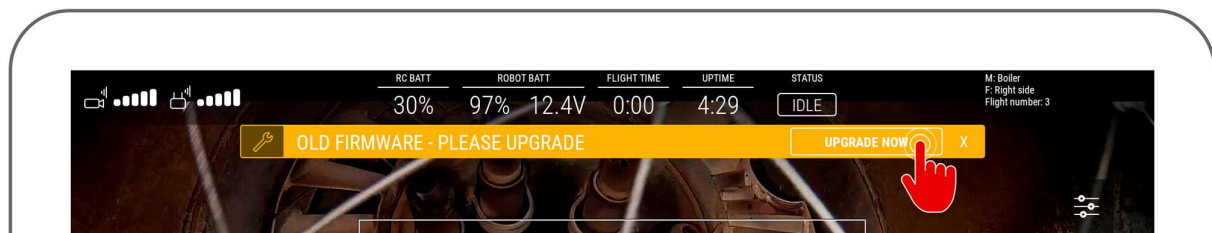


Be sure to have Internet connectivity for activation to succeed. Without activation, Cockpit functions cannot be used. A reminder appears if activation cannot succeed.



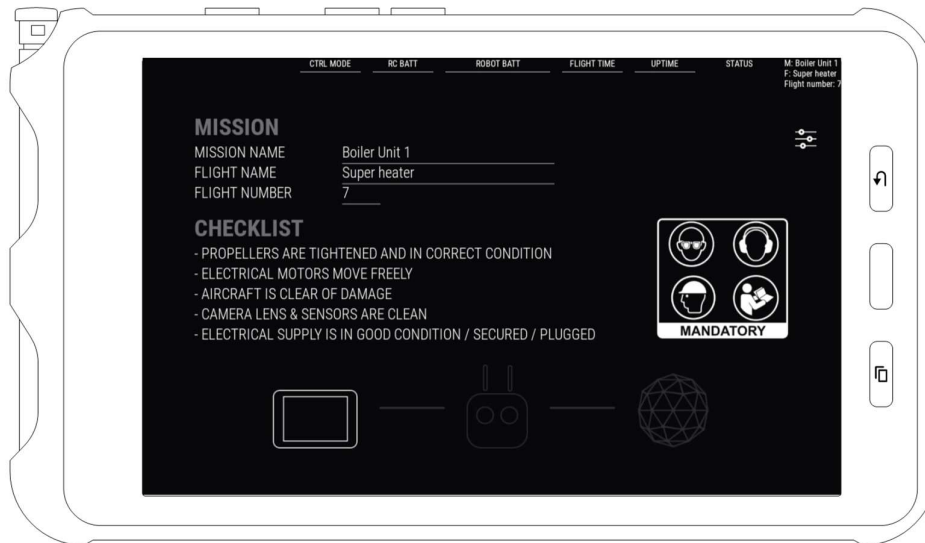
6.1.5 Aircraft firmware upgrade

A warning appears on the screen if an upgrade is necessary. It is highly recommended to perform the upgrade so that you can benefit from all the new features and bug fixes. If you keep your aircraft with outdated firmware, some of the newer features of Cockpit will not be enabled. The warning is visible as an example on the screenshot below.



6.2 User Interface

6.2.1 Home screen



When starting the application, the user arrives on the Home screen. The home screen is enabling the user to:

MISSION

The flight location naming window records the mission name, flight name, and flight number of the current or upcoming flight.

Mission name and flight name can be 40 characters long at most.

Flight number must be between 1 and 255; this flight number is automatically incremented for the next flight upon disarming once it is filled out. If the field is left blank, it will not be automatically incremented.

It is possible to change flight location naming multiple times throughout the flight; data that is considered as definitive naming for the flight is the one being active at the moment of disarming.

Each field is optional. Simply let the field blank to unset the value for the next flight.

For post-mission analysis, all information entered in this dialog box can be retrieved later on a computer using Flyability Inspector 1.4 and above.

CHECKLIST

Short and comprehensive checklist to make sure your system is good to fly

SAFETY REMINDER

Flyability recommends the user to wear eye protection, ear protection, and a hard hat while operating the aircraft. The user **MUST** have read the aircraft user manual prior using the system.

CONNECTION STATUS

Tablet icon: represents your tablet in the connection order. If wi-fi streaming is used, and this tablet is used as a viewer, the tablet icon flashes when no connection is established to the emitting tablet. See [Streaming video and telemetry to a second tablet](#) for details.

- Controller flashing: the controller is being searched.
- Aircraft icon flashing: the controller is recognized and is now looking for the aircraft.

On the above image, the application is waiting for a controller and aircraft to connect.

Once the aircraft is connected and ready, the Home page allows the user to toggle the camera preview by tapping on CAMERA.



6.2.2 Main instrument panel

The instrument panel is fully shown once the connection is established, and the application has received data from the aircraft.

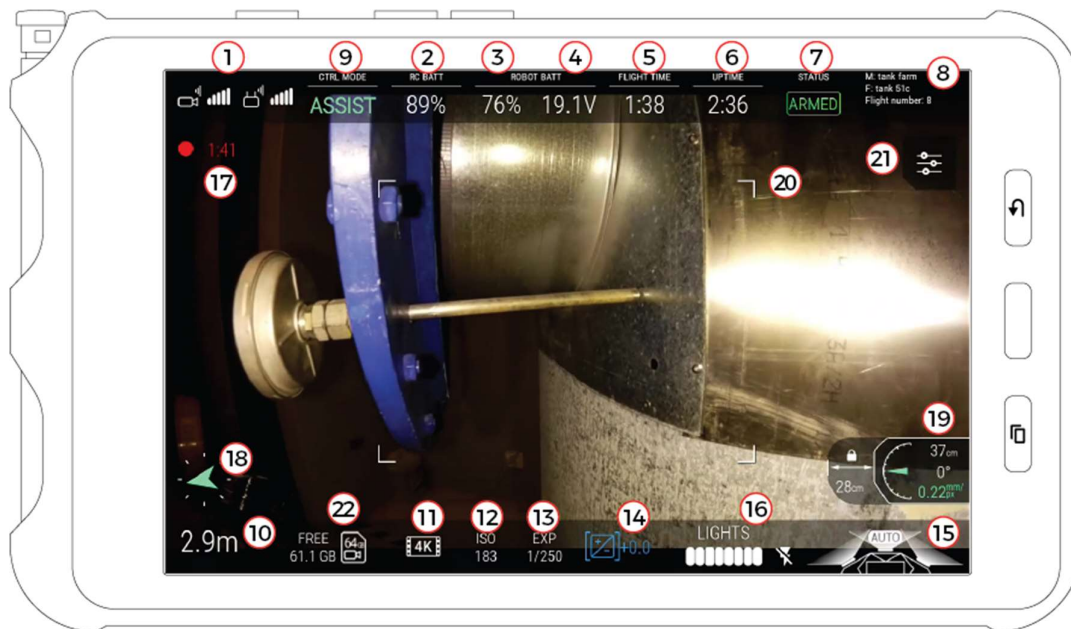


Figure 7: ELIOS 2 cockpit

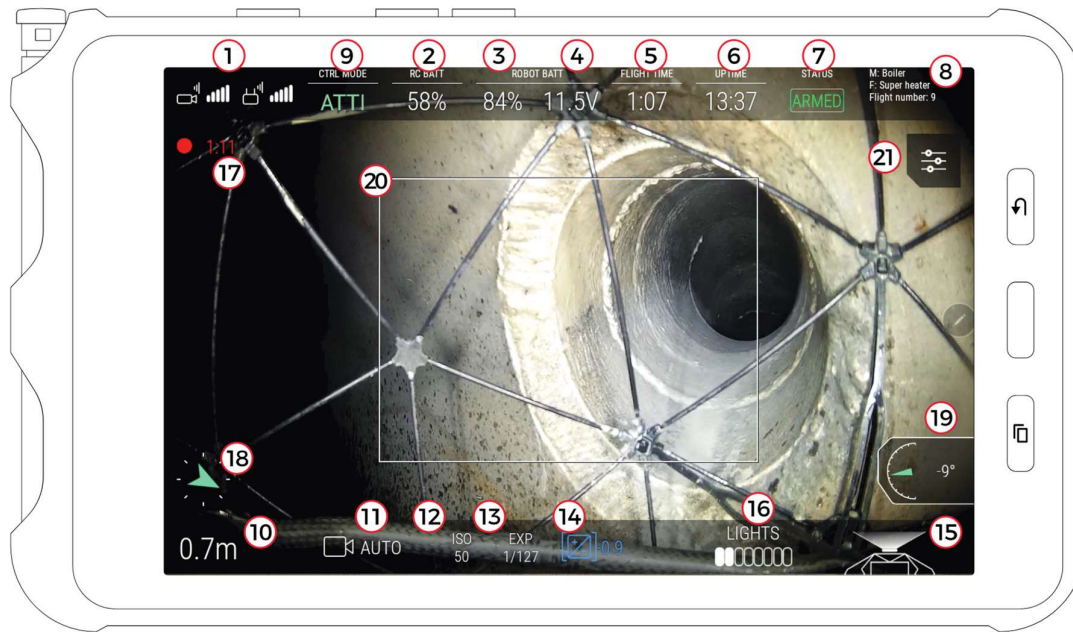


Figure 8: ELIOS 1 cockpit

1. Signal strength (left: video reception quality / right: command transmission quality)
2. Remote controller battery charge
3. Aircraft battery charge (Shows ???% if battery charge cannot be accurately computed)
4. Aircraft battery voltage
5. Flight time
6. Uptime (time elapsed since the battery is plugged in)
7. Flight status
8. Mission and flight information
9. Control mode
10. Altimeter (tap to reset the altitude to zero)
11. ELIOS 1: Camera mode
ELIOS 2: Camera recording resolution
12. Camera ISO
13. Camera exposure time
14. Camera exposure value
15. LED lights status
16. LED lights power indicator
17. Camera recording duration
18. Heading (tap to reset the heading and use the current aircraft heading as the new reference)
19. Payload info (camera pitch, front distance to surface, ground sampling distance)
20. Thermal camera field-of-vision frame
21. Settings button (opens [settings menu](#))
22. Available space remaining on CAM SD card.

6.2.2.1 SIGNAL STRENGTH

Signal quality reading includes:

 Video reception quality



Command transmission quality

When signal quality becomes low, a warning appears to inform you. Make sure to fly closer to the remote control to regain some signal quality and reduce the risk of losing communication. Alternatively, for your next flight, use a range extender to increase the obtainable range.

For detailed data about the signal quality, refer to the [radio settings panel](#).

6.2.2.2 BATTERY STATUS

When the aircraft is not able to estimate its own percentage of battery charge left, question marks "???" are shown instead. In such situations, keep attention to the readings nearby to estimate remaining flight time. You should rely on voltage reading to know when it is time to finish the current flight; please refer to Elios instructions for information about the appropriate voltage levels to watch out for. Aircraft running up-to-date Avionics firmware still notifies you when the battery is critically low in this case.

Battery charge indicator changes colors to warn when the charge becomes too low.

White	Battery charge is good
Yellow	Battery charge is low. If in flight, consider finishing the current flight.
Red	Battery charge is critically low. Land immediately to avoid damaging the battery.

The voltage level can raise warnings as well, independently from the battery charge level. If the voltage indicator is red, you should land immediately.

6.2.2.3 CAMERA AND VIDEO RECORDING

Only on **ELIOS 1**, Camera mode indicator (11) is related to the current mode set by the pilot using the camera mode switch marked (C2-C1-A) on the remote controller.



Auto mode



Manual low / high ISO



Thermal camera

Both Cockpit and the camera on board the drone begin recording video as soon as the arming sequence is performed. An indicator on-screen shows a timer in red and a recording symbol. The time shown corresponds to the aircraft video recorder; the tablet also records a backup video for immediate review and backup purposes. You can view the backup videos in Device Storage/Flyability/Cockpit/Recordings; this process is detailed in [Checking video recordings](#).

Please note: The best video quality is always found on the drone's video SD-card. Due to the nature of the transmission link, the video received by the Android device has a higher compression rate, which adversely impacts the video quality.

6.2.2.4 LED LIGHTS STATUS



ELIOS 1



ELIOS 2

The LED lights status displays the power level of the lighting system and which panels are lit on ELIOS 2.

1. Light power

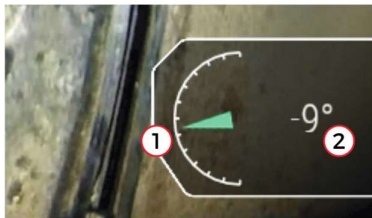
2. Strobing light is disabled
3. Left panel is ON
4. Close up panel is OFF
5. Left panel is ON
6. Auto close-up light is enabled

Note that you cannot set the LEDs to full power until the aircraft takes off. This is because to the heat generated by the LEDs needs to be cooled down by the propellers' airflow.

6.2.2.5 CONTROL MODE

Depending on the situation and pilot wishes, the aircraft can be in different modes. Please refer to the aircraft user manual to learn more.

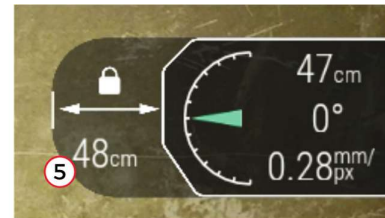
6.2.2.6 PAYLOAD INFORMATION



ELIOS 1



ELIOS 2



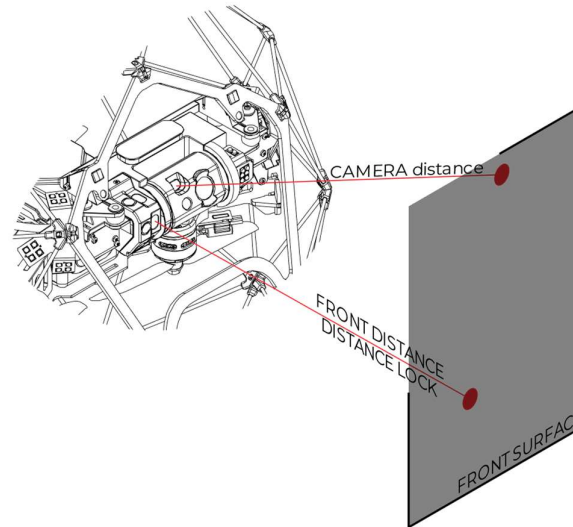
ELIOS 2
WITH DISTANCE LOCK

1. Tilt gauge of the camera head
2. Angle of the camera head
3. Only on **ELIOS 2**, camera distance to the surface in front. The distance sensor is parallel to the optical axis of the camera head; hence, its value depends on the angle of the camera. If the measurement quality is poor or the distance out of range, no value is displayed. Note that this measurement can be influenced by airborne dust, or a dirty sensor.
4. Only on **ELIOS 2**, Ground Sampling Distance (GSD). This is the resolution the user can expect on the center of the image provided no motion blur affects the image. The color indicates the image quality.

Camera distance	Indicator & color	Meaning
<20cm	Too close	The camera is too close from the surface, and the image will most likely be blurry.
≥20cm - <30cm	0.15mm/px	The image is a bit blurry, but the GSD is best.
≥30cm - ≤40cm	0.20mm/px	30cm is the focal point of the camera; the image is sharp with good GSD.
>40cm	>0.25mm/px	Above 40cm, the image is still sharp, but the GSD reduces with the distance.

The GSD is based on the camera distance measurement. If no camera measurement is available, no GSD can be displayed.

5. Only on **ELIOS 2**, Distance lock set distance. Displayed if the Distance Lock is activated. The displayed distance is the normal distance from the drone to the surface measured from the front distance sensor. It does not depend on the camera head angle. See illustration below. This distance can be fine tuned once established.



6.2.2.7 ALTIMETER

Zero-level of the altimeter is the altitude at which the aircraft is present when the battery is plugged in. It is possible to set a new zero reference by tapping the altimeter.

Altitude units (meters or feet) can be changed in the settings (see Image settings section)

6.2.2.8 HEADING

Keep in mind that by default there is no sensing of the North and the heading is thus relative to the aircraft startup heading unless absolute heading is enabled (only on ELIOS 1).

At any moment, it is possible to set the current aircraft heading as the new reference heading. Tap the compass to make the arrow point upwards for the current aircraft heading. Both heading and altitude information are stored in the logs and can be used in our Inspector software to help orientate and create situational awareness.

Only on ELIOS 1: an absolute heading option is available, taking advantage of the onboard magnetometer. Refer to [flight settings](#) for more information. When the aircraft is armed, and this option is active, the compass aligns with the magnetic North.



HEADING DRIFTS OVER TIME DEPENDING ON AIRCRAFT AND ENVIRONMENTAL CONDITIONS. IT IS A NAVIGATION AID, NOT AN ACCURATE MEASUREMENT TOOL. THE ABSOLUTE HEADING OPTION IN THE FLIGHT SETTINGS MAY IMPROVE THE ACCURACY IN SOME CONDITIONS.



ABSOLUTE HEADING CAN BE DISTURBED BY METALLIC STRUCTURES

6.2.2.9 SETTINGS BUTTON

The Settings button opens the [Settings screen](#).

6.2.2.10 THERMAL CAMERA TARGET

The frame shows the field of view of the thermal camera. Only the objects inside this frame will get their thermal images recorded. The frame can be changed and/or hidden in the settings menu; refer to the [Image settings](#) section.

6.2.2.11 WHEEL FUNCTION

On the entire screen, some values shown can be altered using the right wheel on the remote control. The currently Selected value is shown in blue between brackets, when this is the case.

The focused value depends on the camera mode choice and activation of the thermal camera feed. Lights intensity is controlled by keeping the Fn button pressed.



Selected setting (example: EV correction value)



Unselected setting

6.2.3 Thermal camera instrument panel

When the thermal camera view is active, the thermal camera target enlarges to the entire screen size so that the viewer keeps track of the reduced field of view.



White displays the hottest and black the coldest area on the current frame. The range is always automatically scaled from the coldest to the hottest temperature measured on the current frame.

The only available image setting in this mode is the contrast of the thermal image.

