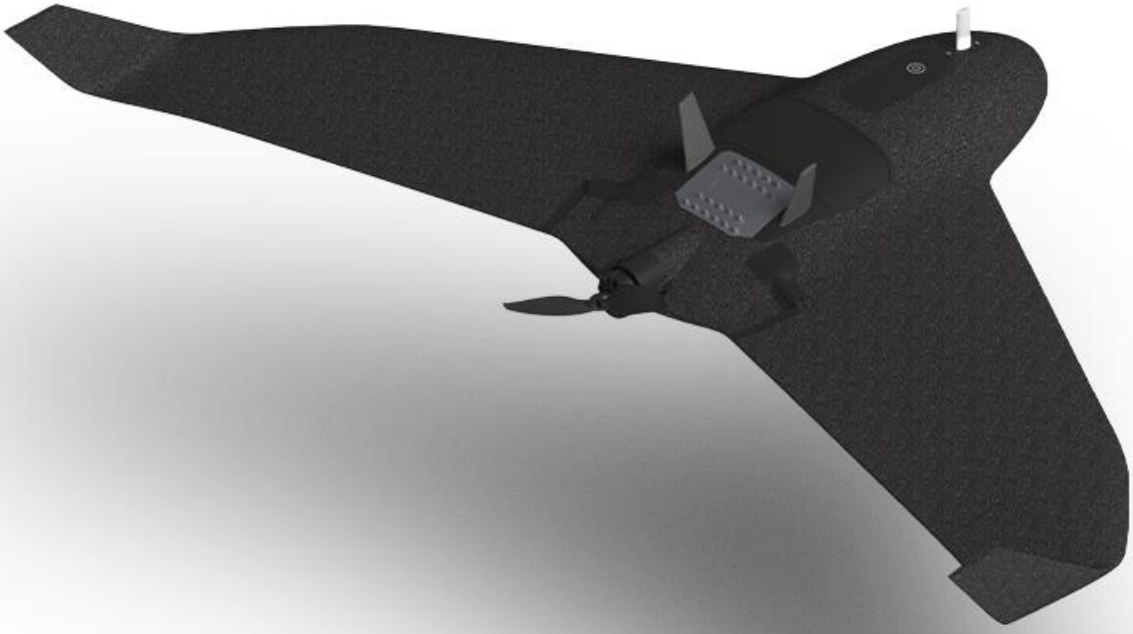
AgEagle

eBee VISION



eBee VISION – User manual

Version 4.0.0 | 10.2024

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1 eBee VISION system description

1.1 Drone

1.1.1 eBee VISION specifications

Figure 1-1 eBee VISION

Weight	1.65 kg / 3.6 lbs
Wingspan	120 cm / 47 in
Cruise speed (airspeed)	12.5–22.5 m/s (28–50 mph)
Endurance	Up to 90 min
Take-off	Hand-launch
Glide ratio	10
Landing	Autonomous Silent Tactical Landing (STL)
Wind resistance	17 m/s (38 mph)
Rain resistance	light rain resistant
Operating temperature	-10 °C to +49 °C / +14 °F to +120 °F Note that for temperatures above 40°C, climbing should be done in intervals not exceeding 600 meters, with a 7-minute level flight between each interval.
Max flight altitude	5000m / 16400ft
Max take-off altitude	Tested up to 3000m / 9800 ft
Global Navigation Satellite System	L1/L2 GPS + E1/E5b Galileo + G1/G2 GLONASS (Beidou capable)
Operating frequency	2.4000-2.4835 GHz
Transmitted Power (EIRP)	2.4 GHz: < 33 dBm / 2W (FCC) < 20 dBm / 0.1W (CE)
Radio link data encryption	256-bit AES
SD Card data encryption (on demand)	256-bit AES

1.1.2 eBee VISION connectivity

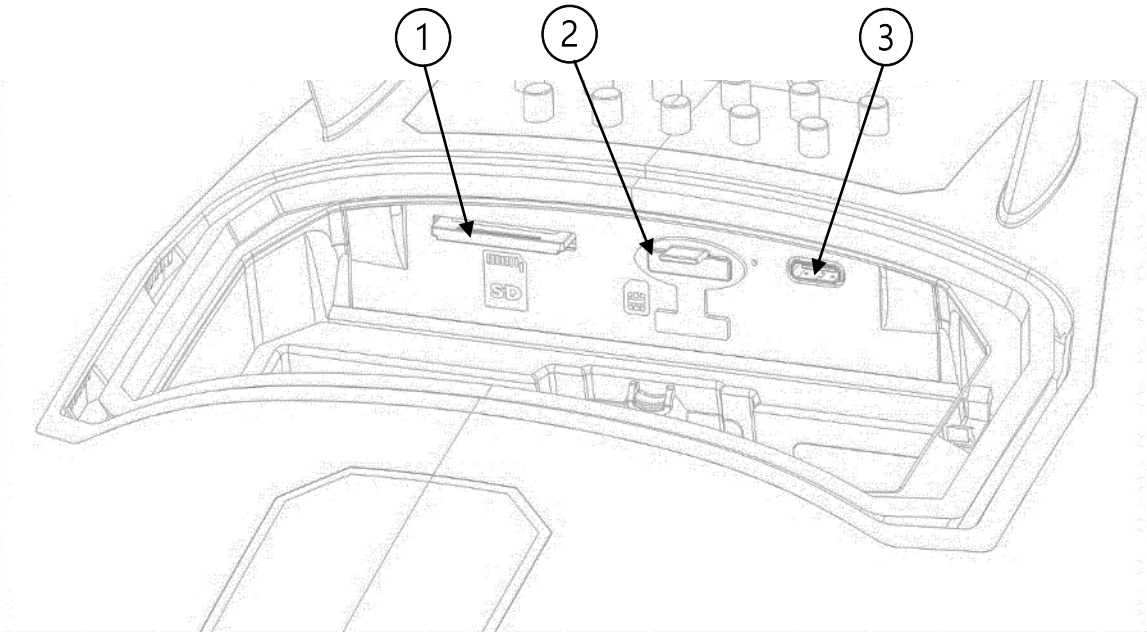


Figure 1-2 eBee VISION connectivity

1. SD card slot: Use only a SanDisk Extreme Pro SDXC – 64GB SD card.
2. Sim Card slot: Reserved for future use.
3. USB-C connector: USB High Speed. Use this port to connect to a computer for downloading pictures, videos, and flight logs.

⚠	Warning
• The USB-C connector must only be used for the purposes mentioned above. • Do not use any SD card other than the specified SanDisk Extreme Pro SDXC – 64GB card.	

Refer to section SD Card for more information about collected data.

ⓘ	Note
• If a battery is already plugged on the drone, unplug it before removing the SD Card (see section 2.1.3 Battery disassembly)	

1.2 GCS

SRoC (Soldier Robotic Controller) is a ruggedized GCS with advanced features, built on the robust Panasonic FZ-S1.
SRoC is designed for the innovative Swappable Radio Module (SRM) platform with the Nett Warrior connector integrated into the controller handle, it provides exceptional communication flexibility even in harsh environments. In addition to the internal battery, the SRoC conveniently accommodates two Swappable Battery Modules (SBMs) on its back, allowing for easy power expansion.

Figure 1-3 UXV SRoC GCS

Range	Short Range: 5 km / 3.1 mi Medium Range: 15 km / 9.3 mi Long Range: 20 km / 12.4 mi
Panasonic FZ-S1	Wi-fi Bluetooth 3G, 4G, LTE
SRoC	1x USB-C connector 1x SRM dock 2x SMB dock 1x Nett Warrior connector
Screen	17.78 cm / 7 in
Weight	950g / 2.1 lbs
Dimension	256 x 140 x 66 mm / 10.08 x 5.11 x 2.60 in
Front human interface	1x 5D joystick 2x Hall effect joystick RuFFy 4x push buttons 11x bezel buttons
Back human interface	2x operator presence buttons (deadman switch)
Top human interface	2x single axis joystick RuFFy 2x push buttons

1.3 Payload

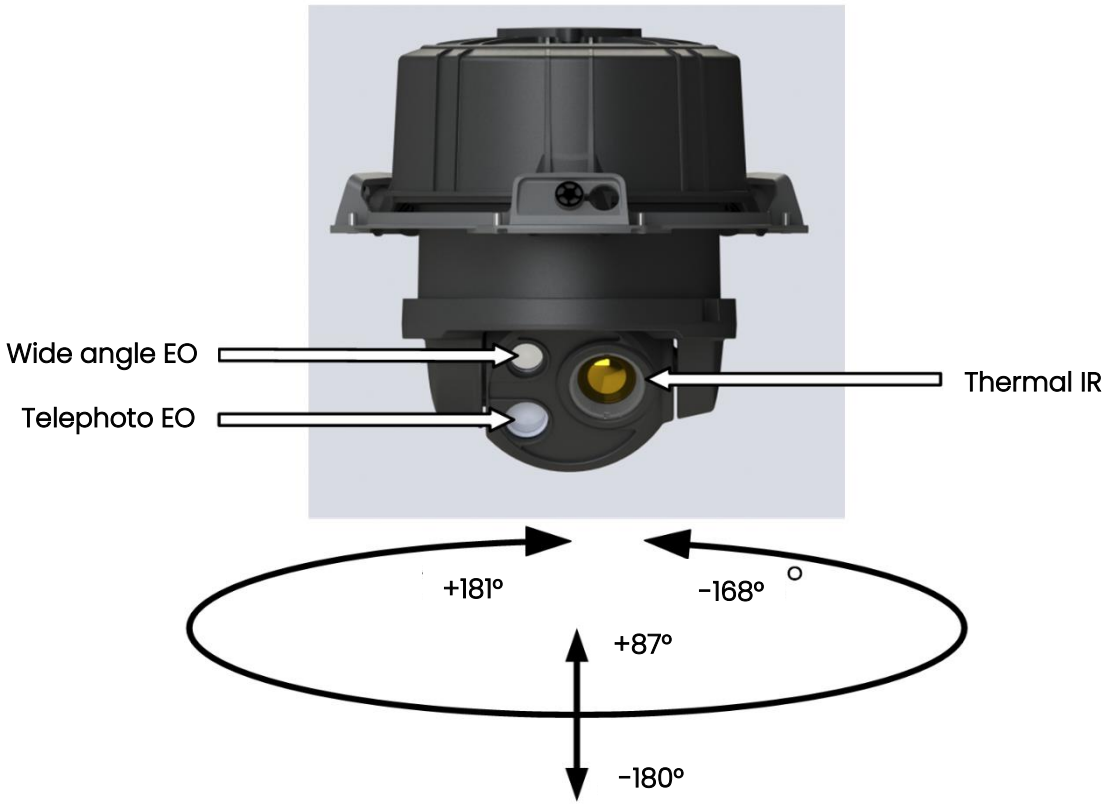


Figure 1-4 Payload motion range and camera location

Wide angle EO / RGB camera	SONY IMX230 1/2.4'' Video: 1080p Frequency: 30 fps Photo: 21 MP Zoom: 1x => 4.8x Focal length: 4mm FOV 72° x 45° F2.4 aperture
Telephoto EO / RGB camera	SONY IMX230 1/2.4'' Video: 1080p Frequency: 30 fps Photo: 21 MP Zoom: 4.9x => 32x Focal length: 16mm FOV 21° x 12° F2.4 aperture
Thermal IR	FLIR BOSON 640 Video: 720p Frequency: 25 fps Focal length: 18mm FOV: 24° x 19° Sensitivity: 50mK

1.4 Collected data

The data collected with eBee VISION can be recorded and stored in the drone SD card or inside the GCS.

1.4.1 SD card

If the SD card is mounted in the drone, high-resolution data will be recorded in the SD card.
Videos:

- Resolution: EO: 1920 x 1080, EO/IR blending: 1280 x 720
- File format: MPEG-TS (Transport Stream), aka. ITU-T H.222
- Image encoding: MPEG-4 part 10 (Advanced Video Coding), aka. ITU-T H.264
- Metadata encoding: KLV/MISB-0601 format

Pictures:

- Resolution: EO: 4032 x 3024 (lower if zoomed), EO/IR blending: 1280 x 720, IR-only: 640 x 512
- File format: JPEG
- Metadata: geotag stored as EXIF tag in JPEG file

1.4.2 GCS internal memory

Low-resolution data are recorded within the internal memory of the GCS.
Videos:

- EO: 720p H.264 mp4 no metadata
- EO/IR blending: 720p H264 mp4 no metadata

Pictures:

- EO: 0.9MP no geotag
- EO/IR blending: 0.9MP no geotag
- IR: 0.9MP no geotag

2 System assembly and disassembly

2.1 Drone

2.1.1 Battery assembly

⚠	Warning

- Never use any type of alternative battery, that has not been provided by AgEagle
- Never use a battery that is swollen or leaking.
- Never use a battery that has been damaged.
- Before placing battery inside the drone, make sure that the following elements are dry and free of water:
    - Battery connector
    - Drone connector
    - Battery bay

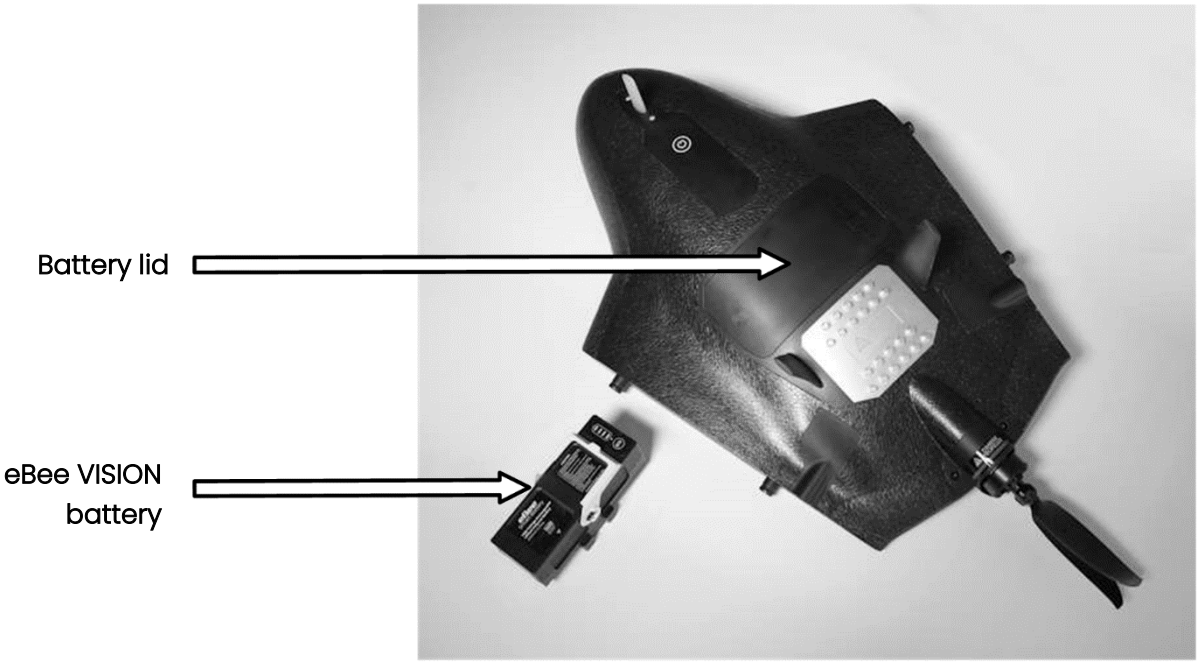
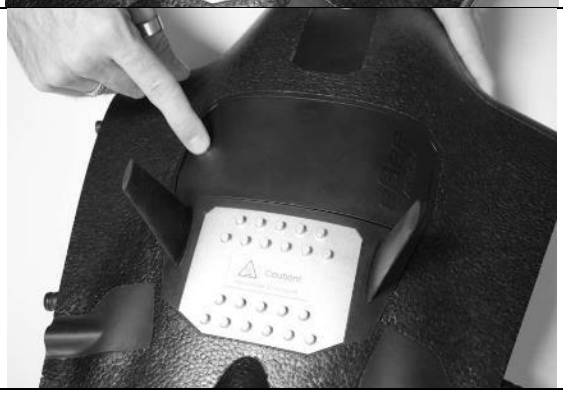


Figure 2-1 eBee VISION battery bay

Click on the marked area to open the battery lid.	
Remove the battery lid.	
Before placing battery inside the drone, make sure that the battery connector is dry and free of water. Remove any water or dirt from the seal.	
Lift-up the battery handle.	
Place the battery into the battery bay and push it down to connect it.	