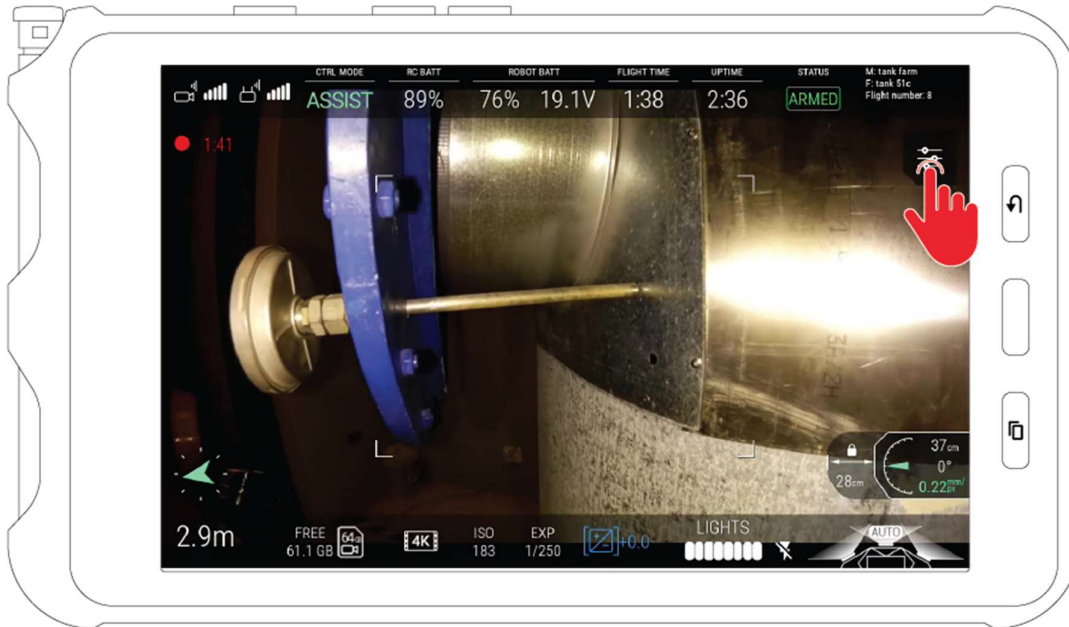


Scroll the settings wheel to change the contrast between the highest and lowest temperatures on the image.

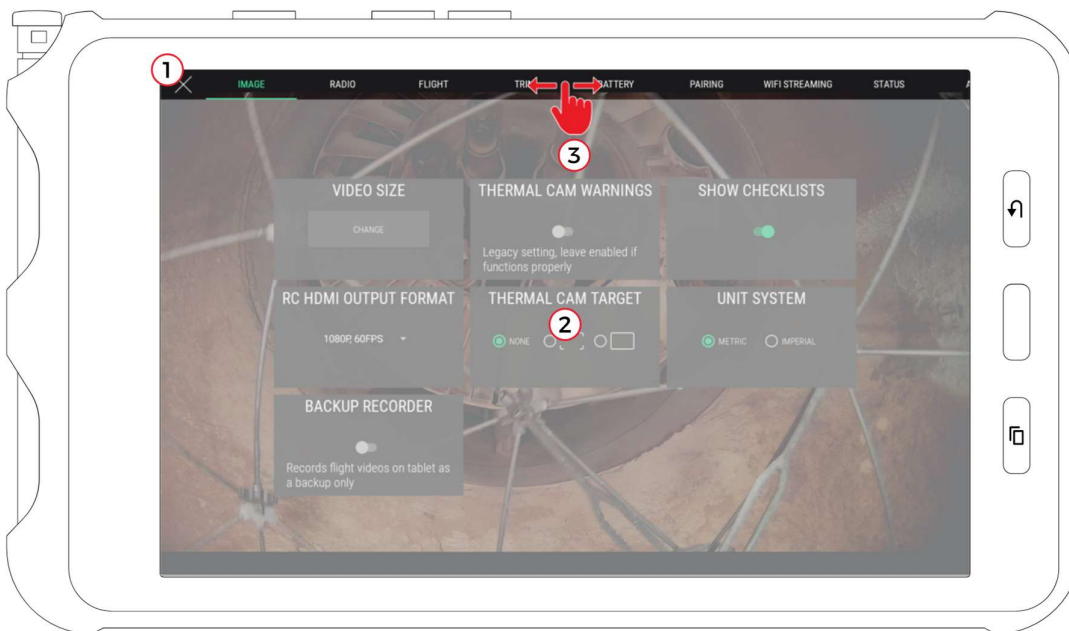
Switching between thermal and optical image does not alter the video recordings on the aircraft, as both are always recorded on the LOG and CAM SD cards respectively for later review. The same principle is valid for the thermal contrast setting.

6.3 Settings

The settings screen opens the options menu, allowing you to change various settings and parameters.



Press the Settings button on the main screen to open the settings screen.



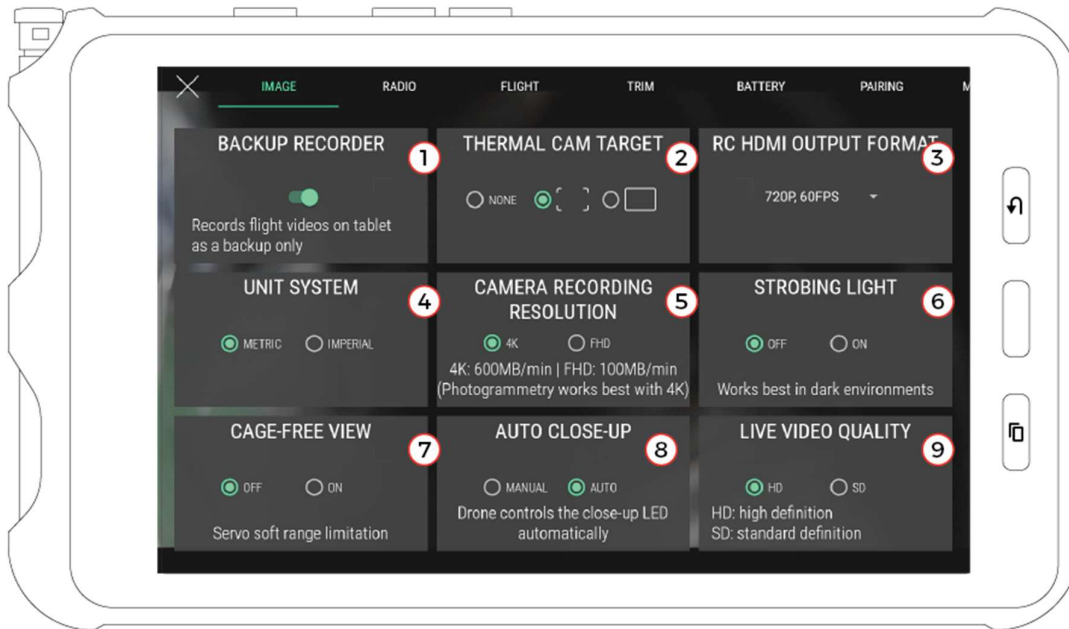
To close the setting screen and go back to the main screen, press the back button on the tablet or the on-screen close button (1) in the top left corner.

The settings screen shows multiple panels with settable parameters, which are detailed inside this section. Panels contents appear in the middle (2).

Tabs at the top give access to each panel. You can click on the tabs to view the corresponding panels or make a horizontal finger swipe gesture to go from one to another.

More tabs are available than shown on screen. A horizontal swipe gesture on the tab strip (3) scrolls its content to reveal the additional tabs.

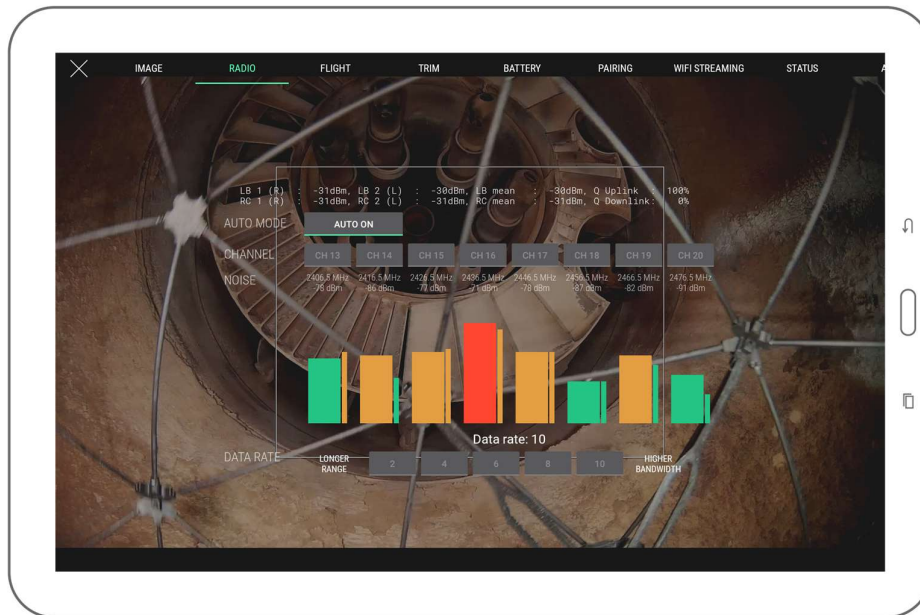
6.3.1 Image panel



1. Backup video recorder toggle (if on, the application will automatically record the live video stream when the drone is armed). We highly recommend leaving this switched on, as having this backup is extremely useful in case aircraft is lost. By default, video recording is enabled, except on specific tablet models on which this video recording feature is known to create instability.
2. Thermal camera field-of-vision delimiter shape, with the option to hide it
3. Remote controller HDMI output format* (sets video signal attributes for external monitor plugged on the remote controller HDMI port).
4. Unit system for altimeter (metric = meters, imperial = feet)
5. Set the camera resolution recording (Only on ELIOS 2, and cannot be changed during flight)
6. Only on ELIOS 2. When enabled, the lighting is 60% more powerful and uses 80% less power. As a result, your ELIOS 2 will fly longer, and deliver brighter and sharper images. It also simulates the a global shutter and therefore improves photogrammetry results. **DISCLAIMER:** The lights will flash at 30Hz and might create discomfort, dizziness and put epileptic persons at risk.
7. Only on ELIOS 2 –If enabled, the camera range is limited to +75° to -15°, delivering cage-free images. The pilot is still able to access the full panning range by forcing the panning either by holding the control wheel or by letting go and moving it again.
8. Only on ELIOS 2 – The close-up LED can be handled automatically by the aircraft or controlled manually. If in automatic mode, the close up light will turn on when the measured distance to an object is smaller than 90cm.
9. Only on ELIOS2 – if the HD video feed signal cable is damaged, you can use the SD video feed.

* Only the output signal from the remote controller is affected; the onboard camera of Elios delivers 30 frames per second even if the HDMI port video mode is set to a higher framerate

6.3.2 Radio panel



This panel displays detailed data about the radio link quality between the controller and the aircraft.

Regular flight operation should not require changing settings shown here. However, if you are in an environment challenged by parasite radio signals, have other aircraft flying in the same area or have particular constraints by plant radio equipment, you can select a specific channel.

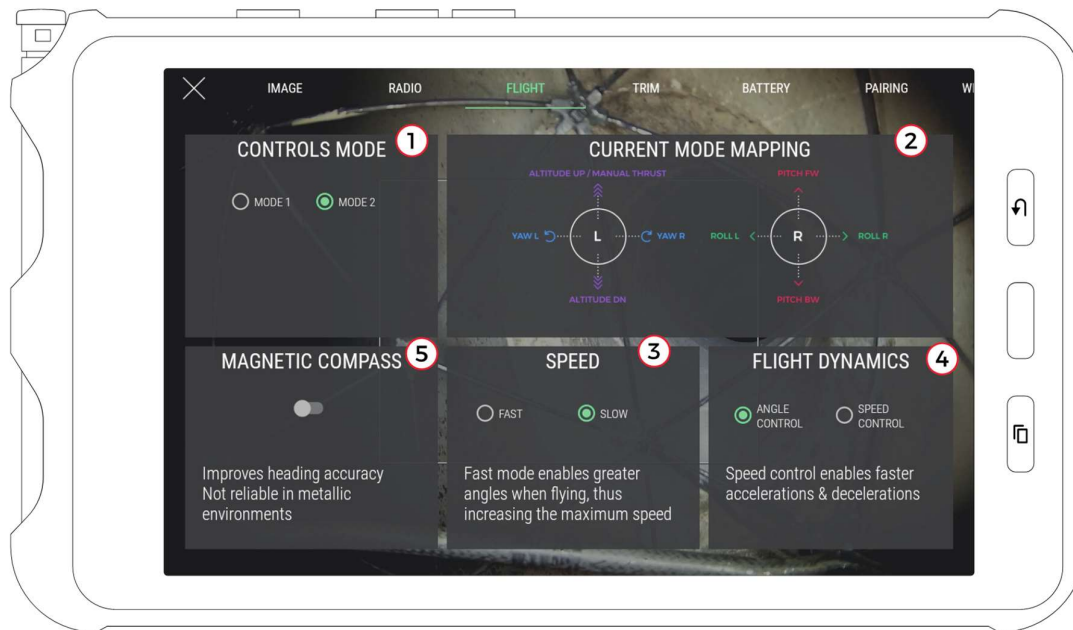
This screen shows the noise on each radio channel which the underlying system is able to use to stream the video feed. By default, the automatic mode is enabled, making an automatic jump to a different channel if the current one is deemed too busy for a quality link. You can force using a specific channel by tapping the corresponding button.

Noise readings are related to how busy each channel is. A higher reading probably means that other radio communications already operate on the same channel in the surroundings; the closer the radio operation happens, the bigger the noise. Below each channel, the large bar is an average reading, and the small one is an instantaneous reading. Colors go from green to orange, then red as the noise level is higher.

When manually choosing a channel, select one which has the lowest noise reading for best signal quality. Once you select the channel, you may see the corresponding noise level raising; this is expected behavior as radio transmission starts on the selected channel.

By tapping the Auto button, you can resume the automatic mode for channel choice.

6.3.3 Flight panel



This panel shows options related to flight controls and modes.

1. Controls mode (mode 1 and mode 2 are different mappings between stick axes and aircraft flight control axes)
2. Visualisation of the mapping of the selected controls mode
3. Only on ELIOS 1: Maximum horizontal speed (not using the pro mode)
4. Only on ELIOS 1: Flight dynamics choice (changes acceleration and deceleration behavior of aircraft)
 - a. Angle control (default behavior)
 - b. Speed control (extra acceleration and braking assistance)
5. Only on ELIOS 1: Magnetic compass (enables more accurate reading of heading by using magnetometer)

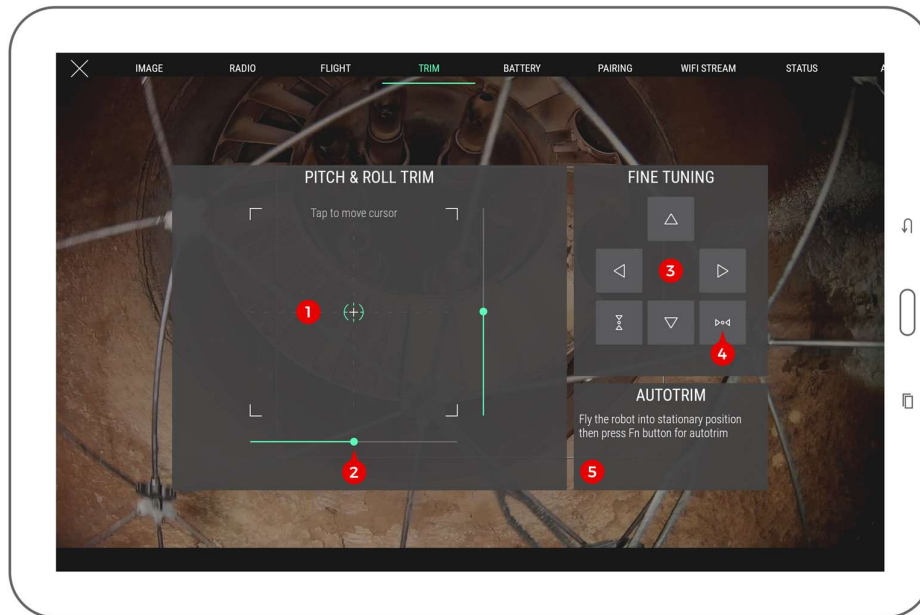
6.3.3.1 MAGNETIC COMPASS CONSIDERATIONS

Magnetic compass can be enabled for a more accurate reading of the heading using the magnetometer but should not be used in a metallic environment. Consider extra drift of the reading over time if disabled or in a metallic environment, as a metallic structure will locally deform the magnetic field.



THE MAGNETIC COMPASS CANNOT BE ENABLED DURING A FLIGHT FOR CALIBRATION REASONS. IT IS POSSIBLE TO DISABLE IT IF AIRBORNE; AFTERWARDS, IT CANNOT BE ENABLED AGAIN UNTIL AIRCRAFT IS DISARMED.

6.3.4 Trim panel



This panel allows the user to trim the drone should it be horizontally-drifting. Various controls are available to perform trimming.

1. Touch frame (tap to enable then drag the finger to set pitch and roll trim at once)
2. Pitch/roll sliders (drag to trim each axis separately)
3. Fine tuning buttons (tap arrows for small trim increments)
4. Trim axis reset button (reset trim to zero on each axis)
5. Autotrim function status (see autotrim procedure for more detail)

Trimming is usually performed while the aircraft is flying in a stable position in a wide open area to avoid turbulence.

To perform a proper trim operation, please refer to the [trimming procedure section](#).



IF THE TRIMMING PROCEDURE OF DJI GO WAS USED IN THE PAST, PLEASE RECALIBRATE THE STICKS USING THE RECALIBRATE FUNCTION OF DJI GO BEFORE USING THE TRIM FEATURE IN COCKPIT.



TRIM RANGE IS VOLUNTARILY LIMITED TO A PART OF THE FULL CONTROL RANGE. THIS PREVENTS CASES SUCH AS ACCIDENTALLY PUSHING THE TRIM VALUE UP TO THE MAXIMUM HORIZONTAL SPEED WHICH MAKES THE AIRCRAFT DIFFICULT TO STOP. THIS BEHAVIOUR MAY DIFFER IF YOU HAVE EXPERIENCE USING THE TRIM FUNCTION OF OTHER RADIO-CONTROLLED VEHICLES OR AIRCRAFT.

6.3.5 Battery panel



This panel shows data about the current battery status.

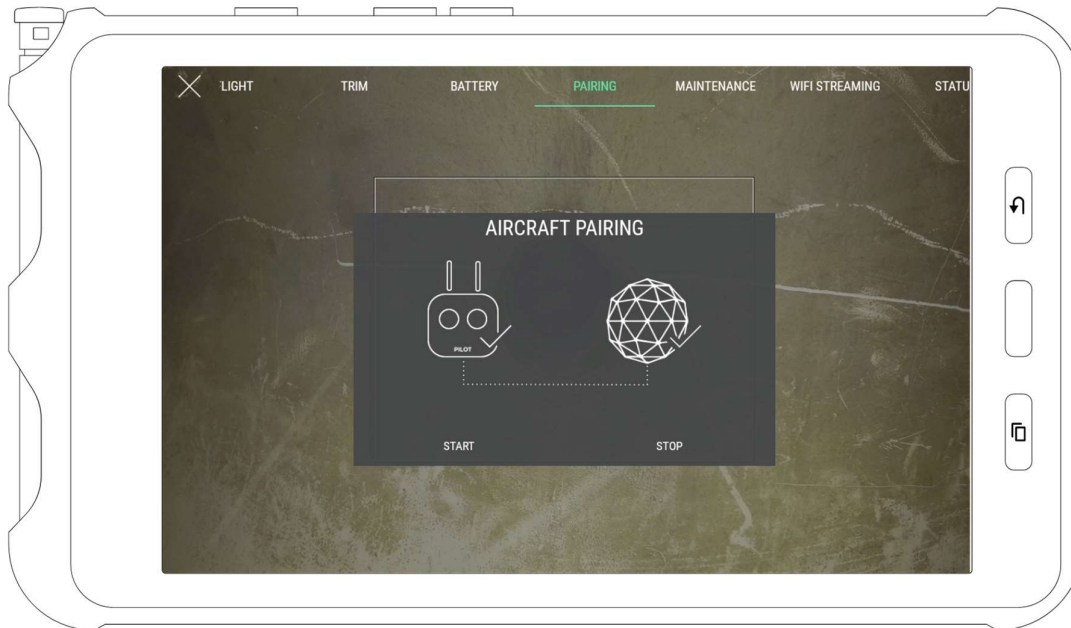
1. Aircraft battery charge
2. Aircraft battery voltage
3. Aircraft battery current
4. Time elapsed since aircraft battery was plugged in
5. Remote controller battery charge
6. Aircraft battery internal resistance. On ELIOS2: it is only measured during the arming sequence.
7. Tablet battery charge

Only on ELIOS 2:

8. Cell Balance
9. Number of cycles on current battery
10. Battery serial number and firmware version
11. Battery % where the autoland failsafe is activated
12. Battery Status
13. Battery temperature. For ideal performance this should be between 20 and 25°C.

Please refer to the aircraft and battery instructions for more detail about each of the above points.

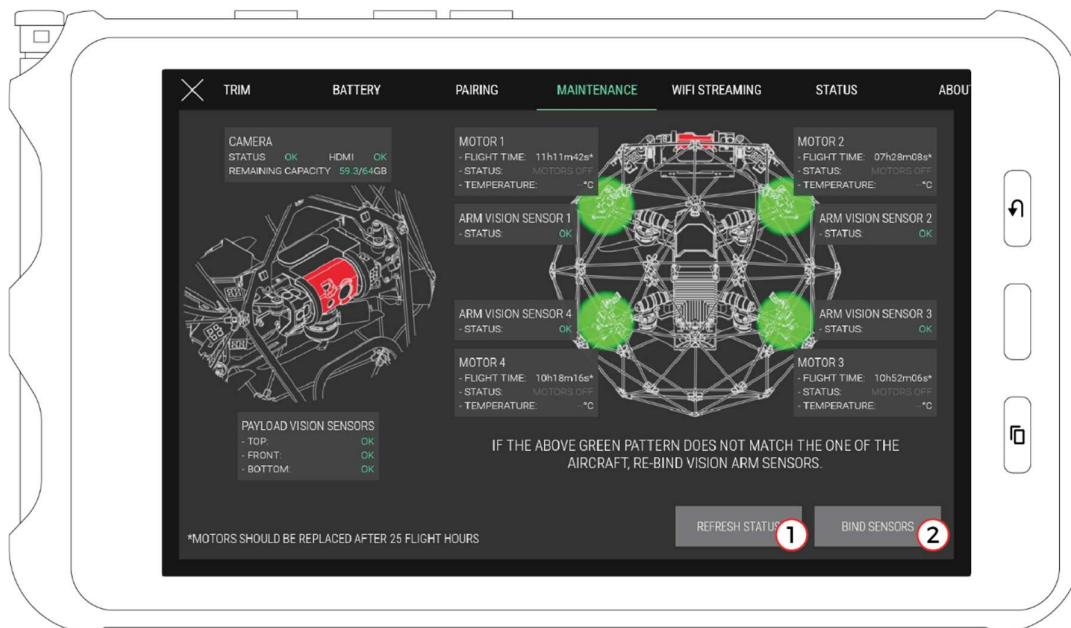
6.3.6 Pairing panel



This panel contains the commands to perform pairing operations between a controller and an aircraft.

To initiate a pairing sequence, press “start”. The ground unit starts beeping; push on the pairing button on aircraft. Pairing is complete when continuous beeping ends. Use the Stop button to interrupt the process manually. Refer to the aircraft manual to locate the pairing button.

6.3.7 Maintenance panel



Available only on **ELIOS 2**, the Maintenance panel gives an overview of the status of:

- The optical and distance sensors
- Motors
- Camera/SD card

Two buttons are at your disposal:

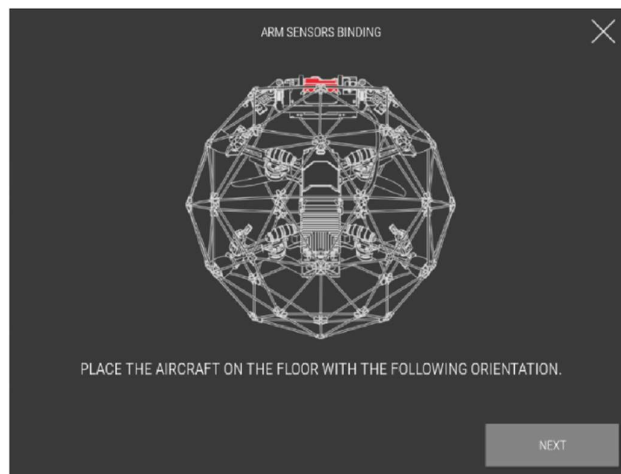
- 1- Refresh all information
- 2- Rebind the sensors

The panel displays the status of the sensors. They can be:

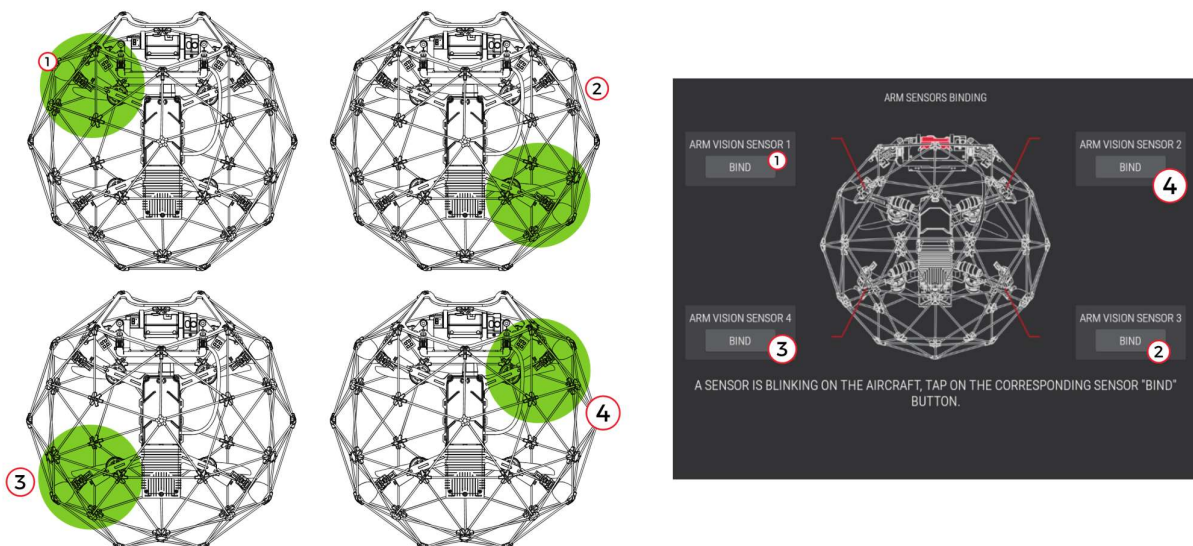
- OK: Working properly
- UNBOUND: Working properly but not physically assigned on the aircraft
- DAMAGED: The sensor may not be working properly. Contact support.
- BROKEN: The sensor is not working anymore and has to be changed.

Note: It is possible to fly with damaged or broken sensors. But as the stability depends on those sensors, the performance of the aircraft in ASSIST control mode might be reduced.

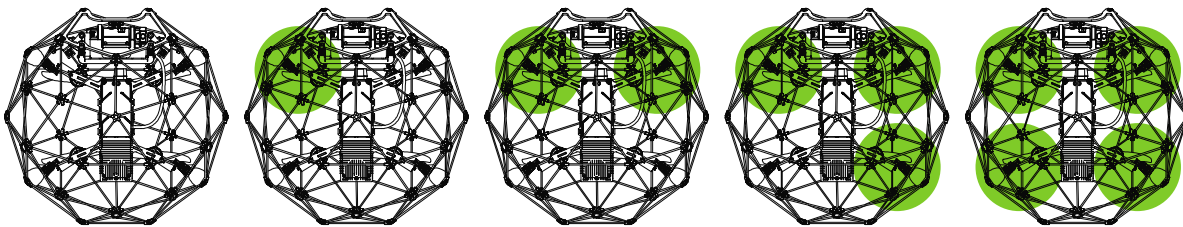
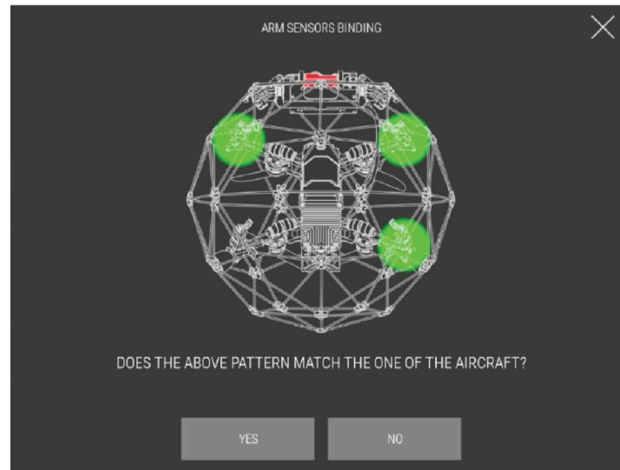
After a sensor has been replaced, it must be calibrated to its specific location on the drone. The user must provide this information. By tapping on Bind sensor (2), the user will start the binding procedure and will be guided through the process.



Place the aircraft as shown on the image. Once ready, the aircraft will make the sensor blink one by one. By tapping on the Bind button of the corresponding sensor in the application, the aircraft know the position of each sensor.



The above illustration is an example of the binding pattern going top-left, bottom-right, top-right, bottom-left. Please note that this is an example, and the binding pattern is random.



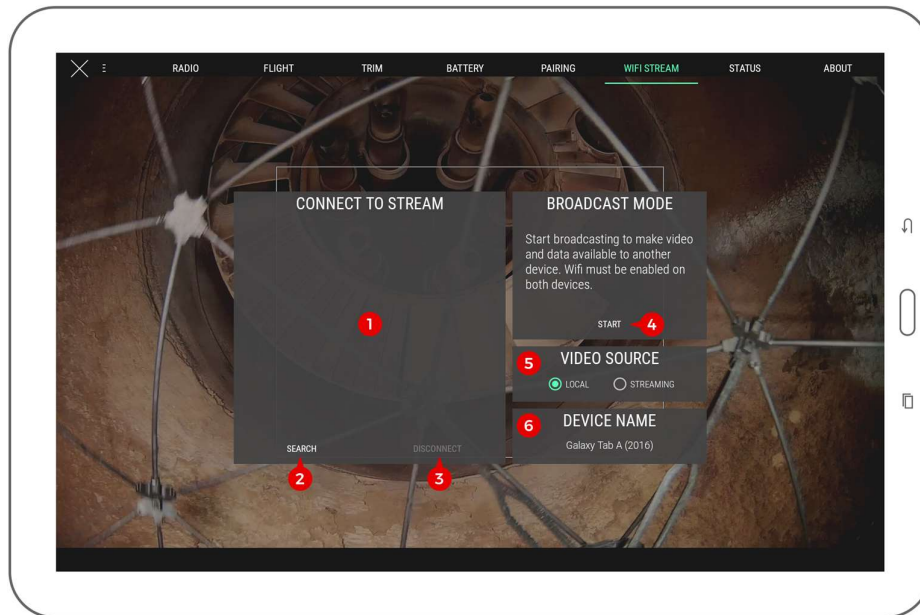
Upon completion, the user is asked to make sure the blinking pattern is the same as shown in the next panel.

If not, the binding process has to be started again.



INCORRECTLY BINDING SENSORS WILL RESULT IN LOSS OF STABILITY AND UNPREDICTABLE FLIGHT BEHAVIOR. PLEASE FOLLOW THE BINDING PROCESS CAREFULLY.

6.3.8 Wifi streaming panel

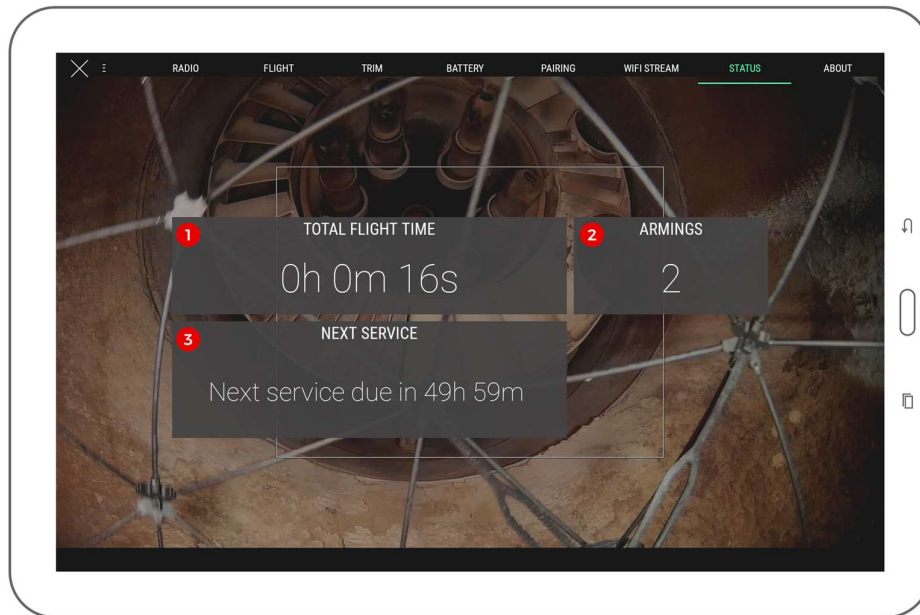


This panel controls everything related to data streaming between two devices through wifi. Wifi streaming allows using a secondary device as a simple viewer without needing to connect it to an actual remote controller; thus, two people can monitor a flight while using a single remote controller. Wifi streaming requires all devices to support Wi-Fi Direct.

Detailed processes on how to work with wifi streaming are explained in standard procedures. See the [wifi streaming procedures](#).

1. List of detected Wi-Fi direct devices (used to connect to a streaming device when in receiving role)
2. Streaming devices search button (starts a new search of devices around)
3. Disconnect button (disconnects active connection, available when a connection is established)
4. Broadcast start/stop button (starts streaming from the current device and makes it visible from other devices)
5. Video source selection for easy switching
Local: locally-connected RC and aircraft through USB cable (default)
Streaming: video streamed over wi-fi from another device
6. Name of this Android device as listed in wi-fi system options; refer to this name when searching the current device from another device in receiving role.