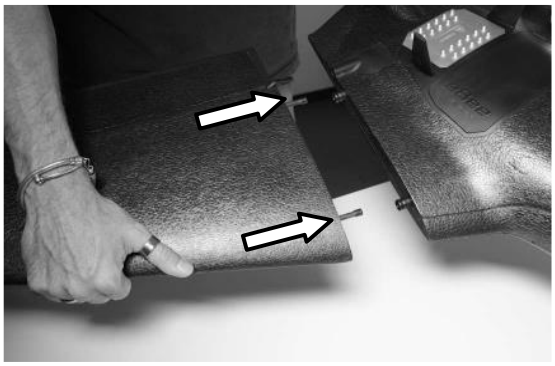
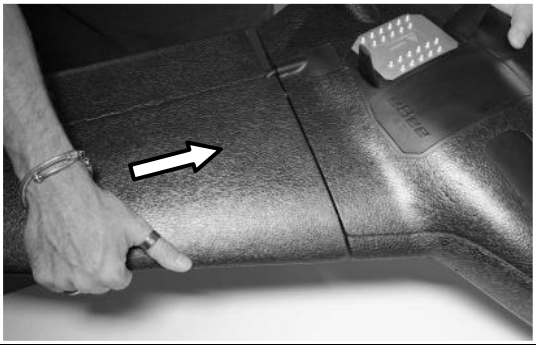
Secure the battery by closing down the battery handle.	
Insert the tabs of the battery lid in the notches.	
Close the battery lid.	
Secure it by clicking on the marked area.	

2.1.2 Wings assembly

⚠	Warning

- Flying with damaged wings affects the aerodynamic of the aircraft and can result in a crash.
- Wings must always be attached properly to the aircraft.

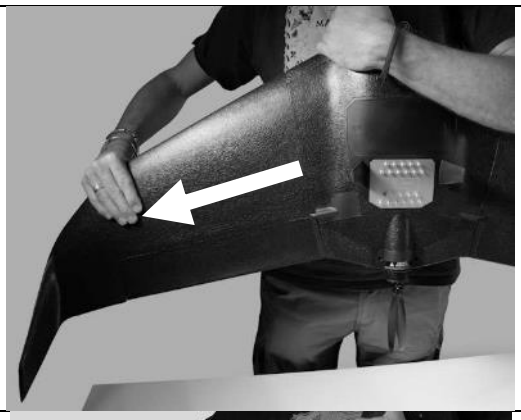
Check winglet for any damage	
Check control surface for any damage	
Check carbon rods for any damage	 

Align the carbon rods and servo interface with eBee VISION's body	
Plug the wing	
Check that the wing is properly plugged	
Check that control surface can move freely	
Repeat actions for the other wing.	

2.1.3 Battery disassembly

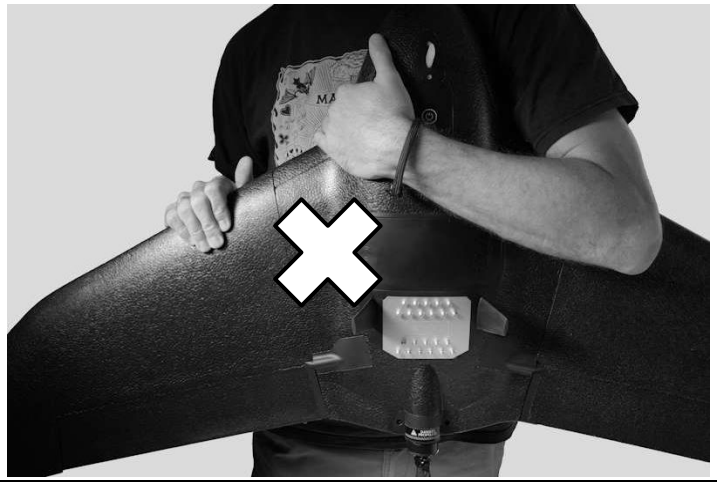
Click on the marked area to open the battery lid.	
Remove the battery lid.	
Open the battery handle.	
Lift-up the battery.	

2.1.4 Wings disassembly

Hold eBee VISION against your body and grab the wing close to the winglet.	
Pull perpendicularly to the joint line to remove the wing.	
Switch hands and pull perpendicularly to the joint line again.	
Pull to remove the wing.	

ⓘ	Note

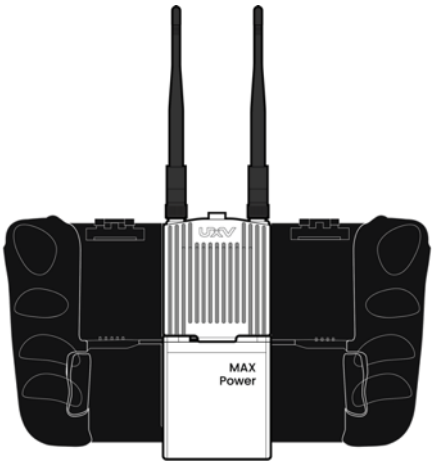
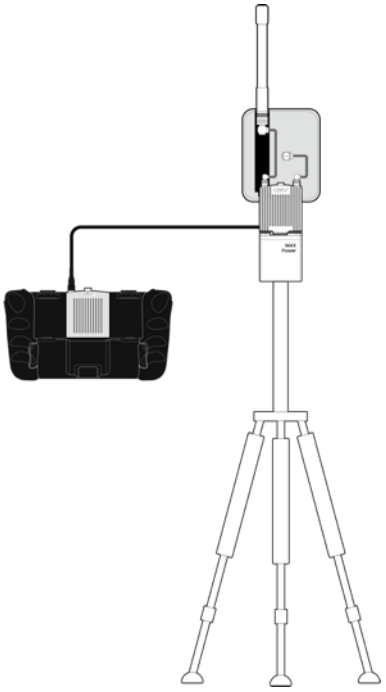
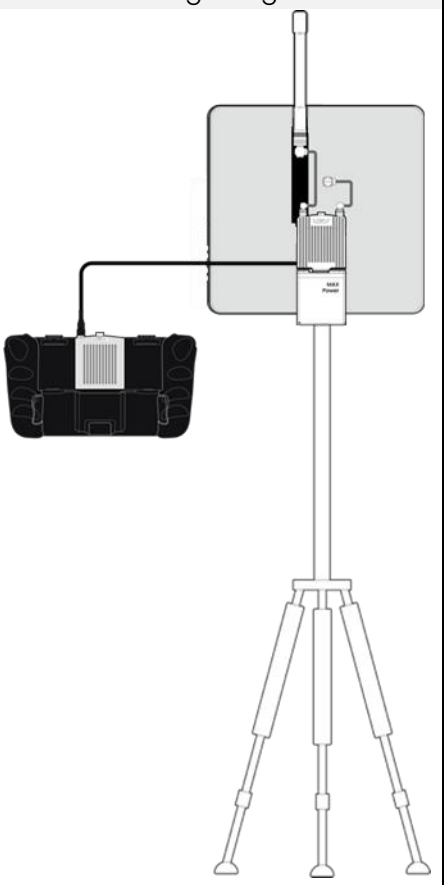
- Using another position can damage the carbon rods over time, especially when holding the wing too close to the body.



2.2 GCS

2.2.1 GCS antennas setups

Max transmission distance depending on the setup (unobstructed, free of interference):

Short Range	Medium Range	Long Range
		
FCC: up to 5km CE: up to 1 km	FCC: up to 15km CE: NA	FCC: up to 20km CE: NA

2.2.2 Optimal transmission zone

2.2.2.1 Short Range setup

The signal between the UAV and the GCS is most reliable when the antennas are positioned in relation to the UAV as illustrated below.

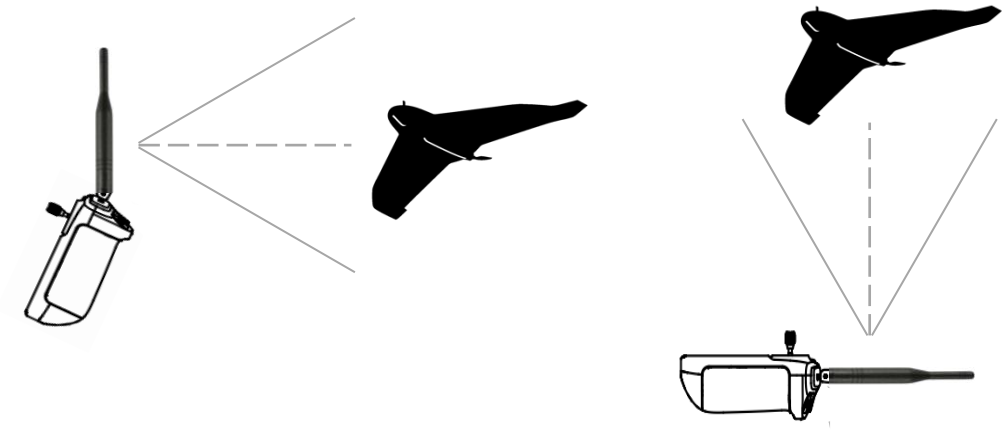


Figure 2-2 Short range antenna radiation pattern

Best results should occur with 25° angle for both antennas, see examples below:

Figure 2-3 Short range antenna placement

⚠	Warning
• Do not use other wireless devices operating at the same frequencies as the GCS. Otherwise, the GCS will experience interference. • Do not stand in front of the GCS during flight. Only the pilot can stand behind the GCS. • Leave the antennas free, without metal objects nearby. • Whenever possible, avoid placing the antennas at ground level; it is preferable to keep them elevated. • Avoid having an obstacle between the UAV and the GCS during flight. • The signal level value is displayed in the App during the flight. Adjust the antennas to make sure that the UAV is in the optimal transmission range.	

2.2.2.2 Medium Range setup

Regarding directional antennas, the optimal transmission range is where the antennas face toward the UAV and the angle between the antennas and the UAV does not exceed 20 degrees:

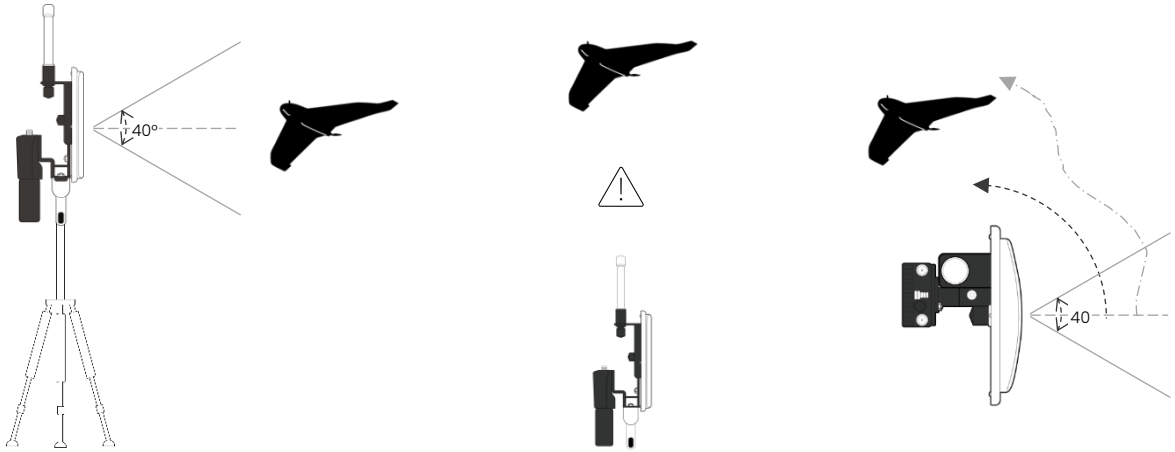


Figure 2-4 Medium range antenna radiation pattern

2.2.2.3 Long Range setup

Regarding directional antennas, the optimal transmission range is where the antennas face toward the UAV and the angle between the antennas and the UAV does not exceed 10 degrees:

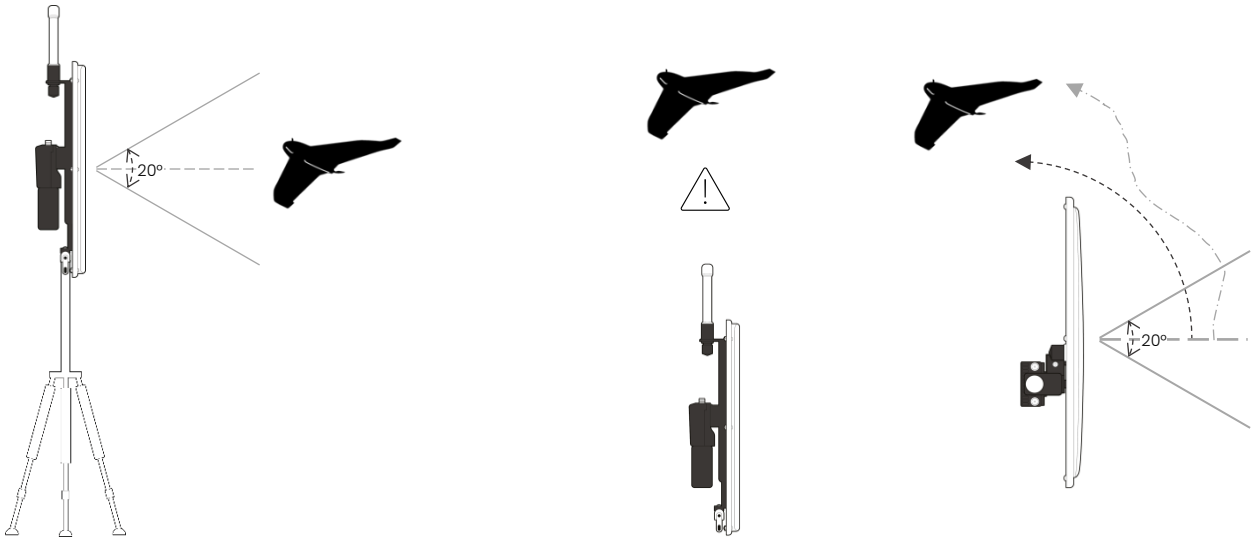


Figure 2-5 Long range antenna radiation pattern

⚠	Warning
• Avoid flying above the antennas or with limited altitude. Otherwise, radio link issues can occur. • If the drone flies out of the antenna's radiation beamwidth during flight, adjust the antenna to point in the direction of the drone.	