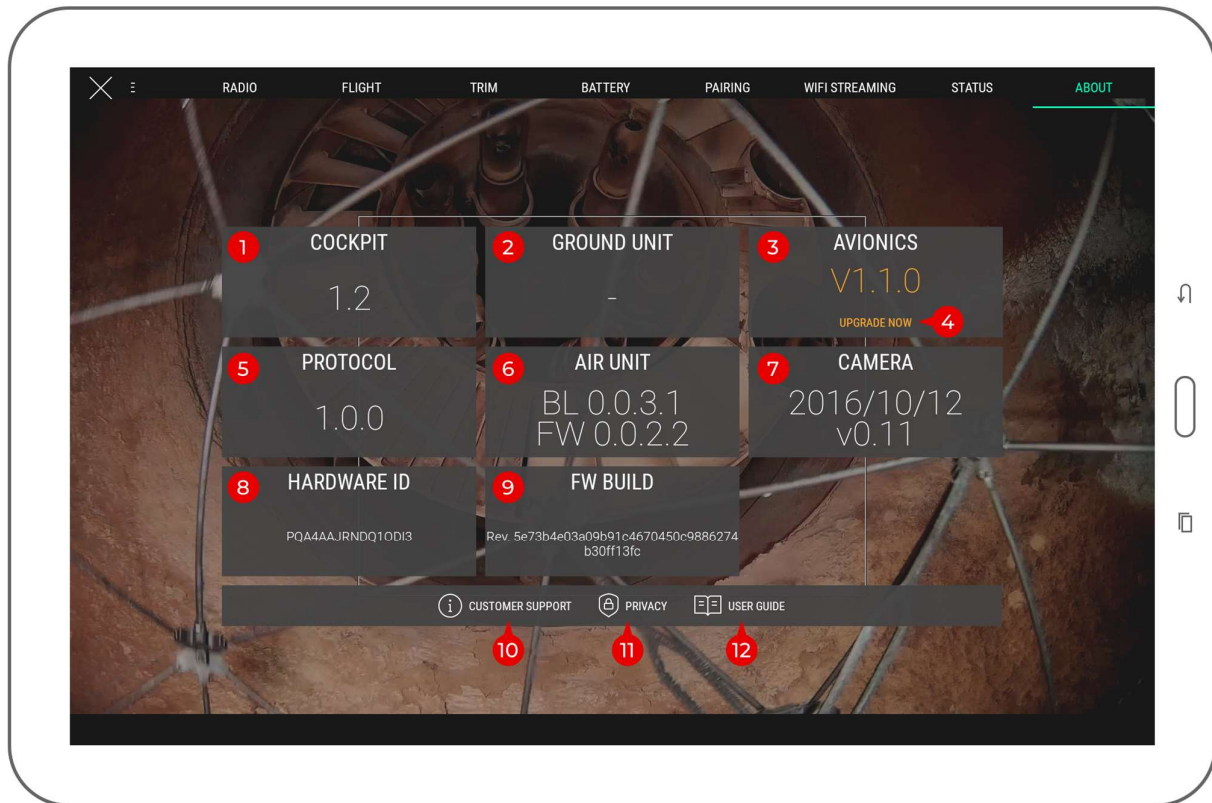
6.3.9 Status panel



This panel shows the status counters of the aircraft, including total flight time, information about the next planned maintenance, and the number of armings.

1. Total flight time counter
2. Total armings counter
3. Only on ELIOS 1, flight time left before next required aircraft maintenance. This must be performed at a 50h interval.

6.3.10 About panel

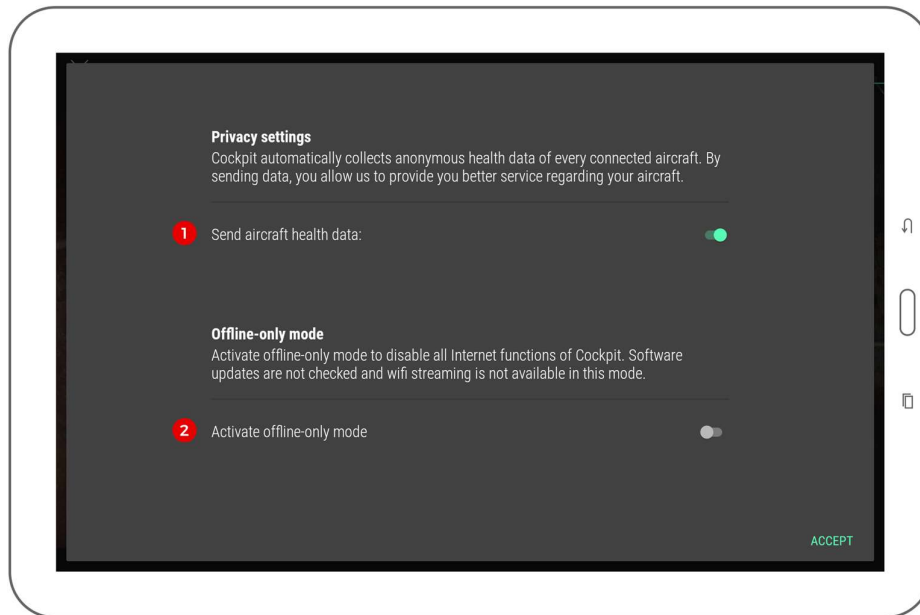


The different version numbers and identifiers of the Elios system are mentioned on this page.

In any incident report, please make sure to include the data shown here; this information helps Flyability to troubleshoot the issue you are experiencing and expedites incident response time.

1. Cockpit version
2. Ground unit (remote controller firmware) version
3. Avionics version of connected aircraft
4. Only on ELIOS 1 – Avionics upgrade button (visible if connected aircraft requires a firmware upgrade, open the firmware upgrade tool)
5. Protocol version of connected aircraft
6. Air unit version of connected aircraft
7. Camera firmware version of connected aircraft
8. Hardware identifier of connected aircraft
9. Build revision of connected aircraft
10. Customer support information button (shows support contact information)
11. Privacy settings button (opens the [privacy settings window](#))
12. User guide button (shows this user guide)

6.3.11 Privacy settings



Accessed from the About panel, privacy settings screen contains settings related to privacy and data security.

1. Send aircraft health data (enables Flyability to receive periodic updates about aircraft flight time and prepare better maintenance procedures)
2. Activate offline-only mode (disables all Internet-related features of Cockpit)

6.3.11.1 OFFLINE-ONLY MODE

Operators in sensitive sites may have to disable all Internet access from their devices to comply with company policies.

Offline-only mode disables all Internet functions of Cockpit, including:

- Software updates check
- Sending aircraft health data to Flyability

You will need to actively check for software updates on your own to get them as they are available.

6.4 Common procedures

This chapter describes processes used in typical usage cases

6.4.1.1 AIRCRAFT FIRMWARE UPGRADE

Refer to the Overview and setup chapter, in the [Firmware upgrade](#) section.

6.4.1.2 CALIBRATING / TRIMMING AIRCRAFT

Trimming the aircraft is a mechanism to compensate for a horizontal drift while no controls are touched.

For a successful trimming, you need to be able to fly in a wide-open space with no obstacles or people in the area for safety reasons. Turbulence can occur if the area is too narrow.



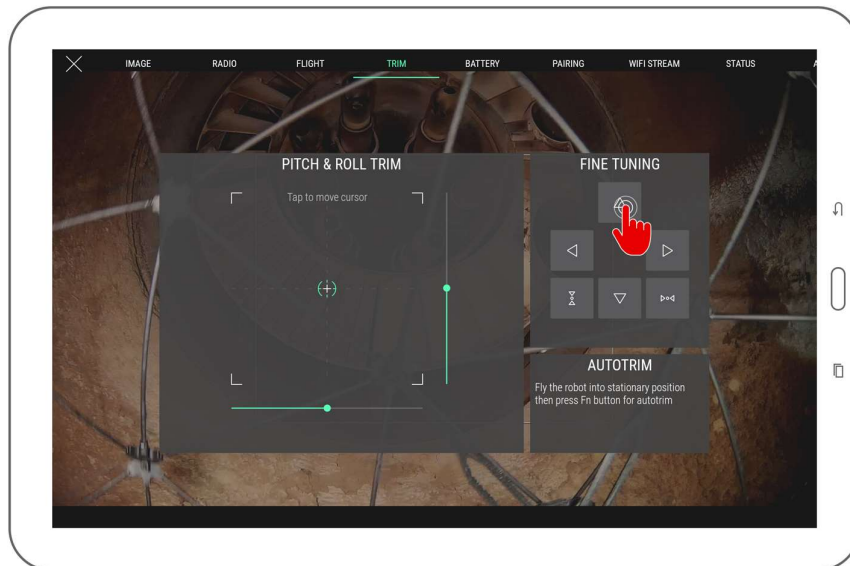
IF THE TRIMMING PROCEDURE OF DJI GO WAS USED IN THE PAST, PLEASE RECALIBRATE THE STICKS BEFORE USING THE TRIM FEATURE IN COCKPIT.



TRIM RANGE IS VOLUNTARILY LIMITED TO A PART OF THE FULL CONTROL RANGE. THIS PREVENTS CASES SUCH AS ACCIDENTALLY PUSHING THE TRIM VALUE UP TO THE MAXIMUM HORIZONTAL SPEED WHICH MAKES THE AIRCRAFT DIFFICULT TO STOP.

6.4.1.3 MANUAL TRIMMING

1. Have the aircraft flying in a safe place, if possible open enough to avoid airflows from the propellers blow back on the aircraft.
2. Open trim panel in settings.
3. For accurate trimming, tap the arrows on the upper right pad. You can alternately use the trackpad to set a trim position.

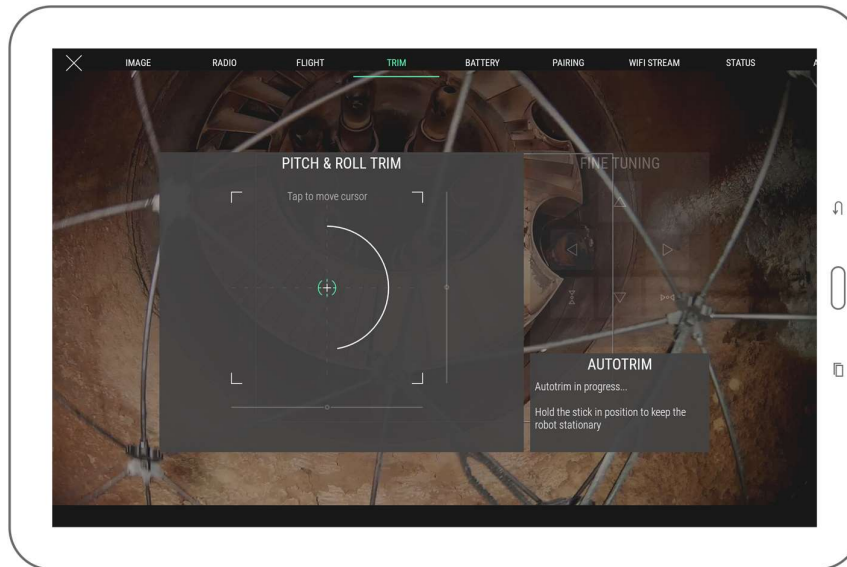


6.4.1.4 USING THE AUTOTRIM FUNCTION

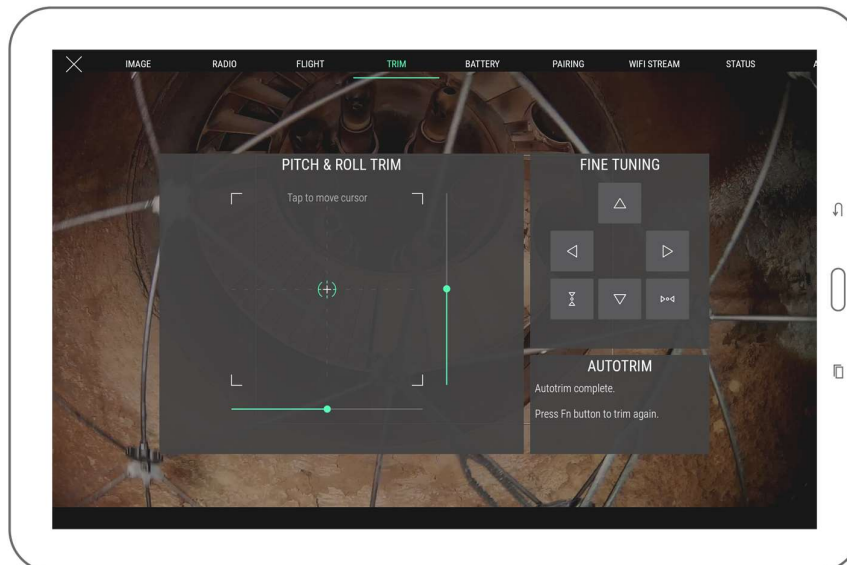
1. Have the aircraft flying in a safe place, if possible open enough to avoid airflows from the propellers blow back on the aircraft.
2. Open trim panel in settings.

Using the pitch & roll stick, find the position in which the aircraft is stationary. The small cross indicates the current stick position relative to the current trim. Don't use aggressive stick motions, but instead try to find a constant stick position combination that stabilizes the aircraft and prevents it from drifting horizontally.

3. Press the Fn button on the remote controller to begin recording.
4. While the recording progress bar fills up on the screen, hold the stick into the position that makes the aircraft steady. During this moment, values from the stick are collected to compute an average that will be the new trim position.



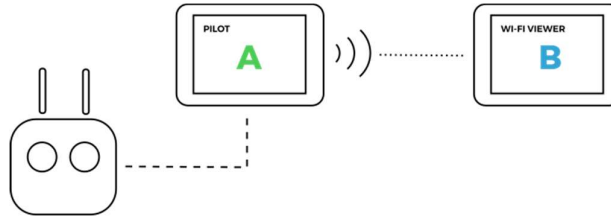
5. New position is then recorded unless the stick has moved too much during the recording. The trim target takes the position of the small cross when recorded. Success is confirmed by the message shown in the Autotrim box on the screen and a sound signal.



6. You can attempt autotrim as many times as you want in a row. Each autotrim take is relative to the previous trim setting; all that is needed is to fly the aircraft in the steady position, and the application takes care of saving it.

6.4.2 Streaming video and telemetry to a second tablet

Wifi streaming allows using a secondary device as a simple viewer without needing to connect it to an actual remote controller; thus, two people can monitor a flight while using a single remote controller. Wifi streaming requires all devices to support Wi-Fi Direct.



In addition, during the use of a range extender and a camera operator remote controller, it is usually not possible to receive video signal from the camera operator RC due to the way transmission works as it needs to be in direct line of transmission with the aircraft; only the controls will be working in such scenario as these are relayed through the pilot RC. Therefore, wifi streaming is a handy way to catch live video while using a camera operator RC and the range extender at the same time.

In this section:

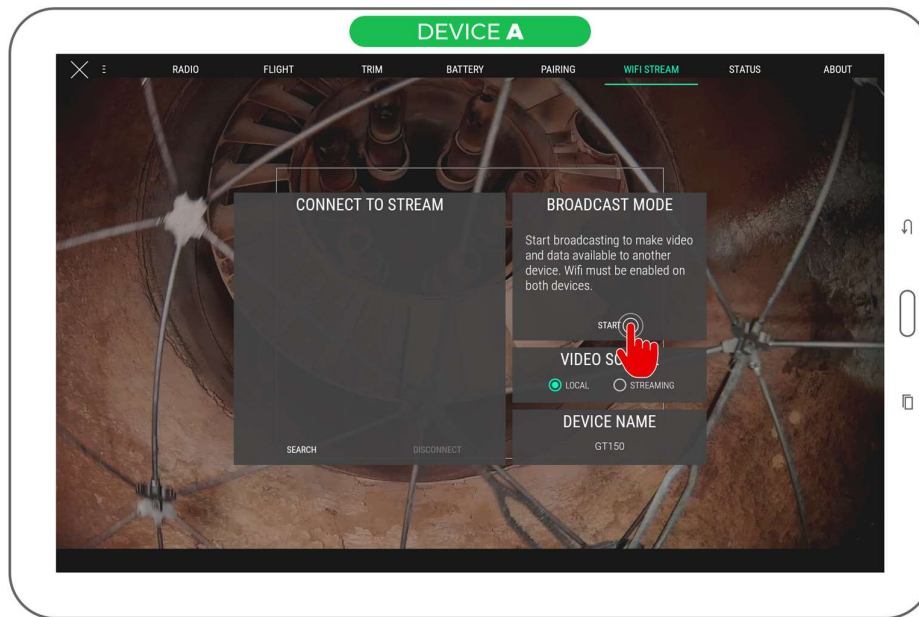
- The Android device running Cockpit emitting the video stream, attached to the main pilot controller, is named as “device A”
- The Android device running Cockpit that receives the video stream is named as “device B”

6.4.2.1 STARTING A WIFI STREAMING SESSION

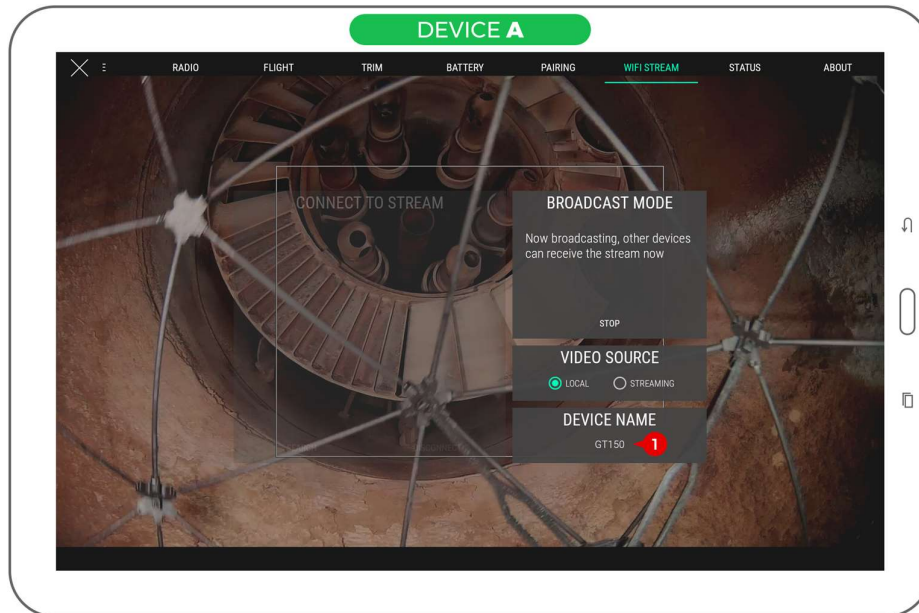
One remote controller and two devices running Cockpit are required. Device A is the one connected to the remote controller; device B is not connected to any controller and will receive the streaming video.



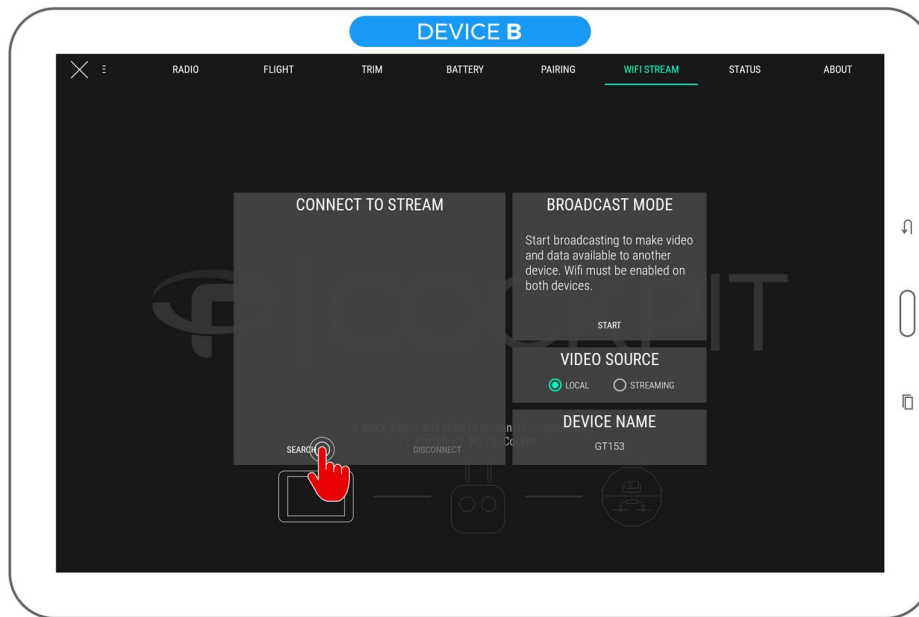
1. Connect device A to the remote controller. Start Cockpit on both devices.
2. Open Settings and go to Wifi streaming panel on device A.
3. Press Start (broadcast mode) button on device A and make sure the video source is set to “local”.



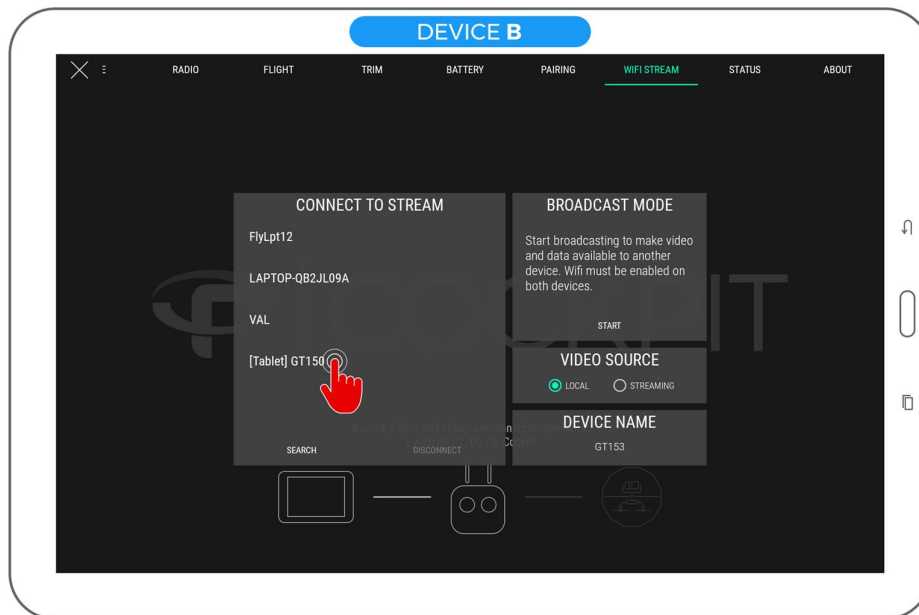
4. Broadcast mode block is now showing that broadcasting is active. Locate the device name (1); it will be the one we will select on the other side to initiate the connection.



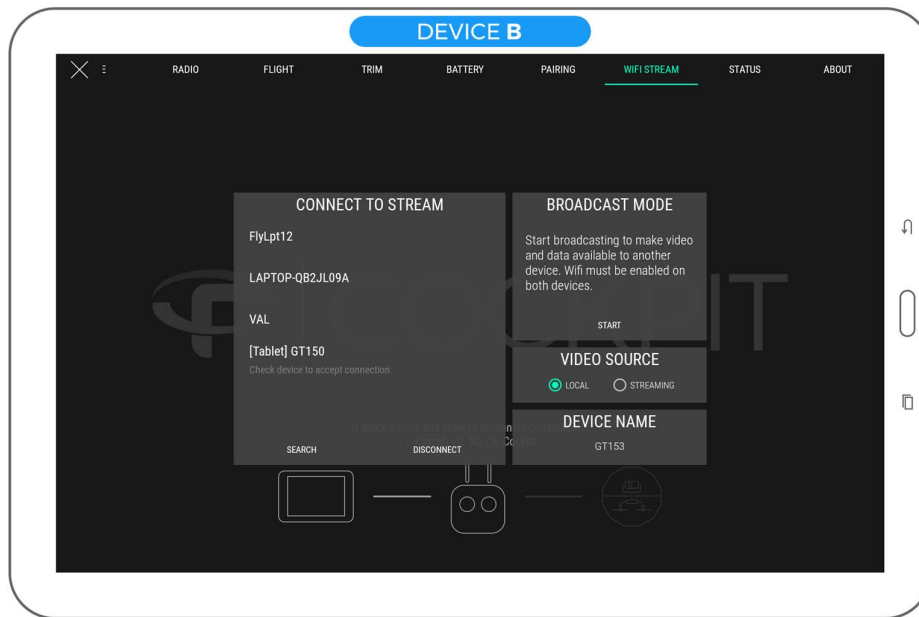
5. Press Search to begin searching for streaming sources on device B.



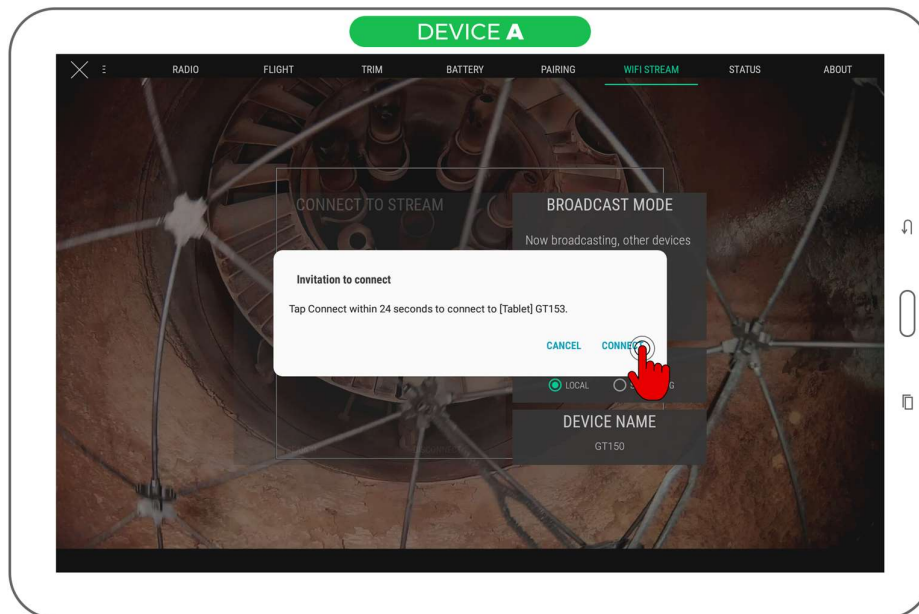
6. On device B, click the source named as previously seen on device A in the list. Be careful, some incompatible Wi-Fi Direct peripherals such as printers may be listed here. Be sure to match by name.



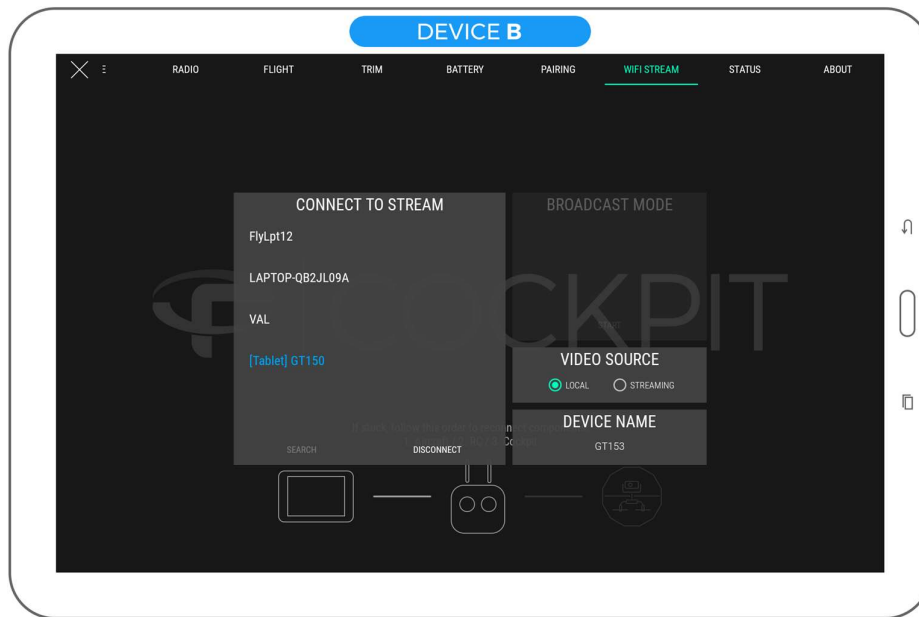
7. The device is now marked as waiting for acceptance from the other side.



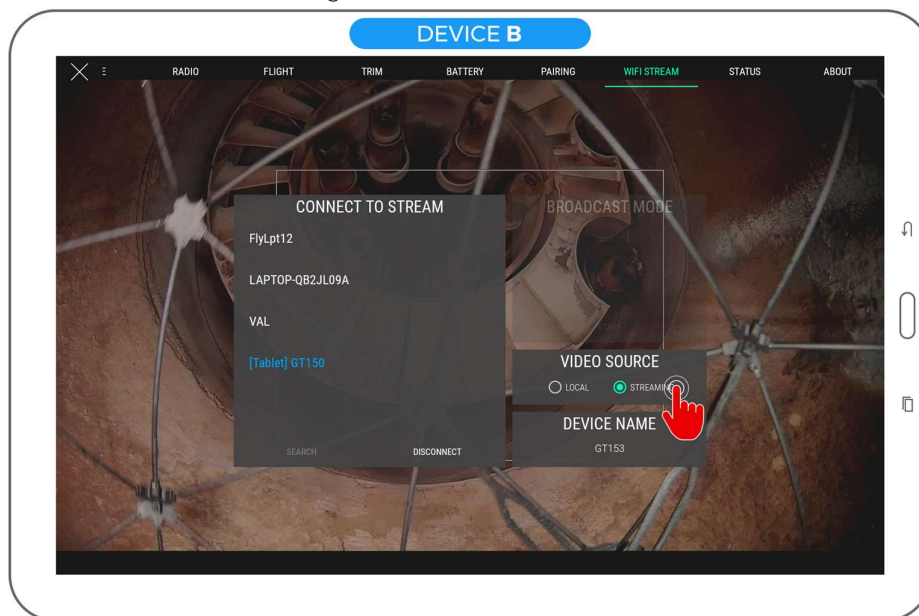
8. Accept Wi-Fi Direct connection on device A by acknowledging the system dialog requesting so.



9. When the connection is established, device A appears in blue on device B's list.

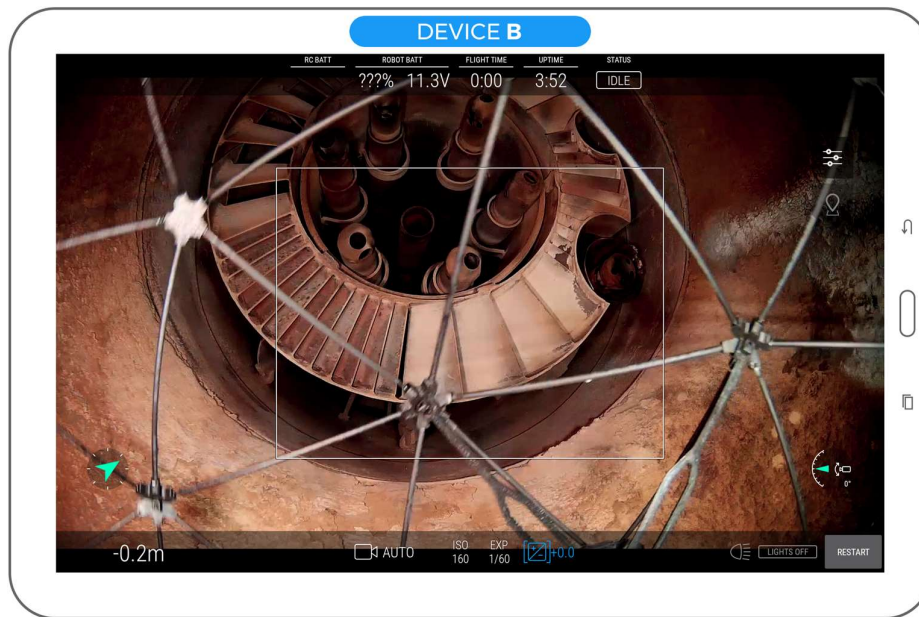


10. Set the video source to "streaming" on device B.



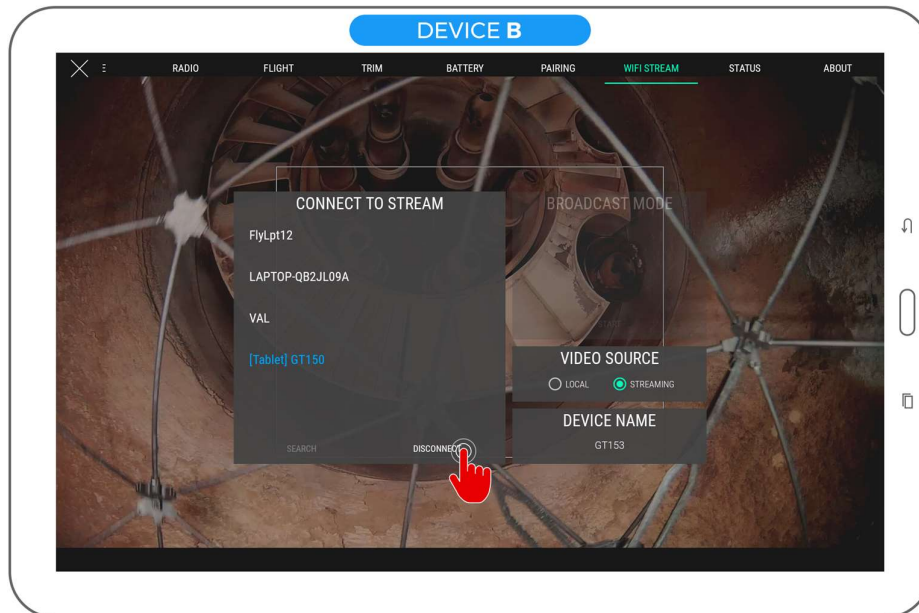
11. Video and telemetry should be visible on the screen of device B now. Exit settings to view telemetry.

12. Note: some information is not available as a wi-fi streaming receiver.

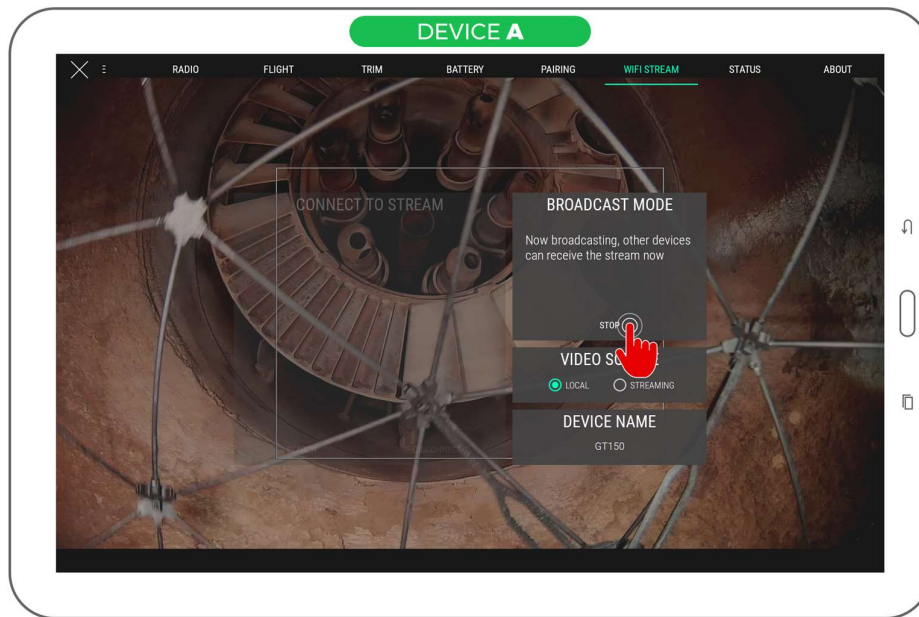


6.4.2.2 STOPPING THE STREAMING SESSION

1. On device B, press the Disconnect button below the streaming sources list.



2. On device A, press the Stop server button in Broadcast mode section.



3. Select "local" video source on device B to resume viewing video from a locally connected RC.



6.4.2.3 USING A CAMERA OPERATOR WITH RANGE EXTENDER

Two remote controllers (one being pilot and the other being camera operator) and two devices running Cockpit are required, together with the Flyability range extender. We assume the pilot and camera operator pairing is already active; if it is not the case, see the section related to this to achieve pairing first.

The device attached to the RC used as pilot is named "Device A", while the one attached to the RC used as camera operator is named "Device B".

1. Connect device A to the remote controller used as pilot, device B to the remote controller used as camera operator. Start Cockpit on both devices.
2. Continue by following the steps in [Starting a wifi streaming session](#).

Now, at any time, you may switch to the "local" source to view footage coming directly from the camera operator RC. Switch again to "streaming" source to resume footage coming from device A.

6.4.3 Checking streamed video recordings

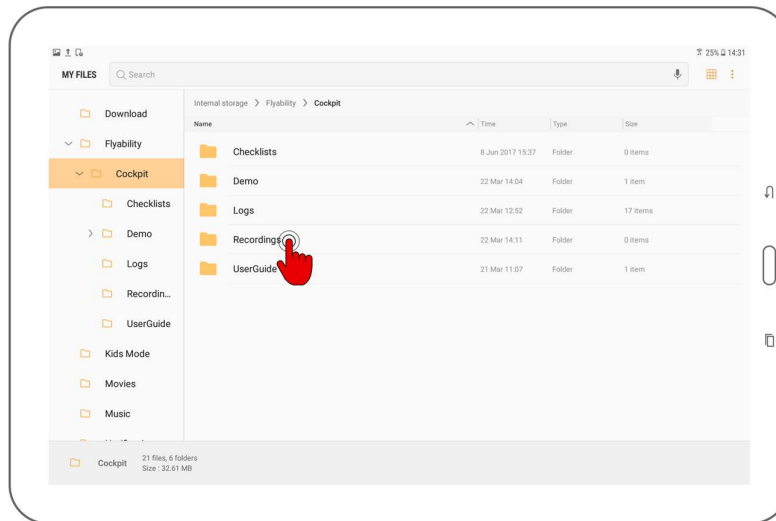
Cockpit automatically starts recording the tablet screen when the aircraft is flying and stops when the flight is over. Telemetry in the form of movie subtitles is also recorded.