⚠	Warning

- Do not use other wireless devices operating on the same frequencies as the GCS, as this will cause interference.
- Ensure there are no obstacles between the UAV and the GCS during flight: avoid standing in front of the antennas during flight and keep them clear of any nearby metal objects.
- Place the antennas on a tripod or mount them on a vehicle; do not position them at ground level.
- The signal strength is displayed in the app during flight. Adjust the antennas to ensure the UAV is in the optimal transmission path.

2.2.3 Short Range antenna assembly

Short range setup is composed of the following elements:

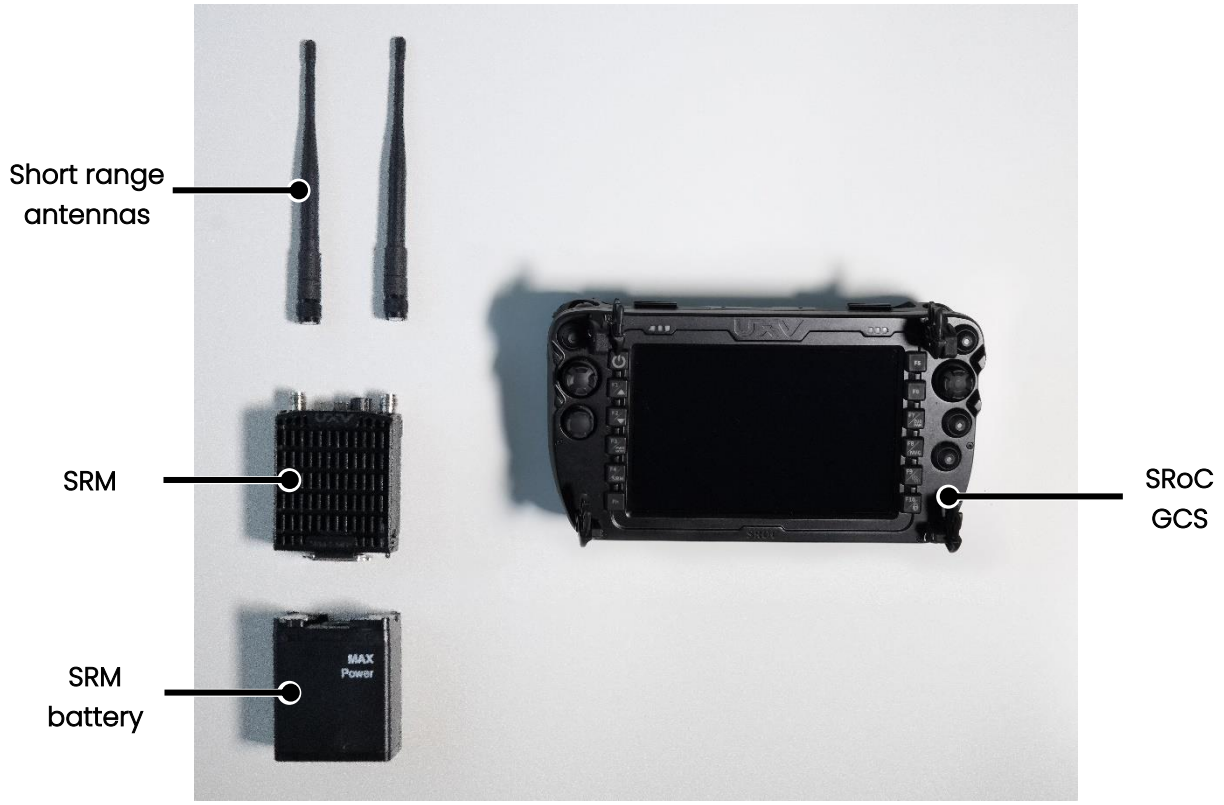
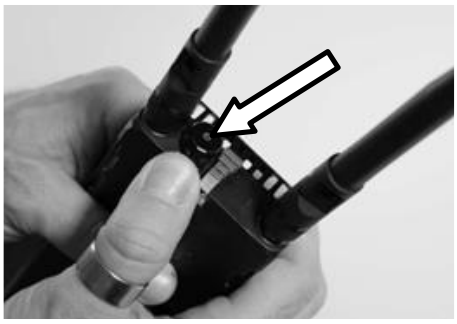
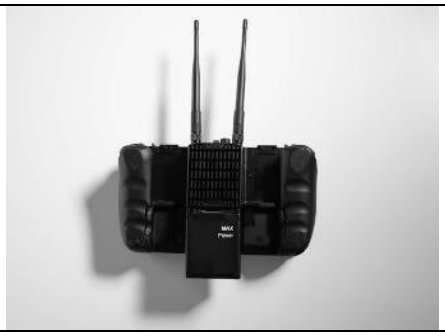


Figure 2-6 Short range antenna components

⚠	Warning
• Powering the SRM without antennas can cause permanent damage.	

Screw the first antenna to the SRM.	
Screw the second antenna to the SRM.	

Connect the SRM with the SRM battery.	
Secure the connection with the twist-lock mechanism.	
Check that the safety pin is engaged.	
Turn on the SRM. LED will turn red.	
Place SRM at the back of the GCS	
Slide the SRM down to lock it into position.	

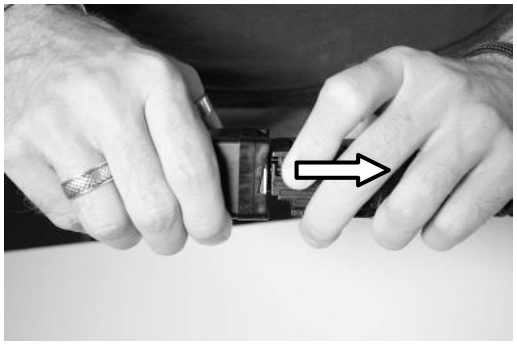
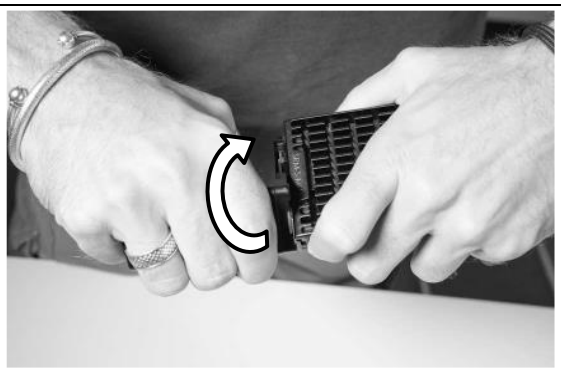
Final setup.	

ⓘ	Note

- A fully charged SRM battery can power the SRM for 36 hours.
- SRM can be used without SRM battery and powered by the SRoC with very degraded performances.
- A fully charged SRoC can power the SRM for less than an hour.

2.2.4 Short Range setup disassembly

⚠	Warning
• Always turn-off the SRM before removing the antennas to prevent permanent damage.	

Pull the pin to unlock the SRM.	
Slide the SRM out of the GCS.	
Turn off the SRM.	
Pull the pin to unlock the SRM battery.	
Twist the SRM battery to disconnect it.	

Unscrew first antenna.	
Unscrew second antenna.	

2.2.5 Medium Range antenna setup assembly

The Medium Range antenna setup is composed of the following elements:

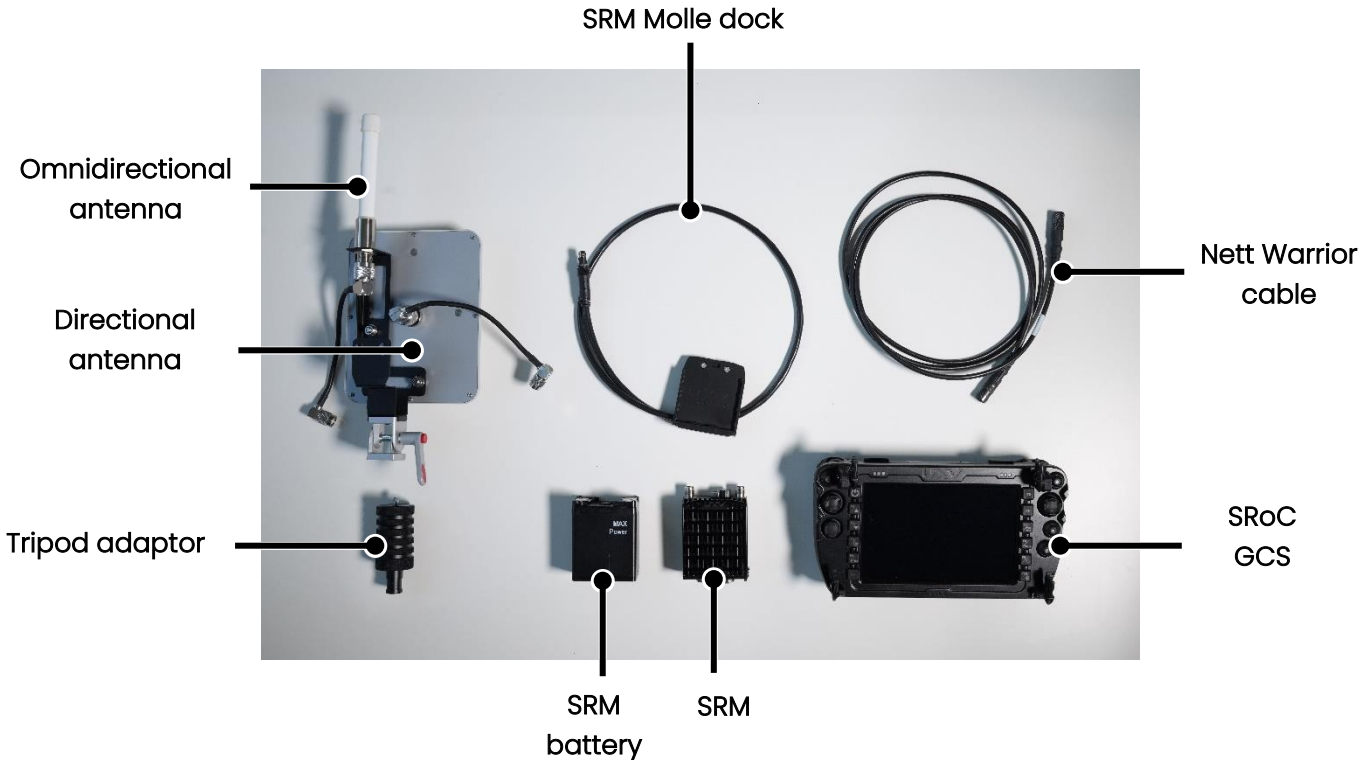
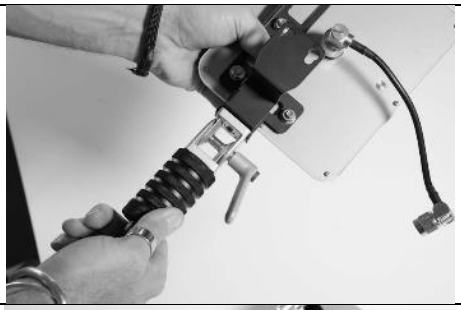
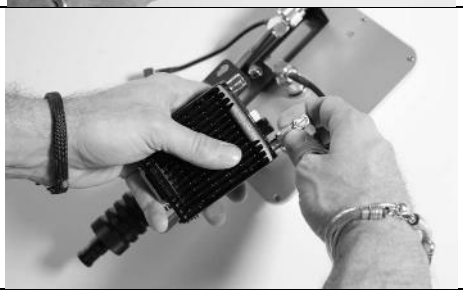
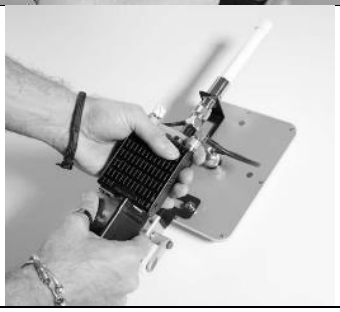
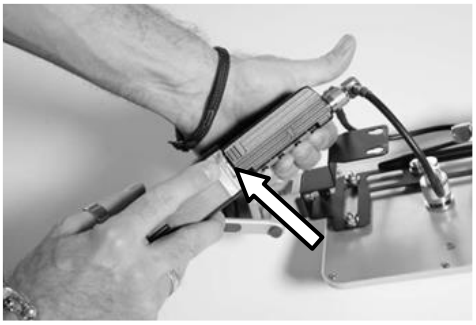
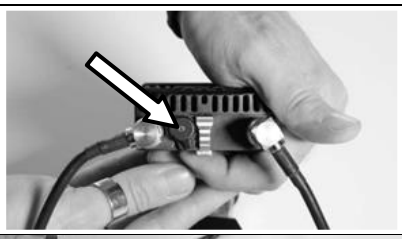
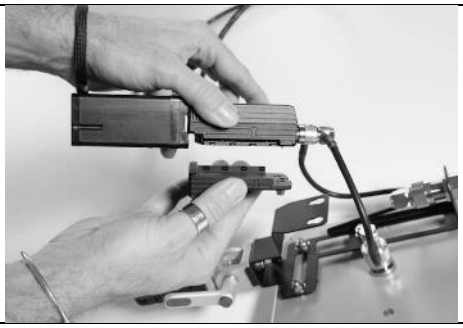
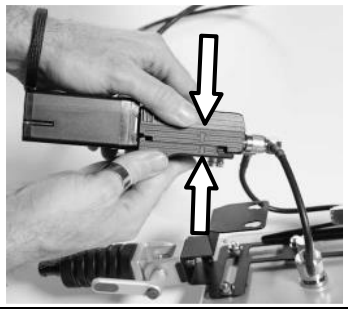
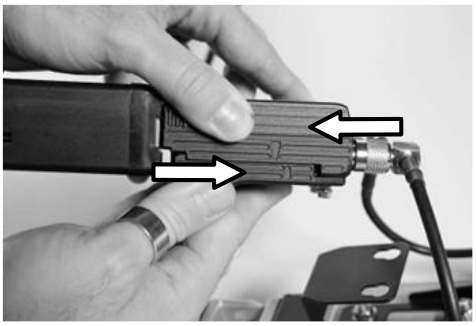
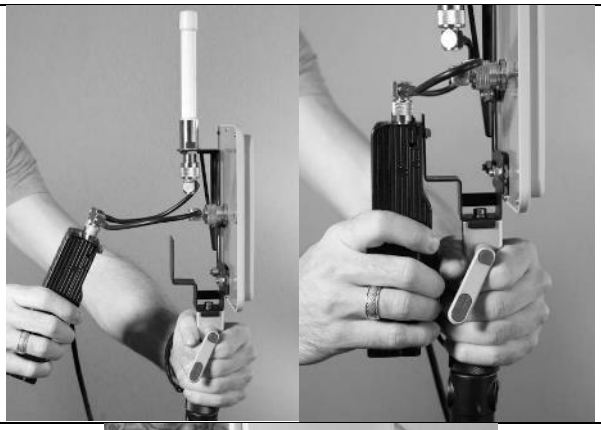
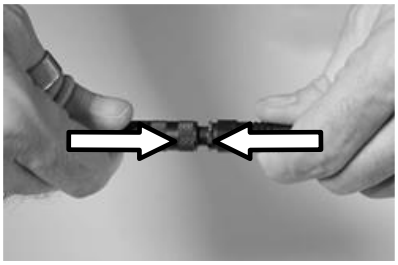


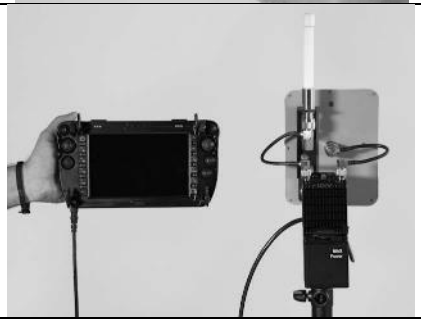
Figure 2-7 Medium range antenna components

⚠	Warning
• Powering the SRM without antenna can cause permanent damage	

Screw the tripod adaptor to the antenna mount.	
Screw the directional antenna cable.	

Screw the omnidirectional antenna cable.	
Connect the SRM with the SRM battery.	
Secure the connection with the twist-lock mechanism.	
Check that the safety pin is engaged.	
Turn on the SRM.	
LED turns red	
Place the SRM Molle dock at the back of the SRM.	

Chek the position markings.	
Slide the SRM into the SRM molle dock.	
Attach the SRM molle dock to the antenna holder.	
Fix the antenna mount on the tripod and secure it with the screw.	
Plug the SRM molle dock connector into the Nett-Warrior cable using the red marking to get the right position.	 

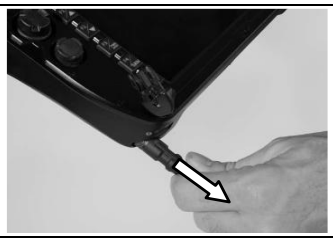
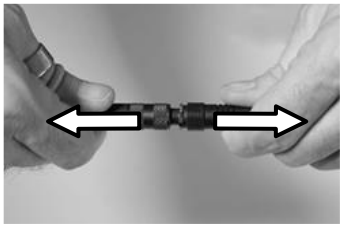
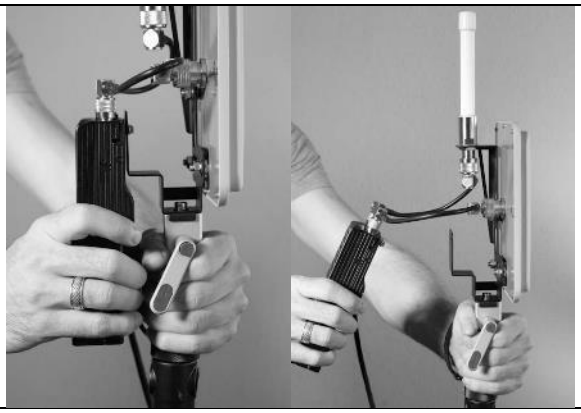
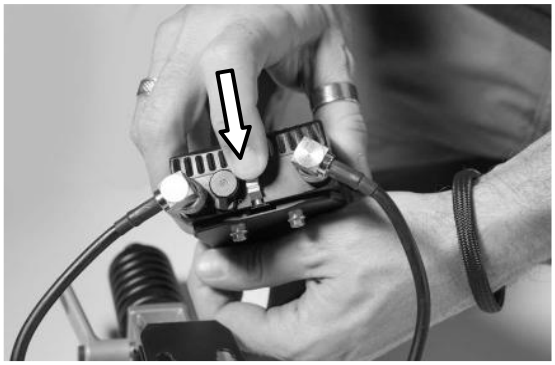
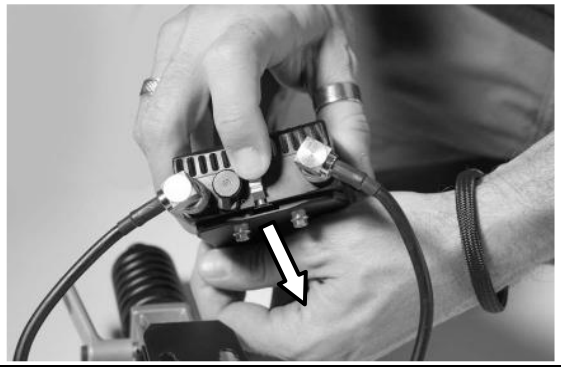
Plug the other end of the Nett-Warrior cable into the GCS.	
Final setup.	

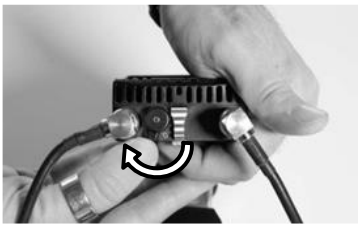
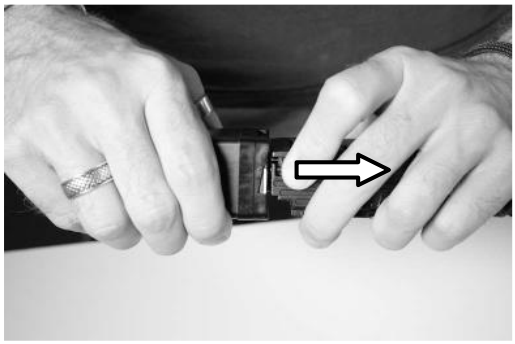
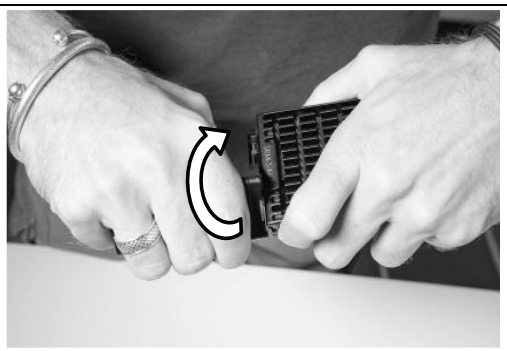
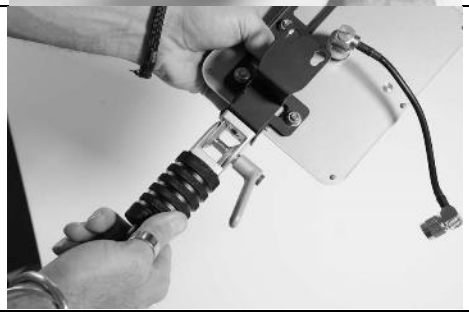
ⓘ	Note

- A fully charged SRM battery can power the SRM for 36 hours.
- SRM can be used without SRM battery and powered by the SRoC with very degraded performances.
- A fully charged SRoC can power the SRM for less than an hour.

2.2.6 Medium Range antenna setup disassembly

⚠	Warning
• Always turn-off the SRM before removing the antennas to prevent permanent damage.	

Unplug Nett-warrior cable from the GCS.	
Unplug the Nett-warrior cable from SRM molle dock.	
Remove the SRM molle dock from antenna mount.	
Pull the pin to unlock the SRM.	
Slide SRM out of the SRM molle dock.	

Turn-off the SRM.	
Pull the pin to unlock the SRM battery.	
Twist the SRM battery to disconnect it.	
Unscrew antenna cable.	
Unscrew second antenna cable.	
Unscrew the tripod adaptor.	

2.2.7 Long Range antenna setup assembly

The Long Range antenna setup is composed of the following elements:

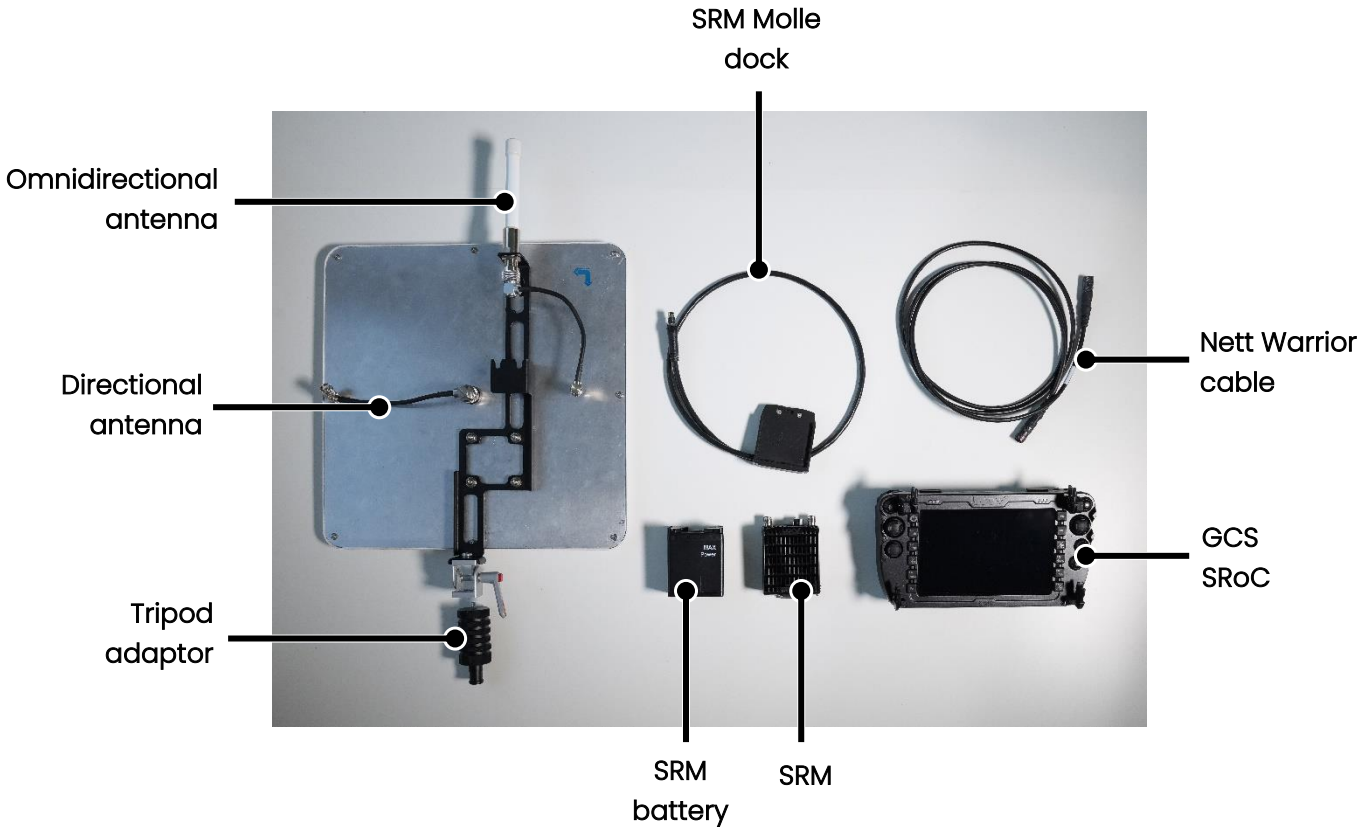
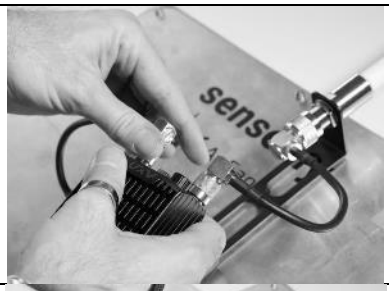
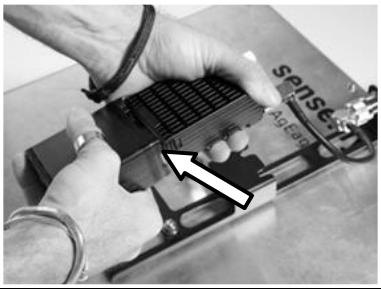
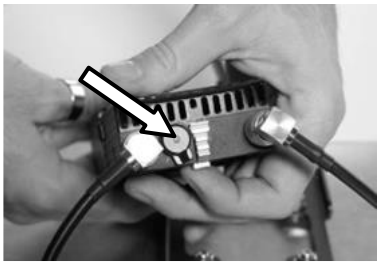
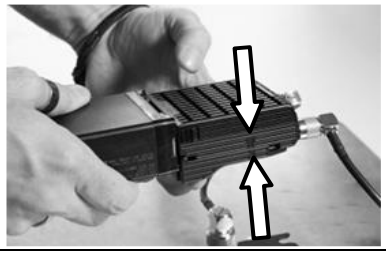
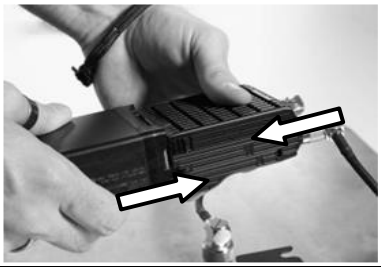
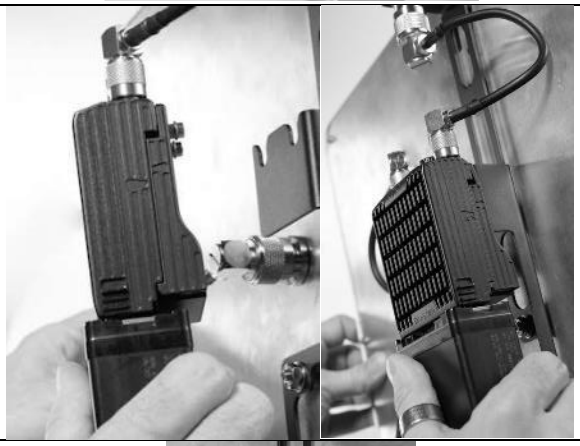
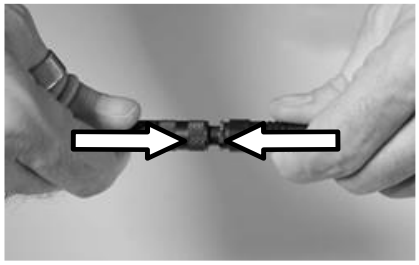


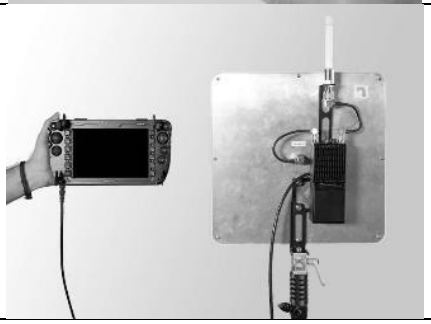
Figure 2-8 Long range antenna components

⚠	Warning
• Powering the SRM without antenna can cause permanent damage	

Screw the tripod adaptor to the antenna mount.	
Screw the omnidirectional antenna cable.	

Screw the directional antenna cable.	
Connect the SRM with the SRM battery.	
Secure the connection with the twist-lock mechanism.	
Check that the safety pin is engaged.	
Turn on the SRM.	
LED turns red	
Place the SRM Molle dock at the back of the SRM.	

Chek the position markings.	
Slide the SRM into the SRM molle dock.	
Attach the SRM molle dock to the antenna holder.	
Fix the antenna mount on the tripod and secure it with the screw.	
Plug the SRM molle dock connector into the Nett-Warrior cable using the red marking to get the right position.	 