Main uses of streamed video recordings are:

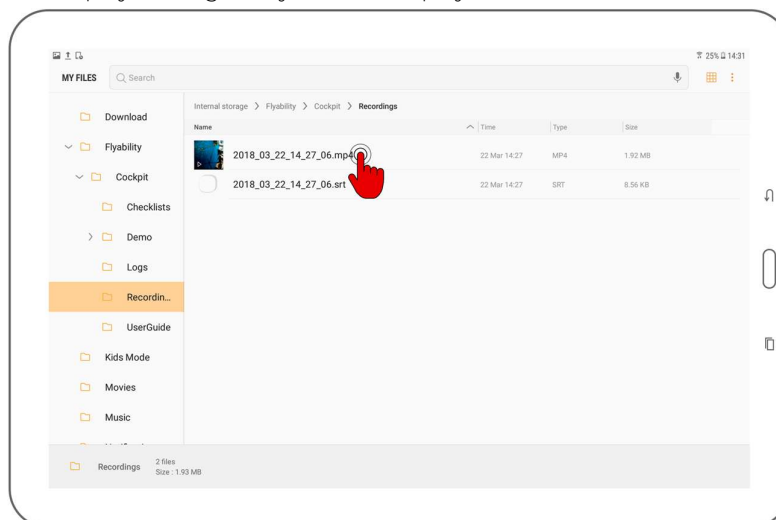
1. Immediate review of flight on the tablet, without extracting data from SD card
2. Backup in case aircraft cannot be recovered

Such recordings have lower quality than the onboard footage. To review those videos:

1. Open the file manager application on your Android device
2. Browse into Device Storage/Flyability/Cockpit/Recordings



3. Find the video files corresponding to your previous flights. Files are named by date and time of recording. SRT-files accompanies videos recorded with Cockpit 1.2 and later; they contain recorded telemetry in the form of subtitles.
4. Tap a video file to play it using the system video player.




6.4.3.1 VIDEO STORAGE LIMITS

For performance and space management, once the total size of the recordings folder exceeds 4GB, the oldest videos are automatically deleted as new footage is recorded. Please mind doing backups of such files in a timely manner if you would like to keep them.

6.5 Warning messages

To ensure the best experience with Elios and prevent failures, the application will issue warnings when necessary. It is essential to take action as described in the table below when such warnings appear.



FAILURE TO TAKE THE NECESSARY ACTIONS AFTER A WARNING CAN HAVE CONSEQUENCES RANGING FROM DIFFICULTY TO OPERATE TO SEVERE DAMAGE, LOSS OR PERSONAL INJURY.

6.5.1 Warning types

Multiple levels of importance are given to different warning messages, expressed using different colors.

COLOR	SEVERITY	EXPLANATION
Blue	Information	Advice for improving the user experience of the Elios system; gives recommended actions which are good for most cases but can be ignored depending on the pilot skill level.
Yellow	Warning	Point that requires attention.
Red	Critical / Error	Point that requires immediate action. Safety of aircraft, people, and property can be impacted, or flight can be made impossible.

6.5.2 Audible warnings

Low battery warnings trigger a flashing frame around the screen and an audible tone.

Make sure the System sound level of the tablet is raised so that the alarm tone can be heard, especially if flights take place in a noisy environment.

6.5.3 Error Messages

Following is a list of actions that should be taken for a particular error or warning message.

6.5.3.1 CONTROL AND AVIONICS

MESSAGE	REQUIRED ACTION / EXPLANATION
Stability sensors damaged - Poor ASSIST stability expected.	Multiple stability sensors infrared light are not working. The stability of the aircraft in ASSIST in dark environment might diminish drastically. If the issue persist after restarting the aircraft, the sensor must be changed. Access the maintenance tab in cockpit for further diagnosis. Contact Flyability support for further help.
Stability sensor unresponsive - Poor ASSIST stability expected.	One or more stability sensors are not responding. The stability of the aircraft in ASSIST in dark environment might diminish drastically. If the issue persist after restarting the aircraft, the sensor must be changed. Access the maintenance tab in cockpit for further diagnosis. Contact Flyability support for further help.
Stability sensor unresponsive - ASSIST stability performance diminished.	One or more stability sensors are not responding. The stability of the aircraft in ASSIST might slightly diminish. If the issue persist after restarting the aircraft, the sensor must be changed.

	Access the maintenance tab in cockpit for further diagnosis. Contact Flyability support for further help.
Stability sensors damaged - ASSIST stability performance diminished.	One stability sensor infrared light is not working. The stability of the aircraft in ASSIST in dark environment might slightly diminish. If the issue persist after restarting the aircraft, the sensor must be changed. Access the maintenance tab in cockpit for further diagnosis. Contact Flyability support for further help.
Sensor unbound - Binding procedure required	The stability sensors mapping is incorrect, this sometimes happens after firmware updates or replacement of a sensor. Go to the maintenance panel to re-assign the sensor mapping.
Old firmware - Refer to the manual to learn how to upgrade your aircraft	The aircraft firmware has to be updated.
Old firmware - please upgrade	The aircraft runs outdated Avionics Firmware. To the benefit of all the newest features of Cockpit, please upgrade the aircraft with the latest Avionics version. You typically see this warning after installing a new version of Cockpit.
Magnetometer calibration failure	The magnetometer has failed to calibrate during the arming sequence. This can be caused by the aircraft being moved or blocked. Do not move the aircraft while the calibration takes place, and make sure it is on a stable surface.
Heading calibration in progress, do not block aircraft rotation	The aircraft is performing the calibration of its magnetometer for a more accurate heading measurement. Do not touch, move, or interfere with the aircraft rotation.
Not in ASSIST mode. Move switch to C1 – ASSIST mode and release PRO MODE button, to be able to arm the drone.	ELIOS 2 can't be armed if the control mode is not ASSIST. Place the top left control mode switch on the remote control to C1 – ASSIST.
Manual thrust engaged. Move switch down before arming and for altitude hold	The altitude control lever is in the thrust position. Dismiss this warning if you are comfortable flying in this advanced mode, or switch to altitude hold mode instead. The drone will not arm in this mode.
Pro mode engaged. Release button to slow down.	Pro mode allows for more responsive attitude control. To be used in gusty conditions when high speed is required. Flying in Pro mode is difficult and voids the warranty.
Service overdue by ___ s - Warranty may be void	The service of the aircraft is overdue. Please contact Flyability.
Drone firmware updating - do not unplug battery	The aircraft is updating their firmware. It is critical not to turn off the aircraft, or the motors will be irreversibly damaged.
Drone initializing - keep it still on the ground	The IMU is being calibrated, requiring the drone to remain perfectly still. Please wait until completion. Upon the disappearance of the message, the aircraft can be armed.

Aircraft is busy. Wait before arming or unplugging the battery	<p>After being switched on, the camera is starting up and initializing the video stream.</p> <p>OR</p> <p>After a flight, the camera needs to and save the recorded video files correctly. If the battery is unplugged during this procedure, video footage and still images may be lost.</p>
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6.5.3.2 BATTERY

MESSAGE	REQUIRED ACTION / EXPLANATION
Critically low battery - Land now	Aircraft battery has reached a very low level. This is critical; immediately land the aircraft in safe conditions and replace the battery with a fully charged one to continue flying. Discharging a battery to a too low voltage can damage it irreversibly
Cold or damaged battery - Cannot fly	<p>The onboard system has evaluated the battery as risky. Batteries with the same conditions can have critical issues during flight, including loss of power during flight and crash even if still charged at a good level. Arming is impossible in this situation for safety reasons.</p> <p>Replace the battery before flight.</p> <p>If you are in a cold environment such as during winter, the battery can be faulty due to the low temperature, although in good condition. Replace the battery with one at a normal ambient temperature (typically 10°C to 30°C). One possibility to keep batteries warm is by using a special LiPo-safe bag with built-in electric warmer. Please refer to the battery safety guidelines for more information.</p> <p>Please refer to the Elios 1 instructions for more information about battery handling specifics.</p>
Critically low battery voltage - Land now	Aircraft battery has reached a very low level. This is critical; immediately land the aircraft in safe conditions and replace the battery with a fully charged one to continue flying. Discharging a battery to a too low voltage can damage it irreversibly.
MAX BATTERY LIFECYCLE REACHED, ...	<p>Battery performance is guaranteed for 40 discharge cycles. This warning is displayed when the battery has exceeded 40 cycles, warranty is void. Use a newer battery.</p> <p>State of charge % will not be indicated on flight display during flight.</p>
Battery Error	One or more battery diagnosis parameters are out of bounds, consult the battery settings panel for further diagnosis. Not safe to fly, use another battery.
Battery Communication Error	The battery management system is unresponsive, reconnect and try again. If the problem persists use a different battery.
Battery Warning	One or more battery diagnosis parameters are close to their limits, consult the battery settings panel for further diagnosis. Fly with caution, or use another battery.
Battery level unknown - Use voltage and time	The battery that was plugged was not full, and the drone is not able to evaluate the real charge. It is advised to use a freshly charged battery instead. If the problem persists even when the battery was freshly charged the battery may be worn out and should be replaced.

	With an aircraft running the latest firmware, when the critical battery voltage level is reached, the corresponding warning is shown anyway with the associated alarm sound
Battery is getting old, contact support to buy new ones. You have X remaining cycles.	Battery performance is guaranteed for 40 discharge cycles. This warning is displayed when the battery has over 35 cycles.
Controller battery low	Controller battery is low. Even if the controller does not discharge as fast as the aircraft, consider charging it soon

6.5.3.3 PROPULSION

MESSAGE	REQUIRED ACTION / EXPLANATION
Propulsion system failure	Failure detected in the aircraft propulsion system. Check that propellers are in good condition, tightly attached to the motors and each one is mounted to a motor with the correct direction of rotation. A propeller may be broken, loose, or in the wrong place; This can also signal a motor failure. If you are confident with the proper tightening of propellers and correct state of motors, Try arming the aircraft again
Motor communication error - drone cannot fly	A communication issue occurred between the aircraft and its motors. You must try to restart the aircraft and try again. If the problem persists, contact Flyability.
OLD MOTOR, your motor reached 25h...	Motor reliability and performance is guaranteed for 25 flight hours. This time has been exceeded by one or more motors, Warranty is void. Replace the motors with new ones immediately.
Motor is getting old, XXXX	Motor reliability and performance is guaranteed for 25 flight hours. This time will soon be exceeded by one or more motors. Prepare to replace the motors with new ones.
High vibrations - check propellers	Damaged propellers may increase the vibration levels of the aircraft resulting in less stable flights and faster mechanical damaged of some parts. Change the propellers shortly.

6.5.3.4 CAMERA PAYLOAD

MESSAGE	REQUIRED ACTION / EXPLANATION
Log SD card error	Either the SD card used for log recording is faulty, or the aircraft has stopped recording log files. If this message persists, the current SD card can be damaged; this can be checked easily by using a different SD card.
Avionics SD card error	Either the SD card used for log recording is faulty, or the aircraft has stopped recording log files. If this message persists, the current SD card can be damaged; this can be checked easily by using a different SD card.
Payload communication error	The payload had a communication issue. Please restart the aircraft. If the problem persists, please contact Flyability.

Avionics SD card missing - cannot fly	Please insert an SD card in the Avionics SD card slot to be able to fly.
Avionics SD card full	Please empty the Avionics SD card or insert a new empty SD card in the Avionics SD card slot to be able to fly.
Log SD card full	Please empty the LOG SD card or insert a new empty SD card in the LOG SD card slot to have your telemetry data saved.
Thermal camera error - Restart robot	The thermal camera cannot record at the moment. Restart the robot to restore recording. If the issue persists, please contact support.
SD card slow for logs - Possible loss of data	The inserted SD is not able to write fast enough. User may try to reformat it according to the aircraft user manual or contact Flyability.
Camera error	The camera is encountering a problem that can affect the recording. Also caused by old camera firmware version; consider upgrading the camera firmware especially after an aircraft firmware upgrade.
Camera not working	The camera had an issue. Please restart the aircraft. If the problem persists, please contact Flyability.
Video recording error - restart aircraft	The camera failed to correctly record the current video. You may need to restart the aircraft.
Camera SD card almost full - free up _ GB to do a flight	Free up some space on the camera SD card to ensure your subsequent flight will be correctly recorded.
Camera SD card full	The camera SD card is full. The aircraft is not able to record video anymore. Empty the SD card to resume recording.
Incompatible SD card – Flight will not be recorded	The camera SD card does not have enough capacity (less than 64GB), or is not formatted in exFAT.
Camera SD card missing	Please insert an SD card in the CAM SD card slot to have your video footage saved.
Camera SD card error	Error concerning camera SD card operation. Can be caused by a corrupt card.
Log SD card missing	Please insert an SD card in the LOG SD card slot to have your telemetry data saved.
Payload temperature high	The electronics of the aircraft are warming up. The electronics will shut down to protect themselves, making the pilot lose control of the aircraft. You must bring your aircraft back in a colder environment.
Lighting hot - do not touch	The LEDs are hot and may burn you. If you need to touch them or manipulate the aircraft, please wear gloves.
HD video feed error – low quality feed displayed	HD output of the payload is not detected, composite output is used instead

6.5.3.5 TRANSMISSION

MESSAGE	REQUIRED ACTION / EXPLANATION
Weak signal - fly closer	Radio signal is getting weak, bring your aircraft back, or you may lose its control.
Do not fly - unreliable data transmission! Restart Cockpit, RC and drone. If the issue persists, please contact Flyability Support.<	The telemetry received by Cockpit is delayed and results in inconsistent information. It is dangerous to fly the aircraft. Cockpit should be restarted. If the issue persists, contact support.
Critical Transmission Issue, fly back and check carefully your antennas.	A difference is detected in the signal strength between the left and right antennas. This could indicate a damaged antenna, a damaged Range Extender, or a hardware failure in the transmission system.
Critical transmission issue. Check carefully your antennas or range extender...	A difference is detected in the signal strength between the left and right antennas. This could indicate a damaged antenna, a damaged Range Extender, or a hardware failure in the transmission system.
Too strong signal - increase distance between R/C and drone.	The wireless transmission signal received by the GCS is too strong. Increasing the distance between the drone and the GCS might fix the issue. If the problem persist, restart aircraft and GCS.
Manual transmission channel set. Use auto if quality is low.	Radio transmission channel choice is set to manual on the current aircraft, likely during a previous flight. This is a reminder of this setting since manual channel choice can decrease the video quality in comparison with the automatic mode. Onboard video recording quality is not affected by this. You can safely fly with the current transmission setting. If video quality is low at some point, you can set the channel choice mode to automatic to attempt to get better quality.

6.5.3.6 TABLET

MESSAGE	REQUIRED ACTION / EXPLANATION
Tablet temperature high	The internal components of the tablet on which Cockpit is running are hotter than during operation in normal conditions. It is likely that an external source is heating it up, such as direct sunlight or hot ambient air. Take action to protect the tablet from overheating to keep an acceptable transmission quality. Normal operating temperature ranges depend on the tablet itself. Please refer to the tablet specifications and instructions to know the recommended temperature range.
Low Android storage space - will not record next flights, performance can reduce, delete files before flying	Available storage space in the internal memory of Android device is low. Free some storage space by deleting unwanted files. System and Cockpit see their performances significantly reduced when internal storage gets full: more latency, bad video quality, slow user interface. The built-in video recorder will not record when this warning is active. Minimal free space (1GB) is required for the recording to start, as it takes additional buffer space into account for the actual recording. Be sure to have freed enough space before you resume flying.

6.6 Troubleshooting

This is a reference for typical issues and their solutions.

A MESSAGE ABOUT ACTIVATION FAILED APPEARS

Make sure the Android device has access to the Internet for the activation procedure. This only needs to be done once.

ALL COMPONENTS ARE TURNED ON AND CONNECTED, BUT COCKPIT IS STILL SHOWING A BLACK SCREEN WITH THE CONNECTION BAR.

Check connection of every component, including the USB cable. The cause can be a bad contact on either end.

COCKPIT IS SHOWING VIDEO FROM AIRCRAFT, BUT THE CONNECTION PROGRESS BAR IS BLINKING INDEFINITELY

Turn off aircraft, RC and quit Cockpit. Then, turn all these components back on using the following order:

1. Turn aircraft on and wait for red & green LEDs to blink alternately in a slow rhythm.
2. Turn remote controller on and wait for the green LED on it
3. Start Cockpit

VIDEO QUALITY IS BAD

Make sure you have a right signal level from aircraft; check the signal meters on screen. Weak signal is a cause for low video quality.

If Android device storage is full or nearly full (less than 1GB remaining), applications have more difficulty to run correctly, and this can affect video quality.

VIDEO IS SLOW / MORE LATENCY IS OBSERVABLE

Screen recording software, applications running background processes (see notifications) and widgets like on-screen CPU meters may affect performance. Shut those down if not needed.

If Android device storage is full or nearly full (less than 1GB remaining), applications have more difficulty to run correctly, and this can affect video quality.

The speed of the tablet

MY FLIGHT VIDEOS HAVE DISAPPEARED FROM THE RECORDINGS FOLDER

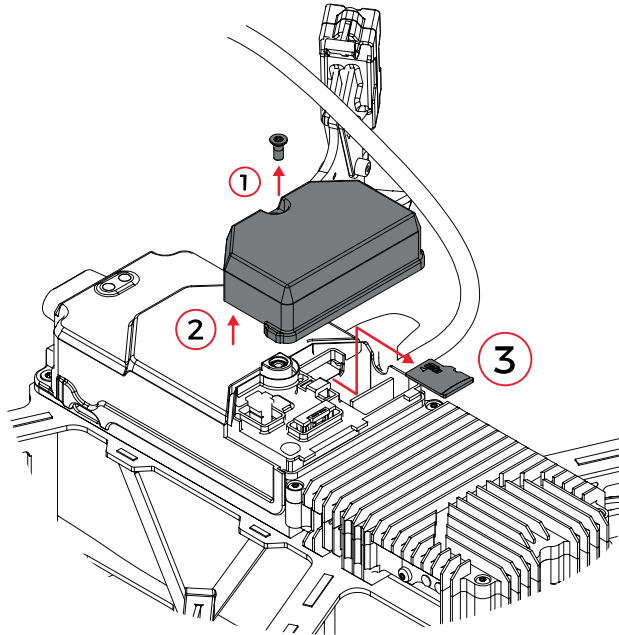
When there are 4 GB of recorded videos or more on the tablet, older recordings are automatically deleted. Make sure you save videos in a different place soon enough to keep them.

7 Advanced set-up

7.1 Access the AV SD card

REQUIRED TOOLS:

- T8 screwdriver



The AV SD card is the black box of the ELIOS 2. Its access is only required in the event of an incident or upon request from the Flyability team.

1. Remove the T8 screw(s) holding the casing using the T8 screwdriver.
2. Remove the casing.
3. Paying attention not to tear or pulling any cables, remove the AV SD card from its slot.

To place back the AV SD card, follow the steps in the reverse order

! THE CABLES PASSING BY THE SD CARD COMPARTMENT ARE THIN AND EASILY DAMAGED. PAY EXTREME CARE NOT TO DAMAGE THEM.

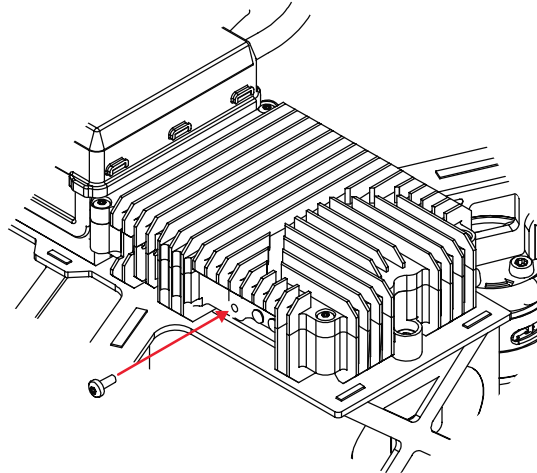
7.2 Controller pairing

REQUIRED TOOLS:

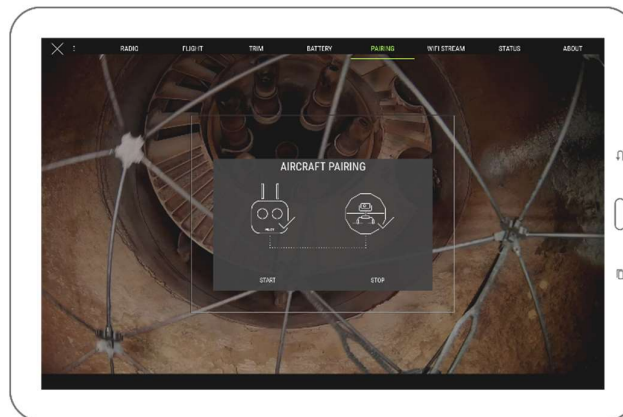
- T6 screwdriver
- Binding pin

Every drone is paired to its own GCS controller, if you wish to pair a drone to another GCS controller then you must first perform this pairing procure.

- Remove the screw located on the side of the transmitter block of the aircraft.



- Place the controller and Elios at 1.5 m from each other.
- Turn on Elios and the controller with the tablet connected.
- Open Elios Cockpit and go to Settings > Pairing and tap on START.



- The Controller Status Indicator will blink blue and emit a beep sound when the Controller is ready to link.
- Using the Sim card remover provided in the Tool kit (or a paperclip), press the link button on the transmitter block on Elios. The controller status indicator will glow solid green and stop beeping if the pairing is successful.
- Put back the screw.

7.3 Connect a Camera Operator GCS to a Pilot GCS

Elios Cockpit doesn't have the capability of performing this operation, so the use of the DJI GO "for products before P4" App is required. As DJI GO and Elios Cockpit don't get along. We recommend that you do not install it on the tablet provided by Flyability, instead install DJI GO on your personal device, for example, a smartphone.

Be sure to have the same firmware installed on both GCS; this can also be updated with the DJI GO App.



DJI GO WILL ASK YOU TO UPDATE THE FIRMWARE OF THE CONTROL UNIT. DO NOT DO THIS. THE FIRMWARE VERSION OF THE CONTROLLER MUST REMAIN AT VERSION 1.2.10



WHAT YOU NEED:

- 2x USB Device with DJI GO installed (DJI GO—for products before P4 version).
- 2x USB Cable.
- 2x GCS fully charged.

THE FOLLOWING STEPS HAVE TO BE FOLLOWED:

- Deploy your ELIOS 2 system, and the Camera Operator GCS.

ON THE CAMERA OPERATOR GCS:

- Launch DJI GO.
- Once the Remote Controller Picture appears, tap on Camera. 
- Tap the settings menu button in the top right corner, 
- Select the RC Tab.
- Set Remote Controller Function to Slave mode.



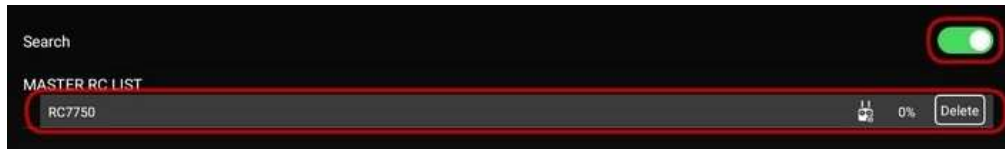
- A confirmation window will appear, tap OK.
- The status LED of the GCS will become purple, indicating that the GCS is in Slave mode.

On the Pilot GCS:

- Launch DJI GO.
- Tap on camera.
- Go to the RC Tab in the settings menu and make sure that it is set as **Master**.

On the Camera Operator GCS:

- Enable "Search".
- In the master list, the Remote Controller name will appear.
- Select the correct RC in the list and tap the password of the Pilot GCS then press OK.



- Both GCS will emit a beep.

On the Pilot GCS:

- The Slave RC will appear in the Slave GCS List.

On the Camera Operator GCS:

- Tap on "Request Permission", then tap OK when a pop-up window will be displayed.

On the Pilot GCS:

- A window will be displayed confirming the control of the camera, tap on Agree.

If a Pilot GCS is turned into a Camera Operator GCS then the drone it was previously paired to will have to be re-paired with the new Pilot GCS.

If the Pilot (Master) GCS is paired to a new aircraft, then the Camera Operator (Slave) GCS will automatically follow it.

8 Charging

8.1 Charging GCS

To charge the tablet, connect the USB cable to the USB port of the tablet. Put the other end of the cable to the USB wall charger. Plug the USB wall charger into the wall socket.

To charge the controller, connect the controller charger to the barrel jack of the controller. Plug the other end of the charger to the wall socket. Use only the provided charger to charge the Controller. The use of a non-approved charger may result in battery damage and risk of fire. While the controller can be charged while piloting the drone, this is not a recommended practice as this may lead to the unit overheating.

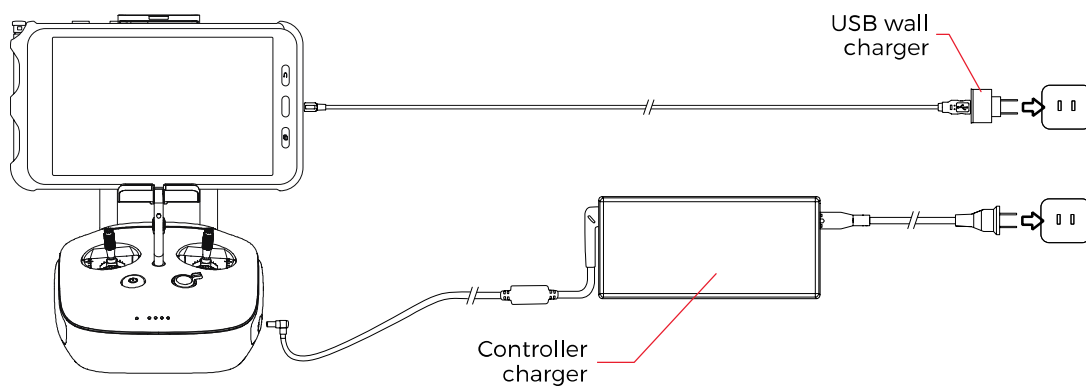
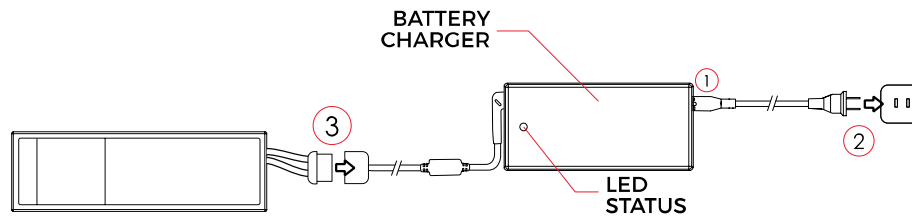


Figure 8.1: GCS charging

8.2 Charging the battery

Flyability's charger comes with a built-in power supply. You can connect the AC power cord to the 100- 240V AC socket directly.



Please refer to the following steps to charge the battery:

1. Insert the AC power cord into the charger
2. Connect the AC power cord into a 100-240V AC socket. The LED will turn green
3. Connect the battery pack to the charger with the provided adapter.

The LED will turn RED, indicating that the charge is ongoing

4. The battery will be fully charged when the LED turns green again

If the LED remains green upon connection it might mean:

1. The battery is already fully charged, check the voltage of the battery using the Battery voltage checker
2. The battery is outside its temperature range
 - a. If warm, let it cool down before re-trying to charge it
 - b. If cold, warm the battery before re-trying to charge it
3. Battery presents permanent damage. Please contact Flyability at support@flyability.com

To access the smart battery's diagnostics data, connect it to the drone and open the "battery" menu of the Cockpit app.

Please also carefully read the **ELIOS 2 Smart battery safety guidelines** before using the battery.

9 Maintenance

9.1 Update the aircraft firmware

1. Please follow the dedicated update process on <https://www.flyability.com/knowledge-base/all>

9.2 Cleaning the drone

It is important to clean the robot after a flight in a dusty or dirty environment. To do so, use compressed air from an air blow gun or gas duster can. If necessary, Isopropanol alcohol can be used to clean the cage and any surface of the robot. Apply gently with a toothbrush or a rag.

Avoid the use of water, as this may damage the electronics.

9.2.1 LED lights

Take special care of the onboard lighting system. Accumulated dust or other dirt on the LEDs' surfaces will reduce the lighting capacity of Elios.

9.2.2 Motors

Pay special attention to the motors. Dust or other particles may damage the motors if allowed to build up inside. Use Compressed air to remove all dust and particles from the motors, regularly check for dust ingress in between flights, especially in a metallic dust environment, as metallic dust might stick to the magnets of the motor.

To guarantee the performance and reliability of the motors, they must be replaced every 25 flight hours. Use the cockpit app to keep track of the flight hours of each individual motor.



IF YOU BLOW COMPRESSED AIR ON THE MOTORS, PLEASE WEAR GLOVES AND HOLD THE CORRESPONDING PROPELLER. THE AIR FLOW MAY MAKE THE PROPELLER SPIN FAST DAMAGING THE MOTOR AND INJURING THE USER.

9.3 Changing a Propeller

REQUIRED TOOLS:

- 8mm 1.4Nm torque-controlled screwdriver
- New propeller



**A DAMAGED OR INCORRECTLY INSTALLED PROPELLER MAY SERIOUSLY DAMAGE THE AIRCRAFT.
IT IS RECOMMENDED TO CHANGE THE PROPELLERS EVERY 10 FLIGHT HOURS**

Propellers should be changed when they are damaged or after 10h of flight. Damage is typically caused by large items entering the cage, but dust and small particles will also abrade the propellers in the long term.

- 1- Unscrew the nut with the screwdriver provided in the tool kit, turn counterclockwise to loosen.
- 2- Replace the propeller. Be careful, the aircraft has two kinds of propellers. Propeller 5045R shall be placed on the front right and bottom left motors, propeller 5045 on the front left and bottom right motors. The propellers' labels must be facing up when Elios is in an upright orientation. Do not use pliers or other tools to hold the rotor. It might bend the motor shaft. Gloves should be used instead.
- 3- Screw on and tighten a new motor nut. Elios is shipped with a Dynamometric screwdriver which is pre-set to the correct torque of 1.4Nm. Using this tool eliminates the risk of overtightening the motor nuts and damaging the threaded motor shafts.

Note: If correctly tightened the propeller should not have any play on the motor shaft, nor should it be possible to rotate the propeller with regard to the motor shaft. An insufficiently tightened nut can cause a crash and might result in severe damage to the robot and injure people or infrastructure.

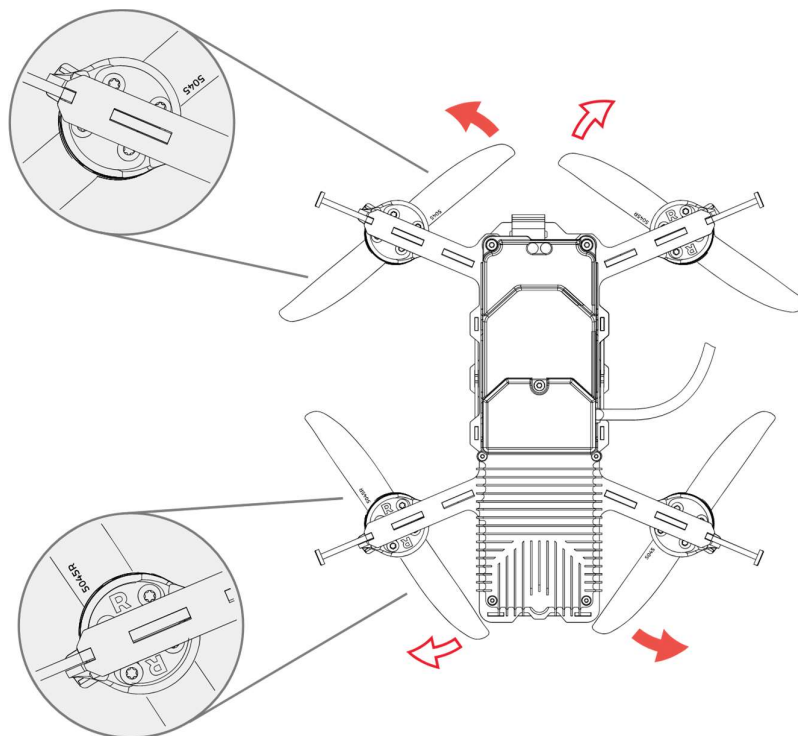


Figure 9.1: Propeller marking



NEVER USE THE SAME MOTOR NUT MORE THAN ONCE, AS THE NYLON LOCKING RING WILL BE LESS EFFECTIVE WHEN RE-USED.

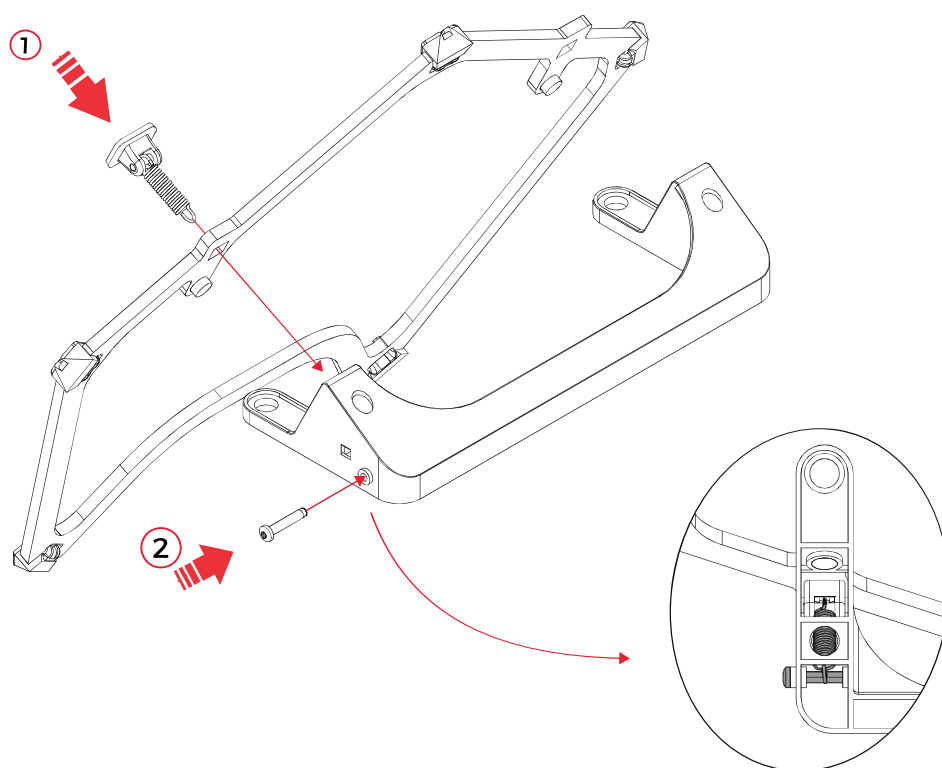


USE ONLY THE PROPELLERS PROVIDED BY FLYABILITY.

9.4 Changing an LLM spring

REQUIRED TOOLS:

- T8 screwdriver
- LLM spring
- K18 LLM spring screw



- 1- Insert the LLM spring in the LLM pentagon and pass it through the LLM plastic frame
- 2- Insert the K18 LLM spring screw in the LLM plastic frame and holding the LLM spring. Tighten the screw lightly – with two fingers.