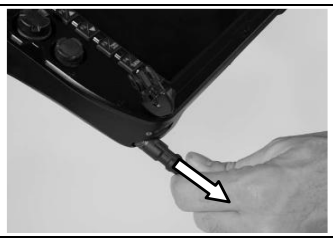
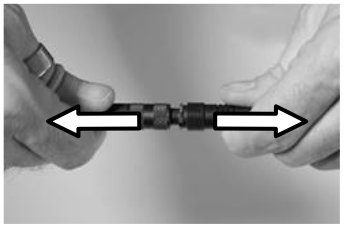
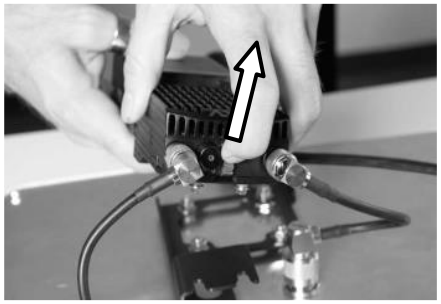
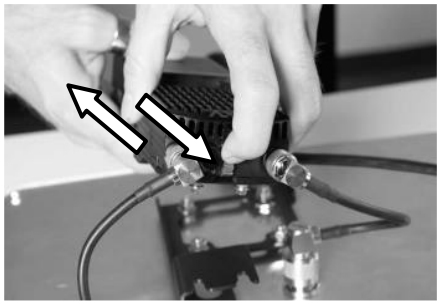
Plug the other end of the Nett-Warrior cable into the GCS.	
Final setup.	

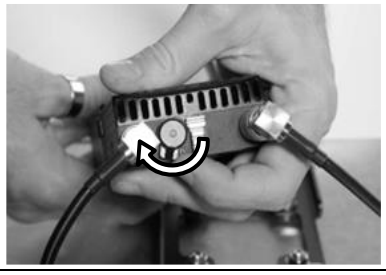
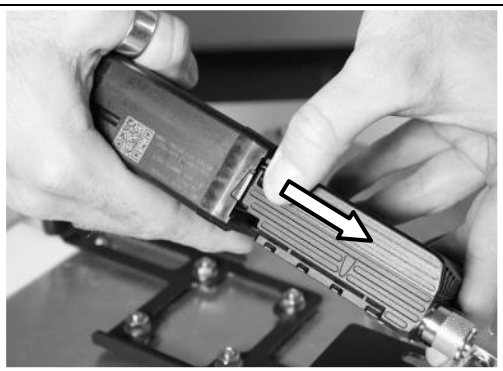
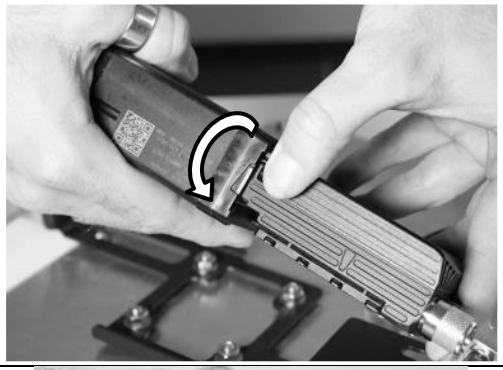
ⓘ	Note

- A fully charged SRM battery can power the SRM for 36 hours.
- SRM can be used without SRM battery and powered by the SRoC with very degraded performances.
- A fully charged SRoC can power the SRM for less than an hour.

2.2.8 Long Range antenna setup disassembly

⚠	Warning
• Always turn-off the SRM before removing the antennas to prevent permanent damage.	

Unplug Nett-warrior cable from the GCS.	
Unplug the Nett-warrior cable from SRM molle dock.	
Remove the SRM molle dock from antenna mount.	 
Pull the pin to unlock the SRM.	
Slide SRM out of the SRM molle dock.	

Turn-off the SRM.	
Pull the pin to unlock the SRM battery.	
Twist the SRM battery to disconnect it.	
Unscrew directional antenna cable.	
Unscrew omnidirectional antenna cable.	

Unscrew the tripod adaptor.	

2.3 Batteries

2.3.1 Drone battery

⚠	Warning

- Always use the battery within its operating range (-10 °C to +49 °C / +14 °F to +120 °F)
- Using the battery outside those conditions will affect its safety and lifespan and may cause spontaneous combustion or permanent damage.
- Do not use battery in strong electrostatic (such as thunderstorms) or electromagnetic environment. Otherwise, some functions of the battery may fail resulting in serious aircraft malfunction.
- Never use a battery that has been involved into a crash or dropped from the aircraft
- Never use a battery that is water-soaked or immerse a battery into any type of liquid. Water contact inside the battery may cause corrosion that can lead to spontaneous combustion or even explosion.
- Do not use a battery that emits smoke, is bulged, leaks, or has a damaged appearance.
- Liquid inside the battery is corrosive. If it leaks, please keep away from it. If it accidentally touches your skin or eye, rinse immediately with clear water for several minutes and seek medical attention.
- Do not disassemble, puncture, strike, crush, or burn the battery in any way. These actions may result in spontaneous combustion or explosion of the battery.
- Do not short-circuit the positive and negative terminals of the battery.
- If the connector of the battery is dirty, use a dry cloth to clean it. Otherwise, it may cause poor contact, leading to energy loss or charging failure.

2.3.1.1 Drone battery properties

Drone battery is a Li-Po 15.4V, 4550mAh.

2.3.1.2 Drone battery charging

⚠	Warning

- Always use the provided USB-C cable to link the charging dock and PSU.
- Make sure that the fan below the charging dock is not obstructed.
- Keep the charging dock and PSU away from any liquids or heat source (fire).

To charge eBee VISION battery the following elements are needed:

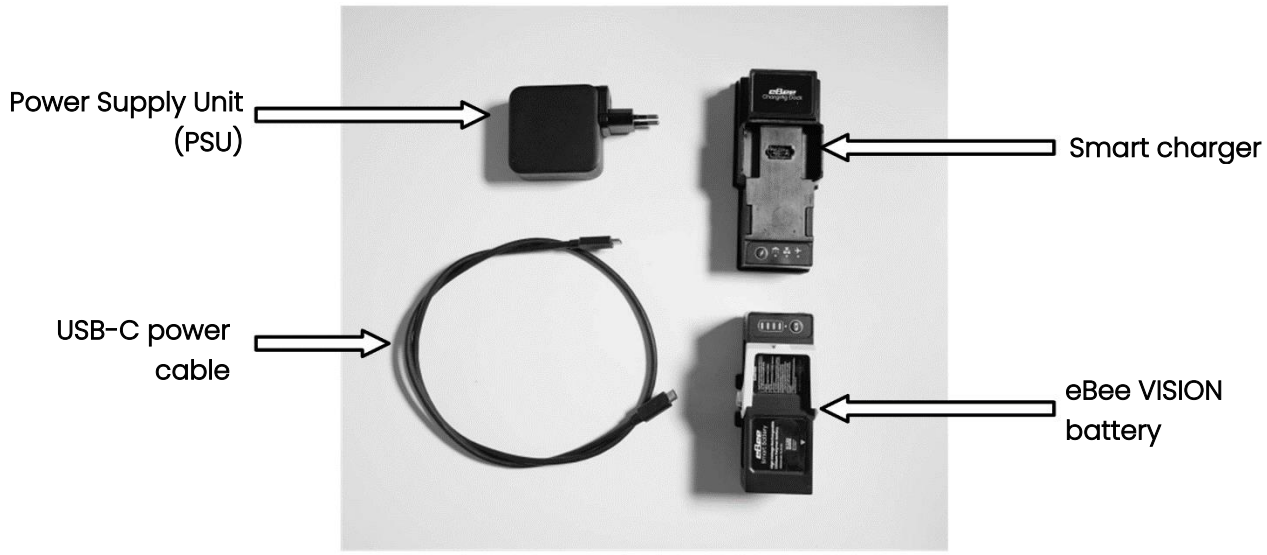
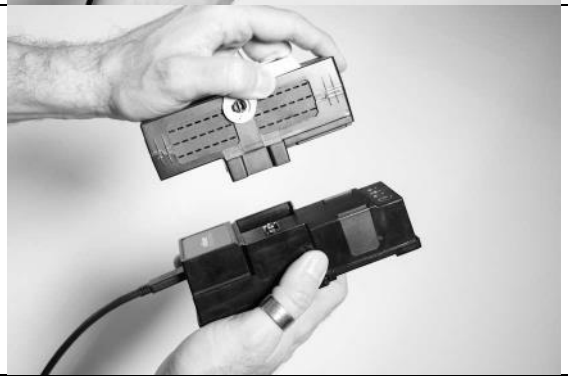
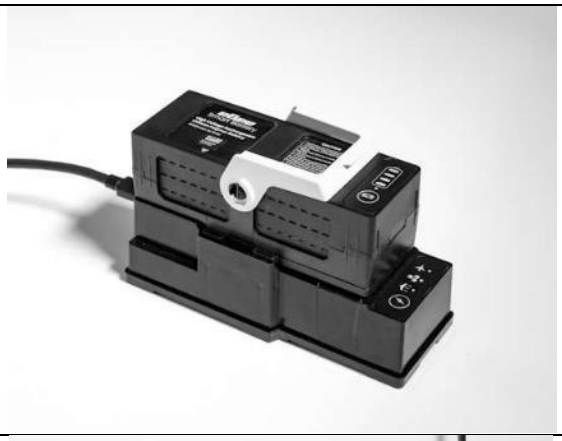
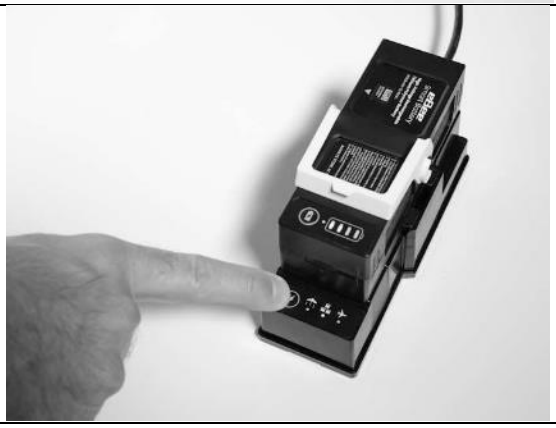
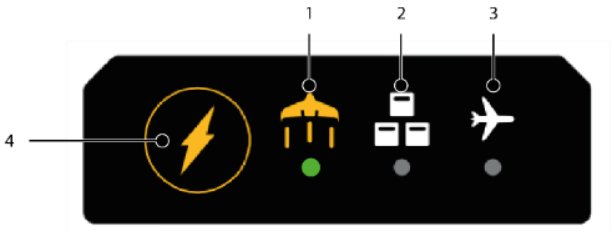


Figure 2-9 eBee VISION battery charger components

Plug the USB-C cable in the PSU.	
Plug the other end of the USB-C cable in the charging dock.	
Align drone battery and charging dock.	

Place the charging block in a dried ventilated area and far from any heat source.	
Select the desired charging mode by pressing the power button on the charging dock.	
1 - flight (100%) / 2 - storage (70%) / 3 - shipping (30%)	
Battery LED and selected power mode will start blinking along with a 1s beep.	
Battery LED and selected power mode will stop blinking along with a 3s beep to indicate end of the selected power mode.	
Charging dock will emit 1s beep every 2 minutes until the battery is removed	

	Note

- By default, the charging mode is set to flight.
- Storage mode and Shipping mode can be performed without connecting the charging dock to the PSU. These modes can only discharge the battery to the indicated level. They do not charge, even if plugged in to the PDU.
- Battery can be removed from charging dock at any time.
- It is not possible to power two charging docks with a single PSU.

2.3.1.3 Drone battery storage

Battery must be stored at a temperature in range (+10 °C to +49 °C / +50 °F to +120 °F).
Battery must be stored in a dry, ventilated environment.
Battery must be stored in a fire-retardant bag or case.

⚠	Warning

- Storing the battery inside the eBee VISION will result in permanent damage to the battery.
- Never store a battery that has been involved into a crash or dropped from the aircraft
- Never store a battery that is water-soaked or immerse a battery into any type of liquid. Water contact inside the battery may cause corrosion that can lead to spontaneous combustion or even explosion.
- Do not store a battery that emits smoke, is bulged, leaks, or has a damaged appearance

2.3.2 GCS battery

2.3.2.1 GCS battery properties

GCS battery is Li-ion 3.8V, 3.200mAh.

2.3.2.2 USB Charging

To charge the GCS battery the following elements are needed:

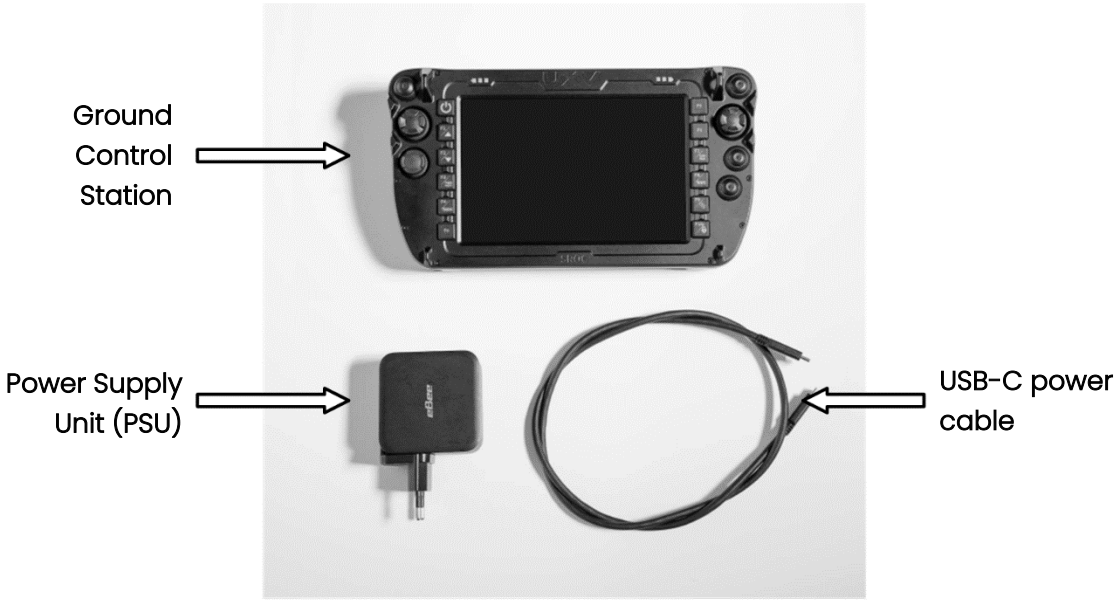


Figure 2-10 SRoC USB charger components

Plug the USB-C cable in the PSU.	

Plug the other end of the USB-C cable into the GCS.	
Power LED will turn orange to indicate charge.	

ⓘ	Note
• SRoC can be charged with any USB power supply, the charging time will vary depending on the available power. • Connect the SRoC to a USB power bank to recharge on the field. • It is not possible to power the GCS and the charging dock with a single PSU.	