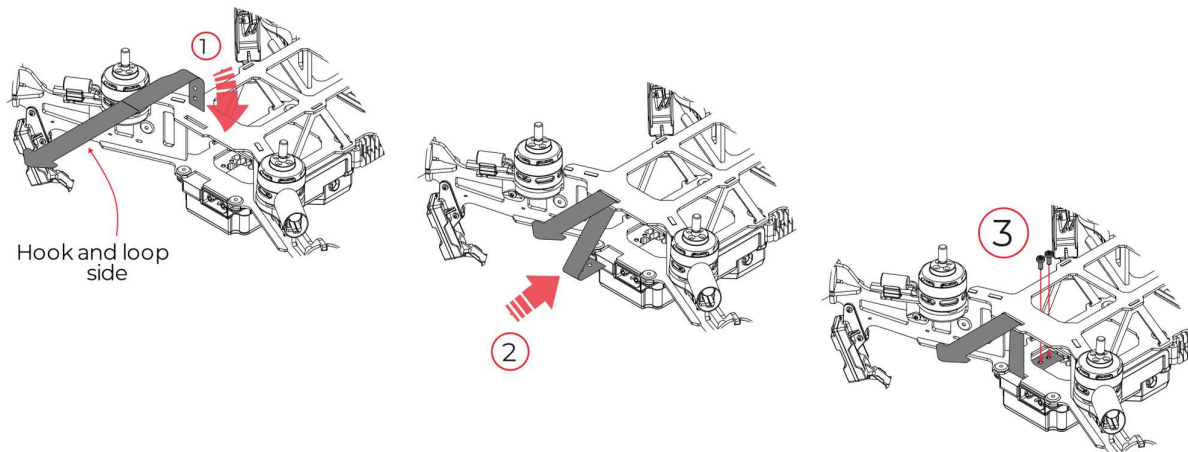


SCREWING IN PLASTIC WITH TOO MUCH STRENGTH MAY DAMAGE THE THREAD. TIGHTEN WITH TWO FINGERS. MOREOVER SCREW COUNTERCLOCKWISE AT FIRST TO FIND THE START OF THE THREAD THEN SCREW CLOCKWISE.

9.5 Changing a battery strap

REQUIRED TOOLS:

- Battery strap
- Screwdriver



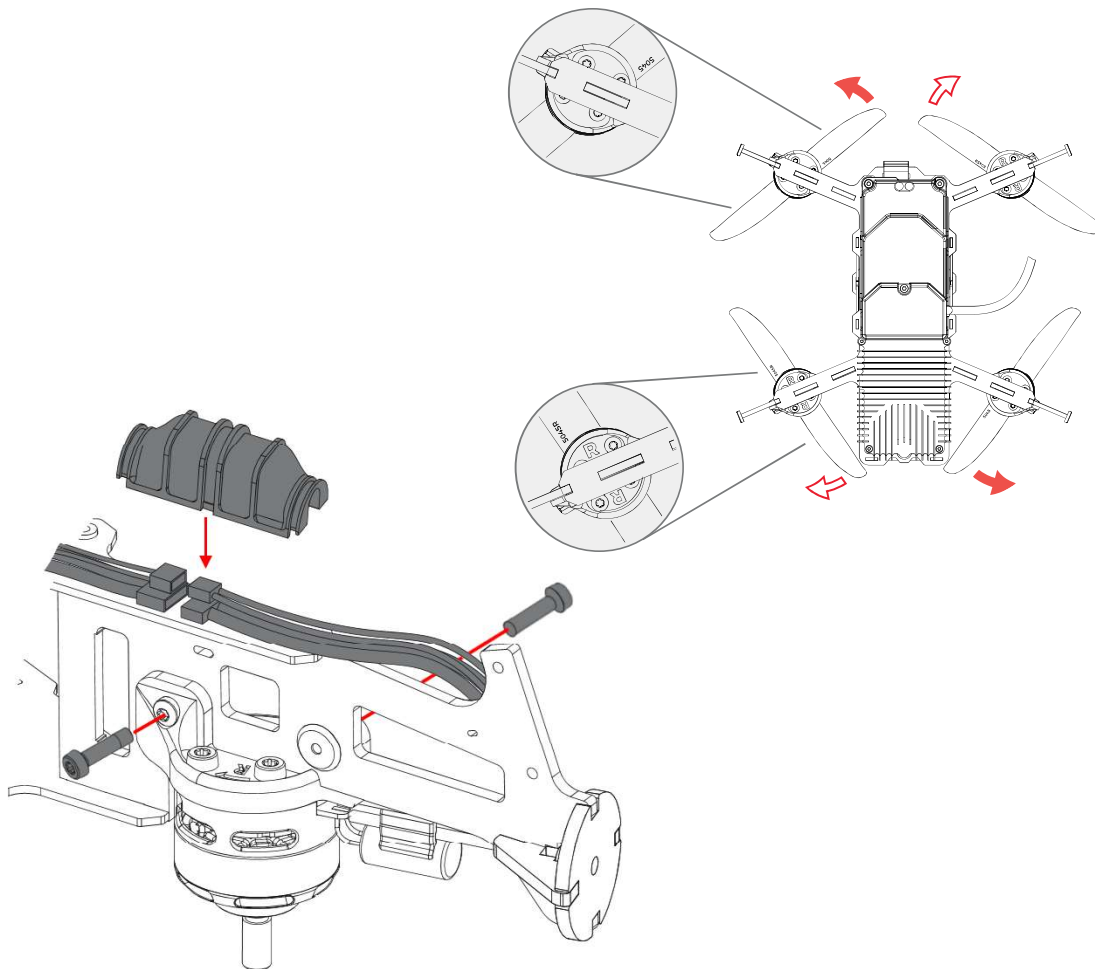
- 1- Insert the battery strap into the bottom loop on the carbon frame. The hooks-and-loops from the strap must be looking towards the electronic stack.
- 2- Slide the battery strap between the carbon frame and the electronic stack aligning the holes with the screw threads.
- 3- Insert the screws. Tighten then with two fingers strength.

9.6 Changing a Motor

REQUIRED TOOLS:

- Motor
- T10 screwdriver
- T10 screws x2
- Zip tie 2.5mm

Spare motors are provided with Right hand and Left hand spin directions, be sure to place the correct type of motor in the correct place.

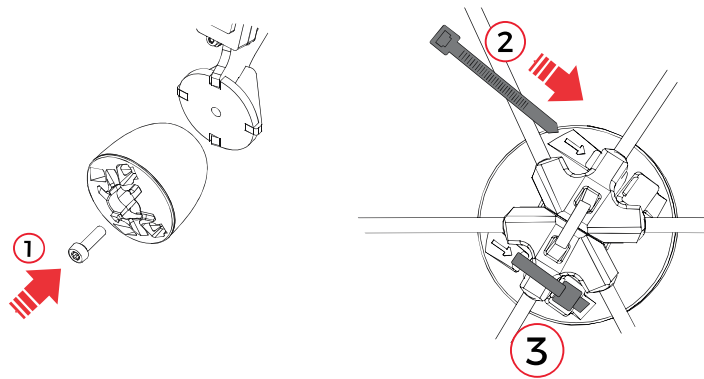


- 1- Apply a drop of Loctite 243 thread locker to the two T10 screws.
- 2- Screw the new motor to the frame with the two screws. Tighten firmly.
- 3- Connect the power and signal cables.
- 4- Place the connector cover over the connectors.
- 5- Fix the connector cover with a 2.5mm zip tie.

9.7 Changing a Bumper

REQUIRED TOOLS:

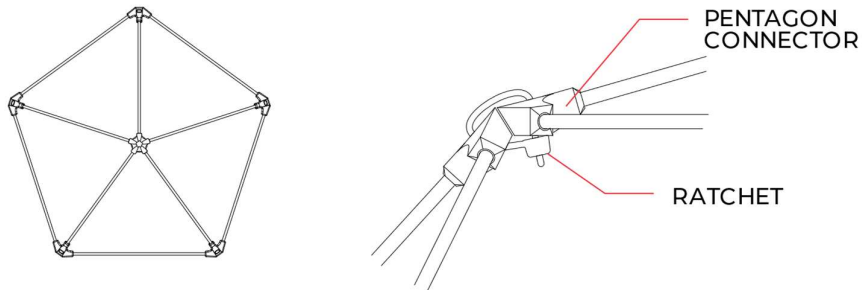
- T8 screwdriver
- Bumper
- M5 bumper screw
- 2.5mm zip ties



- 1- Screw the bumper on the frame arm with the M5 bumper screw.
- 2- Insert the zip tie through the bumper following the engraved arrow. The gear tracks have to be towards the outside.
- 3- Tighten and trim the zip tie. The ratchet should be placed in the bumper's ratchet holder.

9.8 Changing a pentagon

A protective cage with damaged elements becomes softer and more fragile. Not maintaining the cage can significantly reduce its collision tolerance.



- Cut the surrounding zip ties with the cutting plier and remove the damaged pentagon.
- Place the new pentagon and attach it with new zip ties.
- Be careful to place the zip ties' ratchet on the inner side of the cage.
- Using the gripping plier tighten the zip ties.
- Using the cutting plier, trim the zip ties' tape

10 Technical Specifications

AIRCRAFT

CONFIGURATION	Quadcopter
DIMENSIONS	Fits in a < 400 mm sphere; 15.75 in
MOTORS	4 fast reversing electric brushless motors
MOTOR POWER RATING	120W average power, 750W nominal peak power
PROPELLERS	4 propellers, 5 inches
TAKE-OFF WEIGHT	< 1450 g; < 3,2 lbs.
	Includes battery, payload & protection
MAX FLIGHT TIME	Up to 10 min
MAX ASCENT SPEED	1.3 m/s; 4.3 ft/s
MAX DESCENT SPEED	1.3 m/s; 4.3 ft/s
MAX SPEED	1.3 m/s (Assist mode); 4.3 ft/s 4 m/s (Atti mode); 13 ft/s 6.5 m/s (Sport mode); 21 ft/s
MAX PITCH/ROLL ANGLES	0.15 rad (Attitude mode) 0.2 rad (Assist mode) 0.3 rad (Sport mode)
MAX WIND RESISTANCE	3 m/s (Assist mode); 10 ft/s 5 m/s (Sport mode); 16.4 ft/s
FLIGHT CONTROL SENSORS	IMU, magnetometer, barometer, 7 vision and distance sensors
MATERIALS	Carbon fiber composites, magnesium alloy, aeronautical grade aluminum, high-quality thermoplastics
OPERATING TEMP.	0 °C to 50 °C ¹ * (32 °F to 122 °F)
FLIGHT MODES	ASSIST - Assist mode ATTI - Attitude mode SPORT - Sport mode
FAIL-SAFE	Auto-landing on signal lost Forced-descent when battery critically low
OPERATING FREQUENCY	2404 – 2483 MHz (UAV to RC)
EIRP	2.4 GHz: ≤ 32 dBm (FCC); ≤20 dBm (CE); ≤10 dBm/MHz (MIC)
INGRESS PROTECTION	Splash and dust resistant
NOISE LEVEL	99 dB(A) hover 120 dB(A) max @ 1m

SMART BATTERY

RATED CAPACITY	5200 mAh
NOMINAL VOLTAGE	19 V
BATTERY TYPE	LiPo 5S HV Smart Battery: - Improved safety (protection for: overcharge, overcurrent, over/under-temperature) - Plug-and-play charging - Self-balancing - Storage self-discharge - Cycle counter - Battery ID
ENERGY	98.8 Wh
CHARGING TIME	1.5 h
BATTERY CHANGE TIME	< 1 min

¹Additional precautions must be taken between 0-10°C and 40-50°C. Stability, flight performance and flight time might be reduced.

COMPLIANCE	Approved for carry-on luggage. Complies with IATA Dangerous Good Regulation.
NET WEIGHT	550 g ; 1.2 lbs
OPERATING TEMPERATURE	0-50°C additional precautions must be taken between 0-10°C and 40-50°C. Stability, flight performance and flight time might be reduced.
CHARGING TEMPERATURE	10 - 40°C ; 50°F - 113°F
MAX CHARGING POWER	150 VA AC power
CHARGER	Elios 2 Smart Battery Charger

PAYLOAD CHASSIS

PAYLOAD HEAD	Damped for vibrations
CAMERA POD UPWARD TILT	+90 degrees
CAMERA POD DOWNWARD TILT	-90 degrees
PAYLOAD PROTECTION	Load limiting mechanism to protect the payload in the case of a frontal shock.

MAIN CAMERA

SENSOR	1/2.3" CMOS Effective Pixels: 12.3 M Sensitivity: Optimized for low light performance
PHOTO FORMATS	JPG
VIDEO FORMATS	MOV
VIDEO RECORDING RESOLUTIONS	4k Ultra HD: 3840 x 2160 at 30 fps FHD: 1920 x 1080 at 30 fps
VIDEO STREAMING RESOLUTION	FHD: 1920 x 1080 at 30 fps or SD 640 x 480 at 30fps
MOVIE FOV	114° horizontal, 130.8° diagonal
PHOTO FOV	118.8° horizontal, 148.6° diagonal
TOTAL VERTICAL FOV	approximately 260° including camera tilt
LENS	2.71 mm focal length Fixed focal
CONTROL MODES	Auto mode with manual EV compensation
FILE STORAGE	MicroSD card (onboard the aircraft) Min Capacity: 64GB Max capacity: 128 GB Recommended model: Sandisk Extreme micro SDXC UHS-I V30
SUPPORTED FILE SYSTEM	exFAT

THERMAL CAMERA

SENSOR	Lepton 3.5 FLIR
VIDEO RECORDING RESOLUTION	160 x 120 at 9 fps
LENS	FOV 56° x 42°, Depth of field 15cm to infinity
SENSITIVITY (NETD)	<50 mK
TEMPERATURE RANGE	-10°C to 140°C (14°F to 284°F)
WAVELENGTH (LWIR)	8-14 µm
FILE STORAGE	MicroSD card (onboard the aircraft) Max capacity: 32 GB Recommended model: Sandisk Extreme micro SDXC UHS-I V30
SUPPORTED FILE SYSTEM	FAT32

LIGHTING SYSTEM

TYPE	High-efficiency LEDs for even lighting in front, top and bottom, optimized for low impact of dust on picture quality. IR light used for stabilization system.
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CONTROL MODES	From the remote controller, adaptive light beam controlled by camera pitch Indirect/dustproof lighting Close up lighting Selective/oblique lighting
LIGHT OUTPUT	Max 10k lumens

OPERATION SAFETY AND CRASHWORTHINESS

NAVIGATION LIGHTS	Green (starboard) and red (port) lights.
PROTECTION CAGE	Carbon fiber cage with soft coating, modular subcomponents for maintenance ease, thermoplastic elastomer suspensions, front opening dimensioned for easy battery access.
COLLISION TOLERANCE	Uniform all around the drone, up to 3 m/s on flat objects, up to 1.5 m/s on sharp objects

REMOTE CONTROLLER

OPERATING FREQUENCIES	2404 - 2483 MHz (RC to UAV) 5738 - 5808 MHz (RC to RC) 920.6 - 928 MHz (RC to RC, Japan only)
MAX TRANSMISSION DISTANCE	Up to 500 m in direct line of sight
EIRP	2.4 Ghz ≤20 dBm, 5.8 GHz ≤13 dBm, 920 MHz ≤10 dBm
WEIGHT	810 g (924 g with tablet holder)
OPERATING TEMP.	0 °C to 40 °C
OUTPUT PORT	HDMI, SDI, USB
BATTERY	6000 mAh 2S
CONTROLS	Aircraft control and payload settings
OPTIONS	Optional remote controller (camera operator) with video stream reception on a secondary screen, and dual control of camera settings.
BATTERY CHARGER	17.4 V / 57 W

TABLET

MODEL	Samsung Galaxy Tab Active 2
BATTERY CHARGER	USB Charger 5V
OPERATING TEMP.	-15 °C to 40 °C
CHARGING TEMP.	-15 °C to 40 °C
CHARGING TIME	5 hours
WORKING TIME	5 hours (when receiving video stream) to 76 hours (idle)
WEIGHT	415 g

TRANSPORT CASE

DIMENSIONS	61 x 44 x 53 cm
WEIGHT	11.5 kg
COMPLIANCE	IATA compliant for checked-in luggage.

COCKPIT SOFTWARE

FEATURES	Real-time video and UAV telemetry, status visualization (remaining battery, payload settings, warnings, etc.), control payload settings and various configurations.
OPERATING SYSTEM	Android. Optimized for tablet provided with the ELIOS 2 system

INSPECTOR SOFTWARE

FEATURES	Video and thermal video viewer (frame by frame), flight log analysis including point of interests recorded during flight, screenshots, and flight data export.
OPERATING SYSTEM	Windows 7, 8 and 10 (32 and 64 bits)

11 ELIOS System transmitted Power

ELIOS 2

FREQUENCY BAND TX	2406 – 2476 MHz
MAXIMUM OUTPUT POWER	60mW, 18dBm in 2.4GHz band (CE mode) 456mW, 26.6dBm in 2.4GHz band (FCC mode)
DESIGNATION OF EMISSIONS	Digital bidirectional video and data downlink to remote controller, command and data uplink to to UAV
TECHNOLOGY	OFDM, wideband
MODULATION TYPE	OFDM
E-FIELD STRENGTH	7.13V/m (measured at 20cm)

GCS

FREQUENCY BAND TX	2404 – 2480 MHz 5738 – 5808MHz (CamOp) 920.6 MHz to 928 MHz (CamOp Japan)
MAXIMUM OUTPUT POWER	40mW, 16dBm in 2.4GHz band (CE and FCC mode) 6.3mW, 8dBm in 5.8GHz band (CE mode) 4.4mW, 6.4dBm in 5.8GHz band (FCC mode)
DESIGNATION OF EMISSIONS	Radio Video Downlink and telemetry and uplink of the from Drone
TECHNOLOGY	OFDM, wideband
MODULATION TYPE	OFDM

To comply with both FCC and CE standards concerning transmission power, the ground unit uses a GPS module to determine its geographic location and the power is adjusted accordingly. FCC mode is used in the following countries: USA, Canada, Mexico, Australia, Brazil, Taiwan. In other countries, or if no GPS position can be obtained, the system uses the more conservative CE standard.

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Content subject to change.

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