2.3.2.3 Nett Warrior charging

SRoC can also be charged via the Nett Warrior connector.
To recharge using a Nett Warrior charger (not included) the following elements are needed:

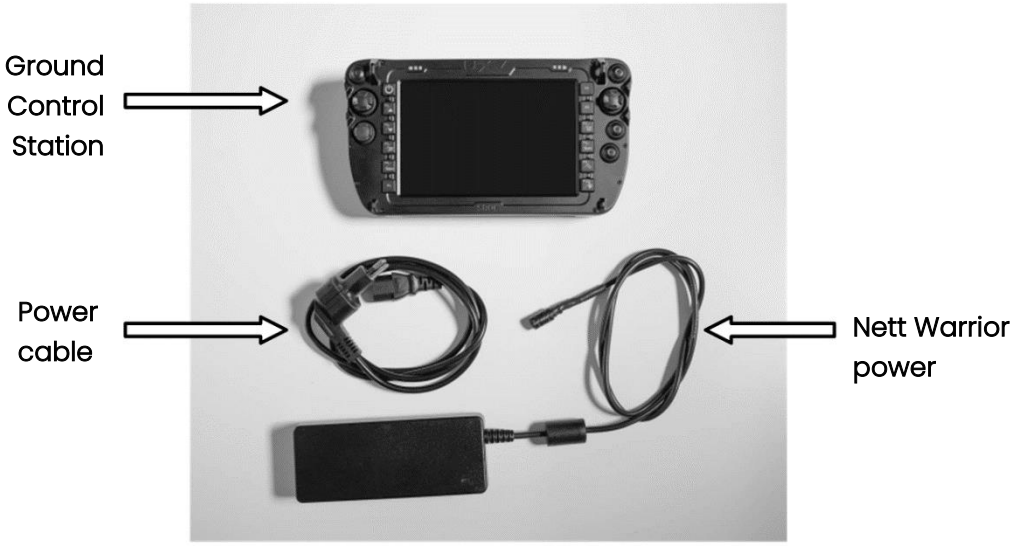


Figure 2-11 SRoC Nett Warrior charger components

Plug the power supply into the GCS using the Nett Warrior connector	
Plug the power cable into the power supply.	
Power LED will turn orange to indicate charge.	

ⓘ	Note
• Connect the SRoC to a Nett Warrior power bank to recharge on the field.	

2.3.3 SRM battery

⚠	Warning

- Always use the SRM battery within its operating range (-30 °C to +60 °C / -22 °F to +140 °F)
- Using the SRM battery outside those conditions will affect its safety and lifespan and may cause spontaneous combustion or permanent damage.
- Do not use SRM battery in strong electrostatic (such as thunderstorms) or electromagnetic environment.
- Never use a SRM battery that is water-soaked or immerse a SRM battery into any type of liquid. Water contact inside the battery may cause corrosion that can lead to spontaneous combustion or even explosion.
- Do not use a SRM battery that emits smoke, is bulged, leaks, or has a damaged appearance.
- Liquid inside the SRM battery is corrosive. If it leaks, please keep away from it. If it accidentally touches your skin or eye, rinse immediately with clear water for several minutes and seek medical attention.
- Do not disassemble, puncture, strike, crush, or burn the SRM battery in any way. These actions may result in spontaneous combustion or explosion of the SRM battery.
- Do not short-circuit the positive and negative terminals of the SRM battery.
- Keep the SRM battery charger away from any liquids or heat source (fire).

2.3.3.1 SRM battery properties

The SRM battery is AN/PRC-148 type, Li-ion 10.8V, 7000mAh.

2.3.3.2 SRM battery charging

To charge the SRM battery, the following elements are needed:

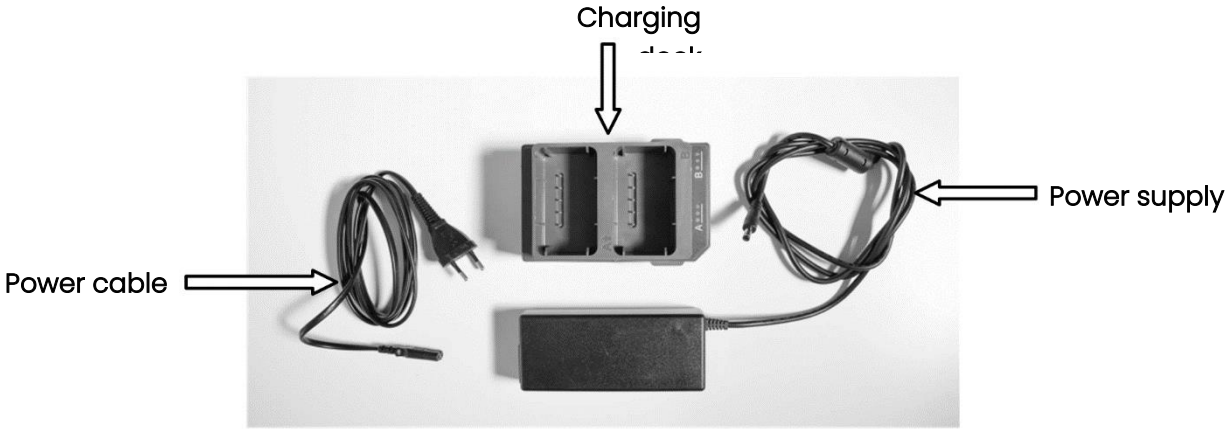
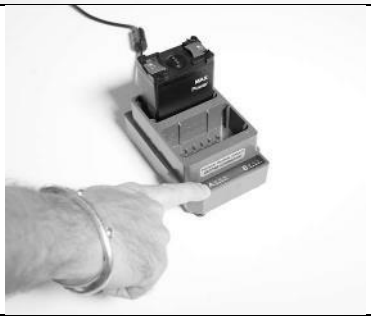


Figure 2-12 SRM charger components

Link the power supply to the charging dock.	
Plug the power cable into the power supply.	
Put the battery in one of the charging dock compartments with the twist-lock connector up.	
The LED will indicate the charge status. Red: error Orange: charging Green: charged	

	Note
	• It is possible to charge two SRM batteries at the same time. • Battery can be removed from charging dock at any time. • SRM battery can be charged with any AN/PRC-148 compatible device. • SRM battery state of charge (SOC) can be read using PRC-148 SOC reader (not included)

2.3.3.3 SRM battery storage

Battery must be stored at a temperature in range (+10 °C to +49 °C / +50 °F to +120 °F).
Battery must be stored in a dry, ventilated environment.
Battery must be stored in a fire-retardant bag or case.

⚠	Warning

- Never store a battery that is water-soaked or immerse a battery into any type of liquid. Water contact inside the battery may cause corrosion that can lead to spontaneous combustion or even explosion.
- Do not store a battery that emits smoke, is bulged, leaks, or has a damaged appearance

3 eBee APP

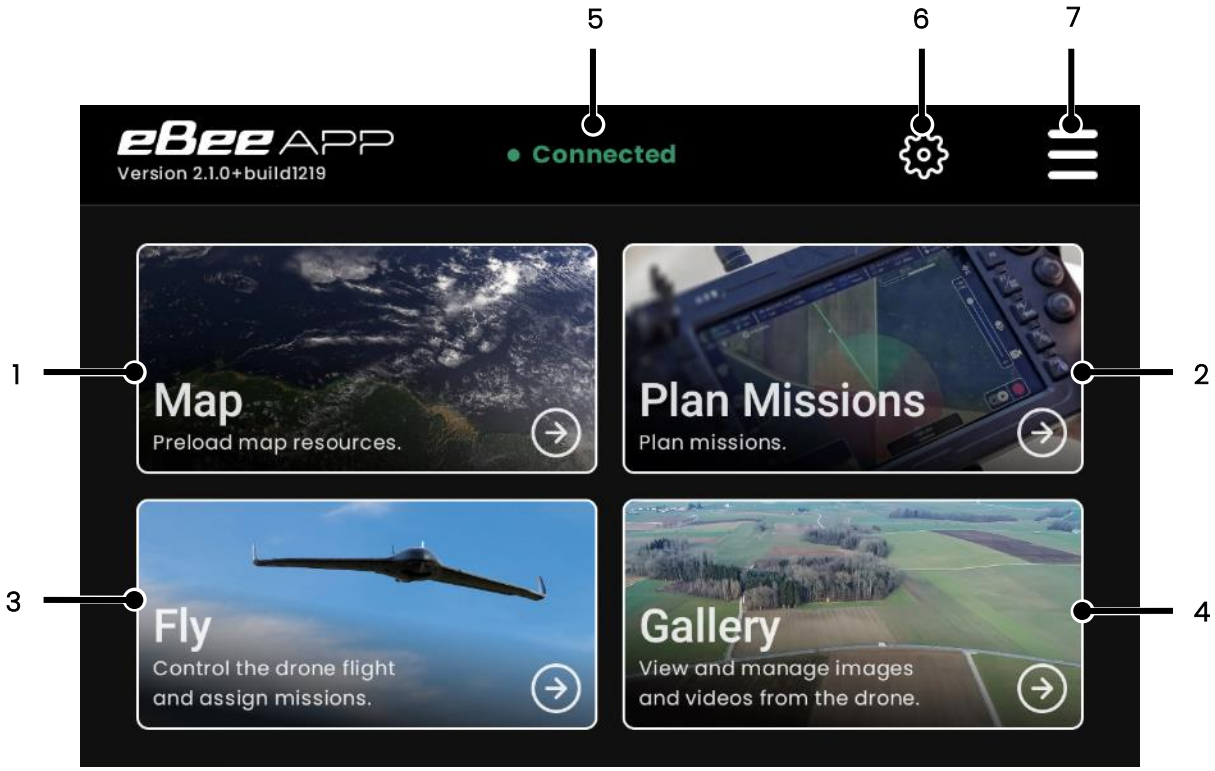


Figure 3-1 eBee APP main screen

1. Maps preloading
2. Mission planning
3. Operate eBee VISION
4. Visualize pictures and videos
5. Radio link connection status
6. Settings
7. System information and logbook

3.1 Map

The Map screen, shown below, is the screen used to import, download, and manage data related to the terrain and the area.

If the application is started without access to the internet, then a uniform blue background is used. If the application is started with an access to the internet, then:

- Map background tiles are automatically downloaded from Mapbox © servers.
- Coarse elevation data is downloaded from the drone manufacturer servers.

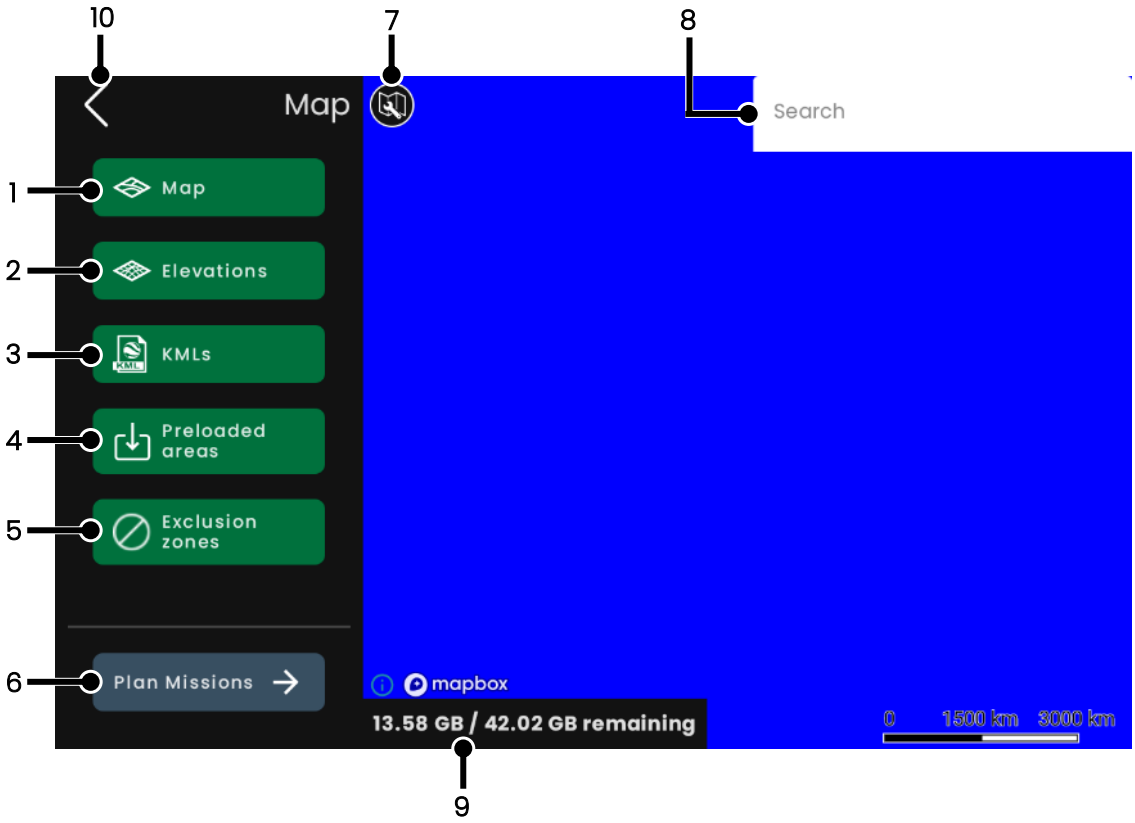


Figure 3-2 Map screen

From this screen, it is possible to import local files and manage:

- Background map from local files by pressing (1)
- Elevation data from local files by pressing (2)
- Map markers and annotation by local KML and KMZ files by pressing (3)
- No fly zones by pressing (5)

It is also possible to download background maps and elevation data from the internet for offline usage by pressing (4).

3.1.1 Map navigation on the *Map* screen

One can navigate the map by holding down with one finger and dragging in any direction or zooming by pinching with two fingers, moving the fingers outward to zoom in and inward to zoom out.

A single press on Figure 3-2 Map screen (7) will open a navigation menu, as shown below.

Figure 3-3 Map navigation icons

This menu is responsible for centering the map in the following ways:

- On specific coordinates with a dedicated widget, using (1).
- If connected to a drone, to the drone current location, using (2). If the GCS is not connected to any drone, then the button is disabled, as shown in the image.

- To the GCS position, as reported by GCS GPS module, using (3). If the GCS position is not known, the button is disabled, as shown in the image.

Using Figure 3-2 Map screen (8), it is also possible to search for specific addresses. Please note that this feature requires an active internet connection.
At any time, pressing on Figure 3-2 Map screen (6) will open the *Mission preparation* screen (see section 3.2 Plan Missions) and pressing (10) brings back the previous menu.

3.1.2 Background map local files management

The screen below displays the interface for importing local background maps and managing them.

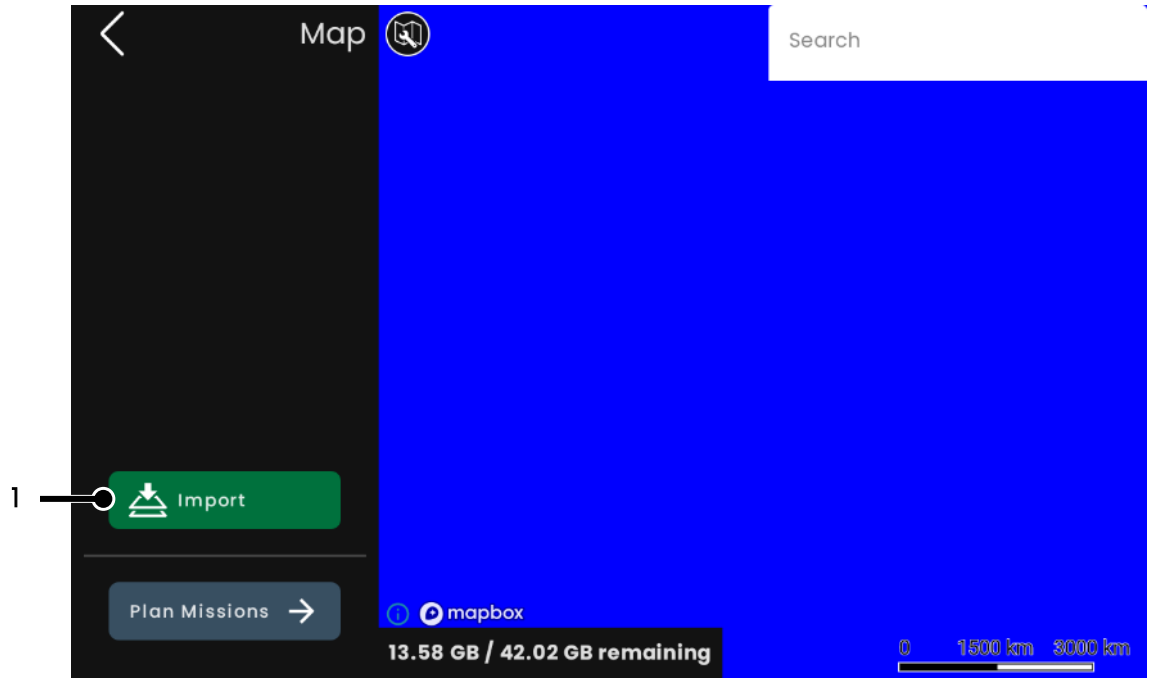


Figure 3-4 Map tiles screen

To select one or more files to import, press (1) and, using the Android file picker (shown below), pick the files you wish to import. The following map tiles format are supported:

- *tif, tiff*
- *jpeg, jpg*
- *jpeg2000*
- *png*

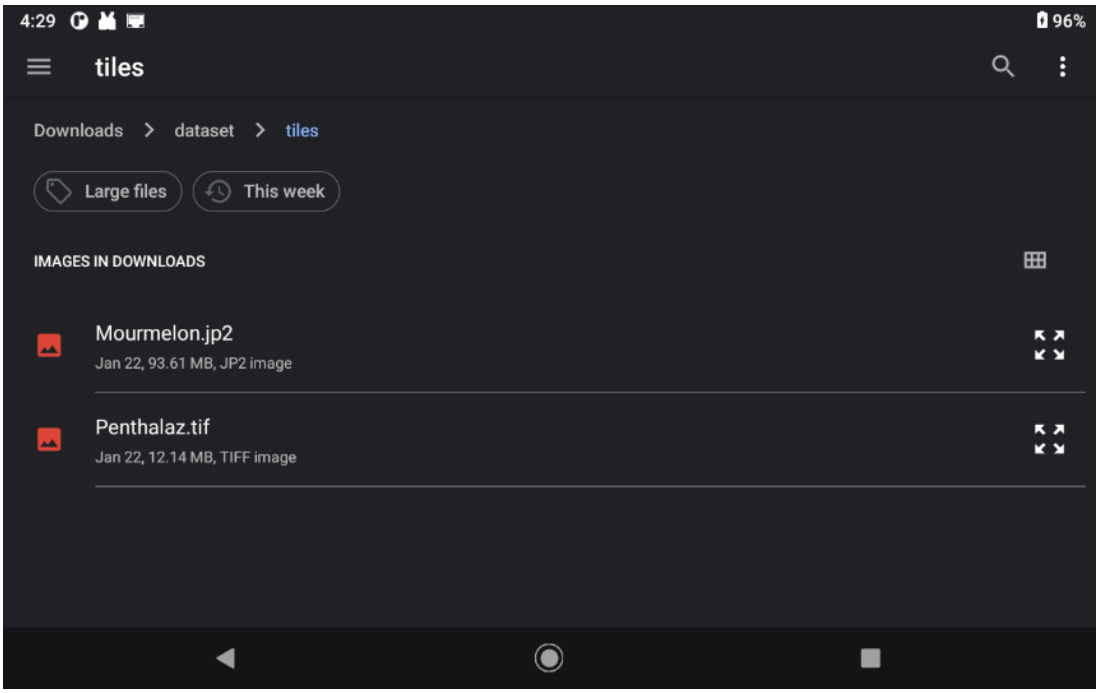


Figure 3-5 Android file explorer

A simple press on a file will select it. To import multiple files at once, press for several seconds on one until the picker switches to selection mode, then simply press on the other files, and validate using *Select* on the top right corner (1), as shown below.

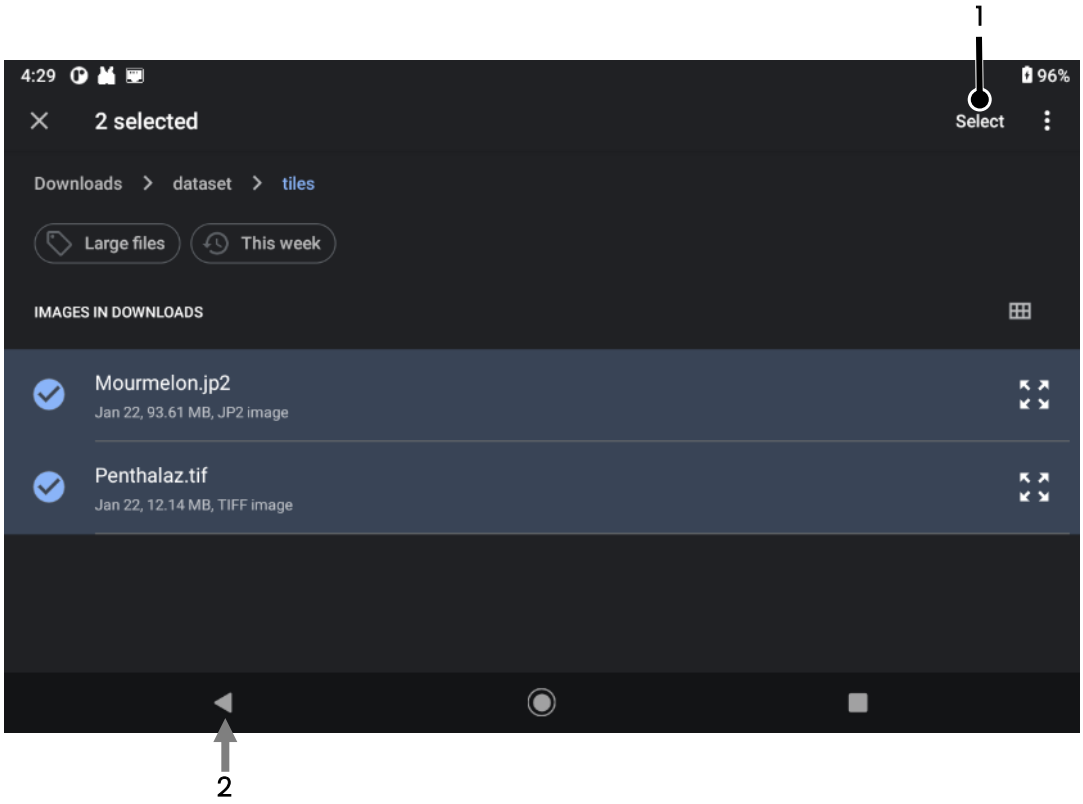


Figure 3-6 File selection demonstration

It is possible to cancel the picking by pressing *Back* (2) several times until the top of the filesystem is reached.
Once the files have been selected, the importing process is shown below.

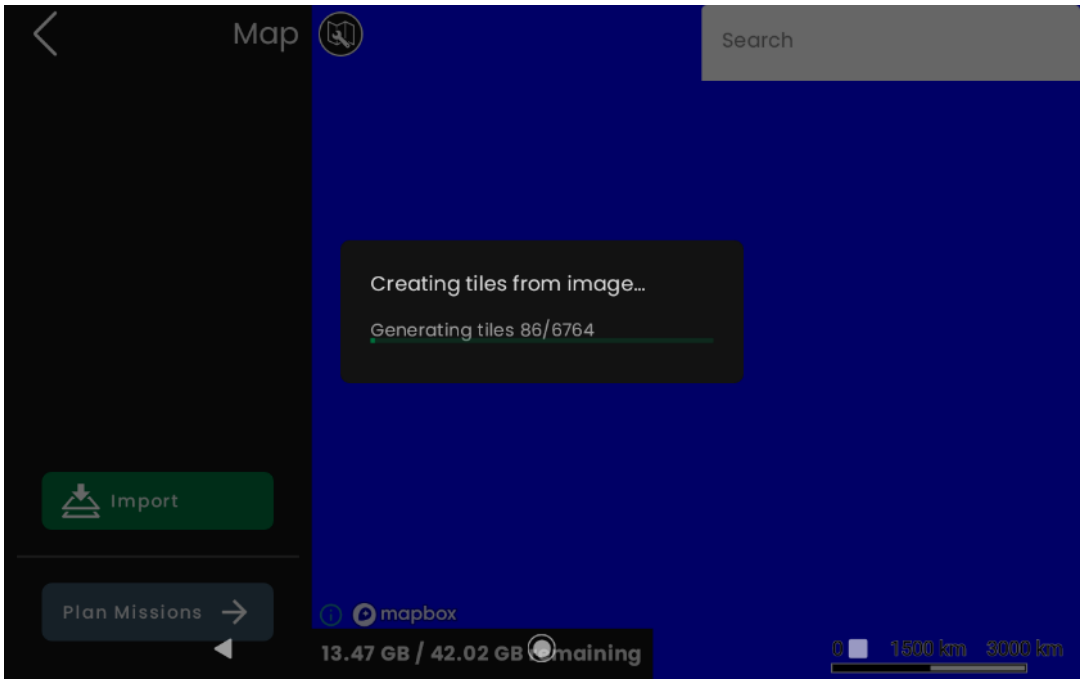


Figure 3-7 Tile import notification

Once finished, an entry is shown on the left for each file imported, with the same name as the original, as shown below.

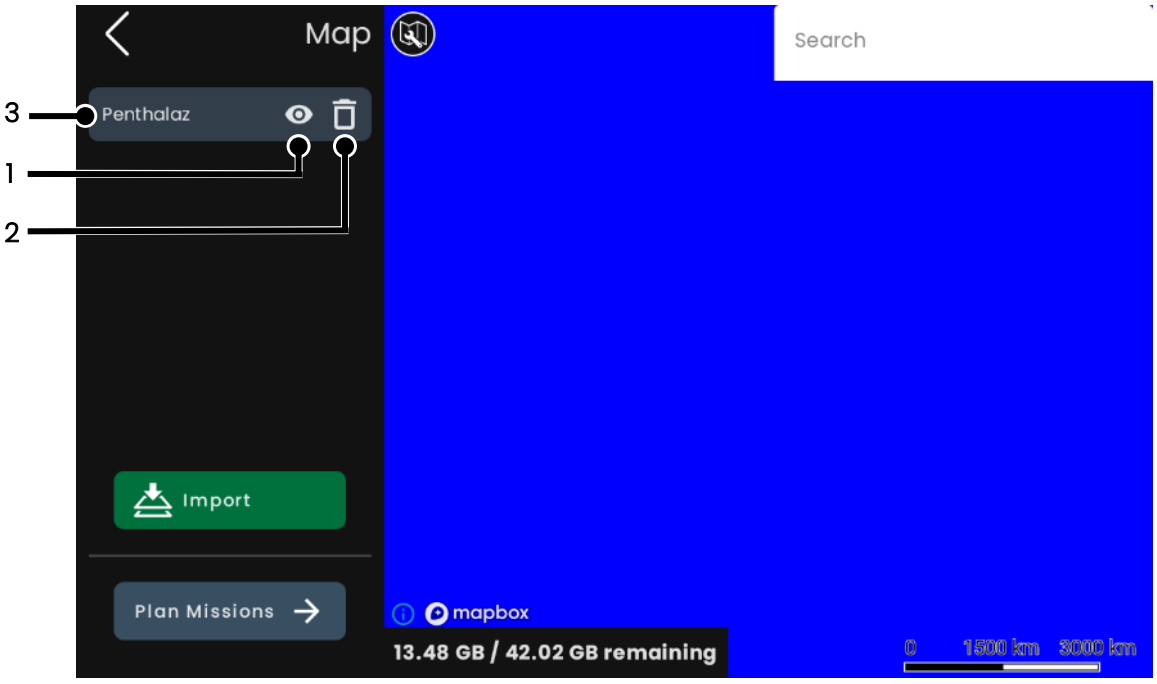


Figure 3-8 Tile management

For each entry, it is possible to

- Hide - Show the resulting map, by pressing on (1)
- Delete the file, by pressing on (2). Before deleting, a popup is shown to confirm the action
- Center the screen on the content by pressing on (3)

ⓘ	Note
• Attempting to import a file with the same name as an existing entry will result in an error notification	

3.1.3 Elevation data local files management

The screen below displays the interface for importing local elevation data files and managing them.

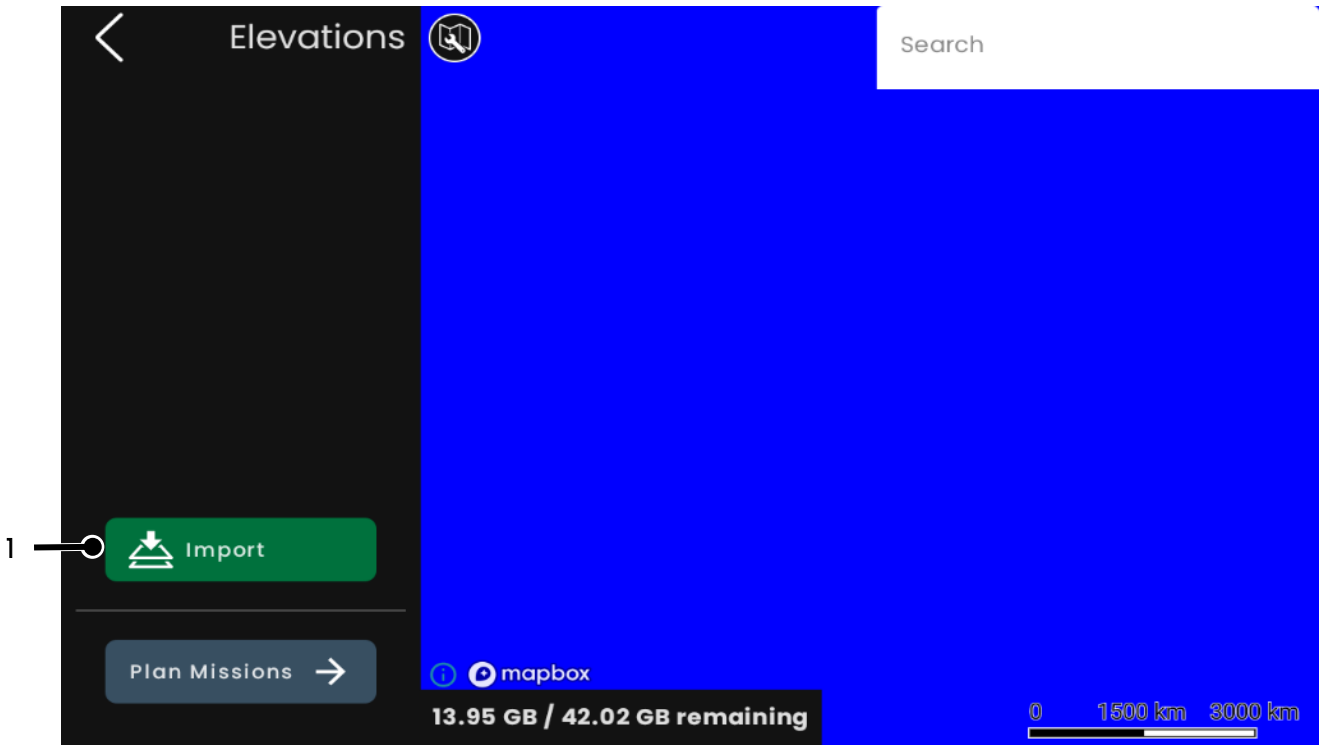


Figure 3-9 Elevation data management screen

To select one or more files to import, press 1 and, using the Android file picker (figure shown below), pick the files you wish to import. The following elevation data formats are supported:

- tif, tiff
- dted
- png

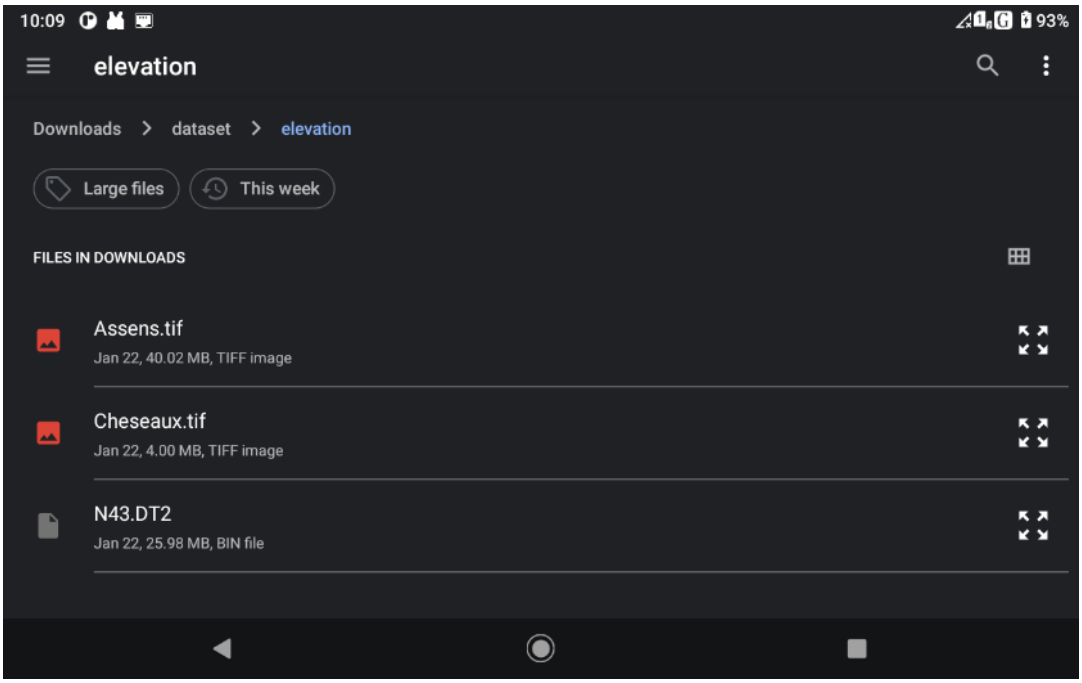


Figure 3-10 Android file explorer

A simple press on a file will select it. To import multiple files at once, press for several seconds on one until the picker switches to selection mode, then simply press on the other files, and validate using *Select* on the top right corner (1), as shown below.

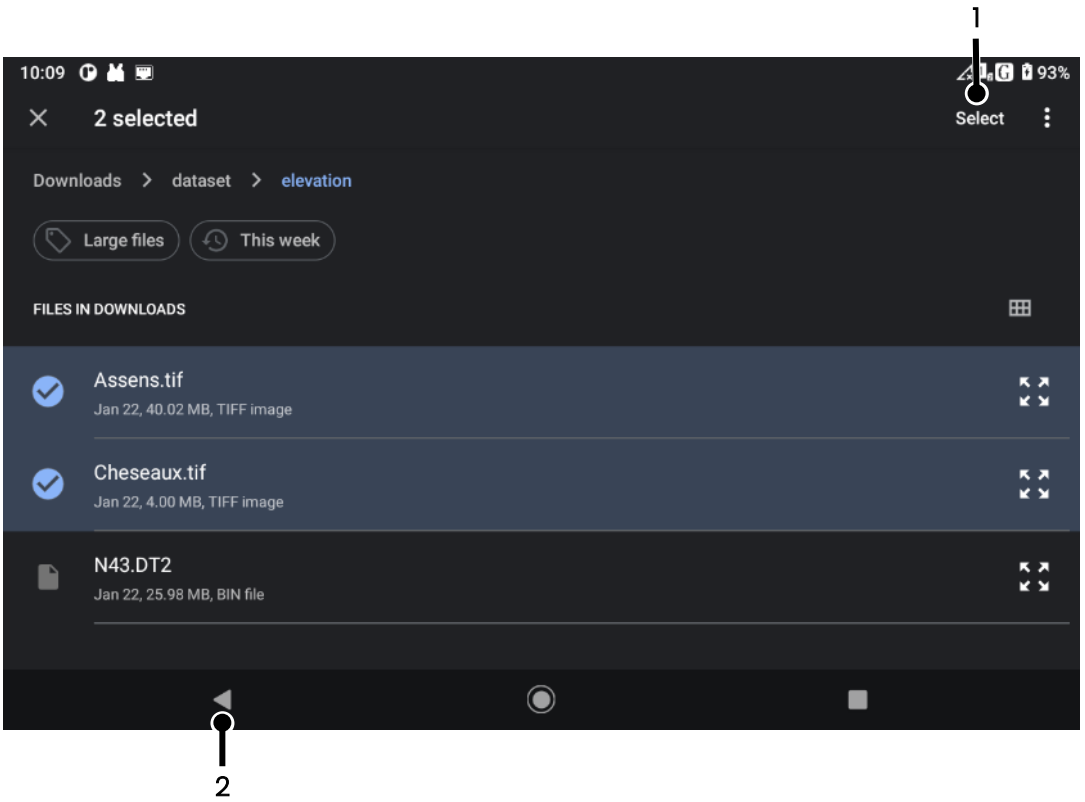


Figure 3-11 File selection demonstration

It is possible to cancel the picking by pressing *Back* (2) several times until the top of the filesystem is reached.
Once finished, an entry is shown on the left for each file imported, with the same name as the original, as well as the bounding box of the data (4), as shown below.

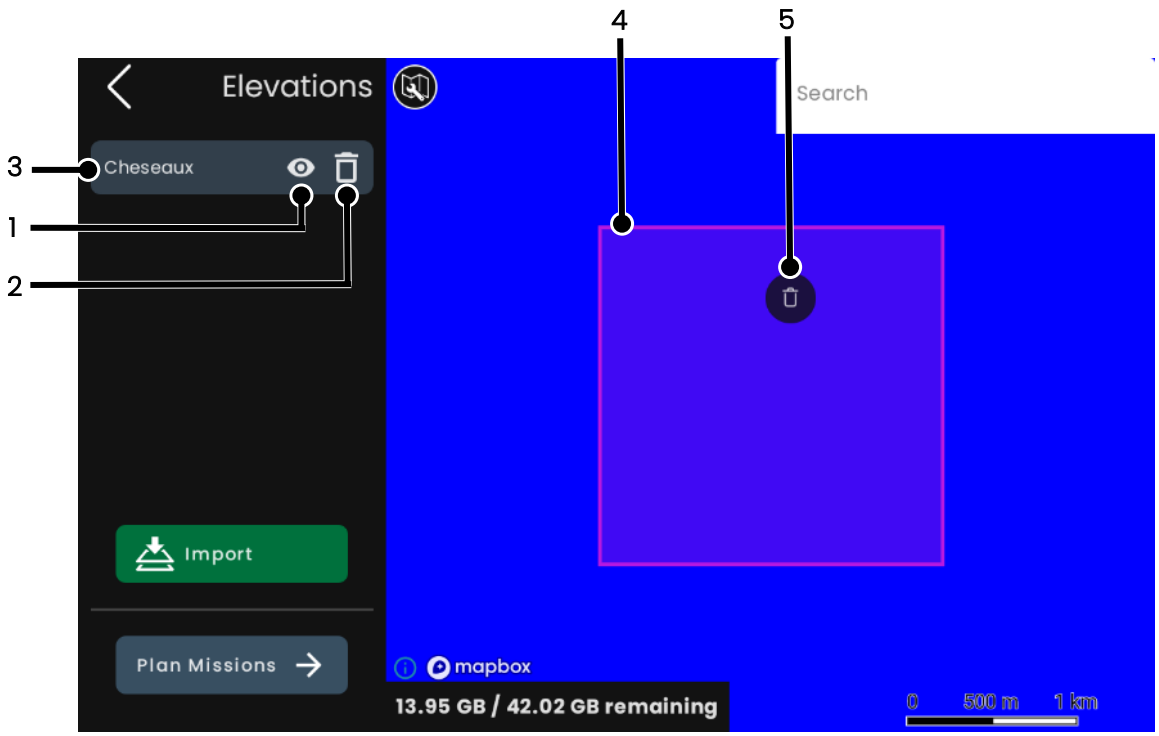


Figure 3-12 Elevation data management

For each entry, it is possible to:

- Enable - disable the file, by pressing on (1). **If a file is disabled, it will not be considered for any operation that requires elevation data.**
- Delete the file, by pressing on (2). Before deleting, a popup is shown to confirm the action
- Center the screen on the content by pressing on (3)

A long press anywhere on the file bounding box displays a trashcan icon to delete the file (5). **There is no confirmation for deletion when using this icon.** To hide the icon, simply press anywhere else on the map.

	Note
	• Attempting to import a file with the same name as an existing entry will result in a crash and the inability to further open this section of the application. The workaround in such a case is to clear the application data.

3.1.4 Map drawings and annotations (KML and KMZ local files)

The screen below displays the interface for importing local KML and KMZ files and managing them. The elements imported from such files are purely graphic, intended for the operator, displayed on top of the map and have no effect on the drone itself.
From a single file, the following KML features are supported:

- Polygon
- Polyline
- Points

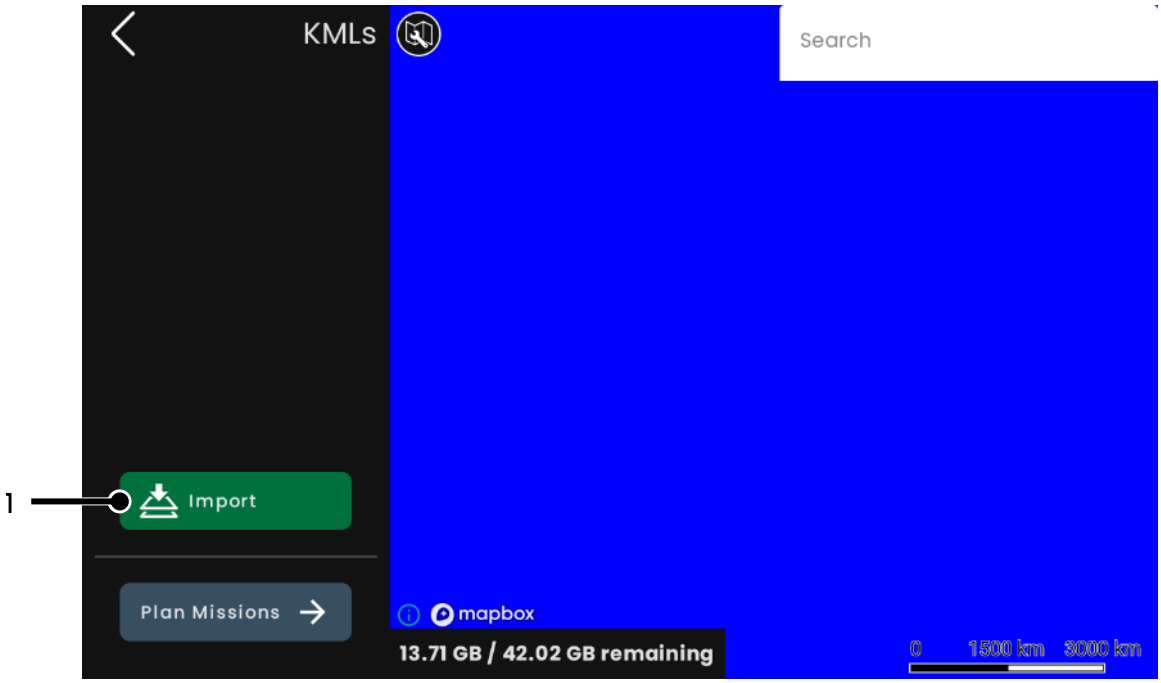


Figure 3-13 Map drawing and annotation screen

To select one or more files to import, press (1) and, using the Android file picker (figure shown below), pick the files you wish to import. The following formats are supported:

- kml
- kmz

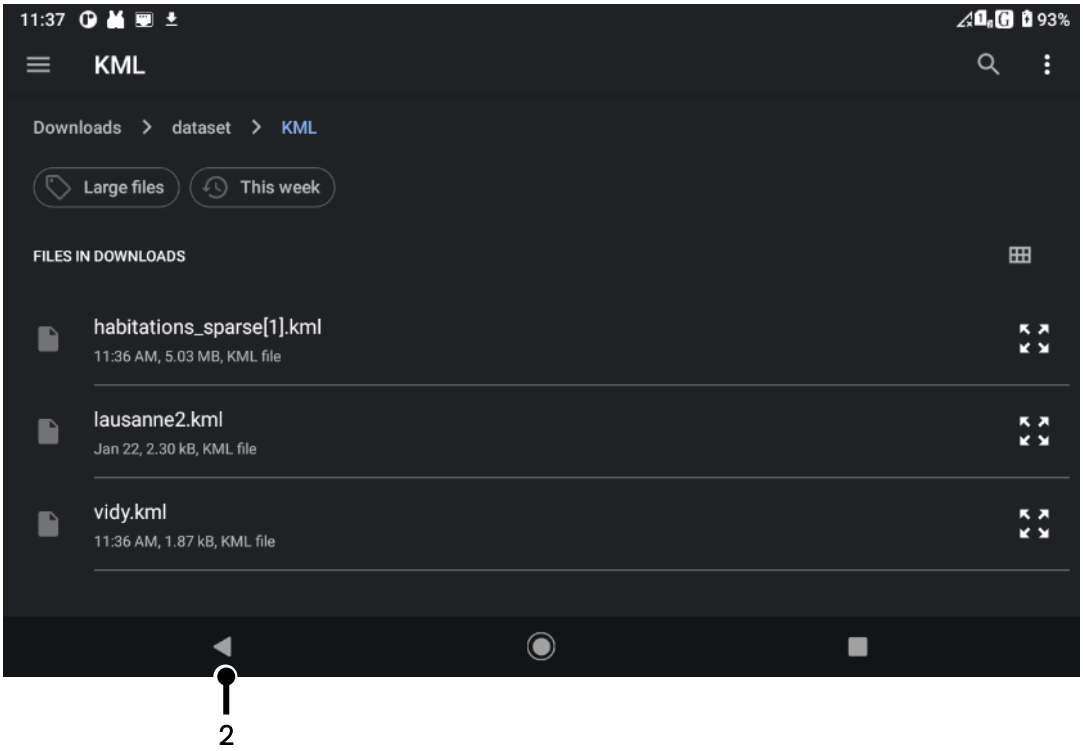


Figure 3-14 Android file explorer

A simple press on a file will select it. To import multiple files at once, press for several seconds on one until the picker switches to selection mode, then simply press on the other files, and validate using *Select* on the top right corner (1), as shown below.

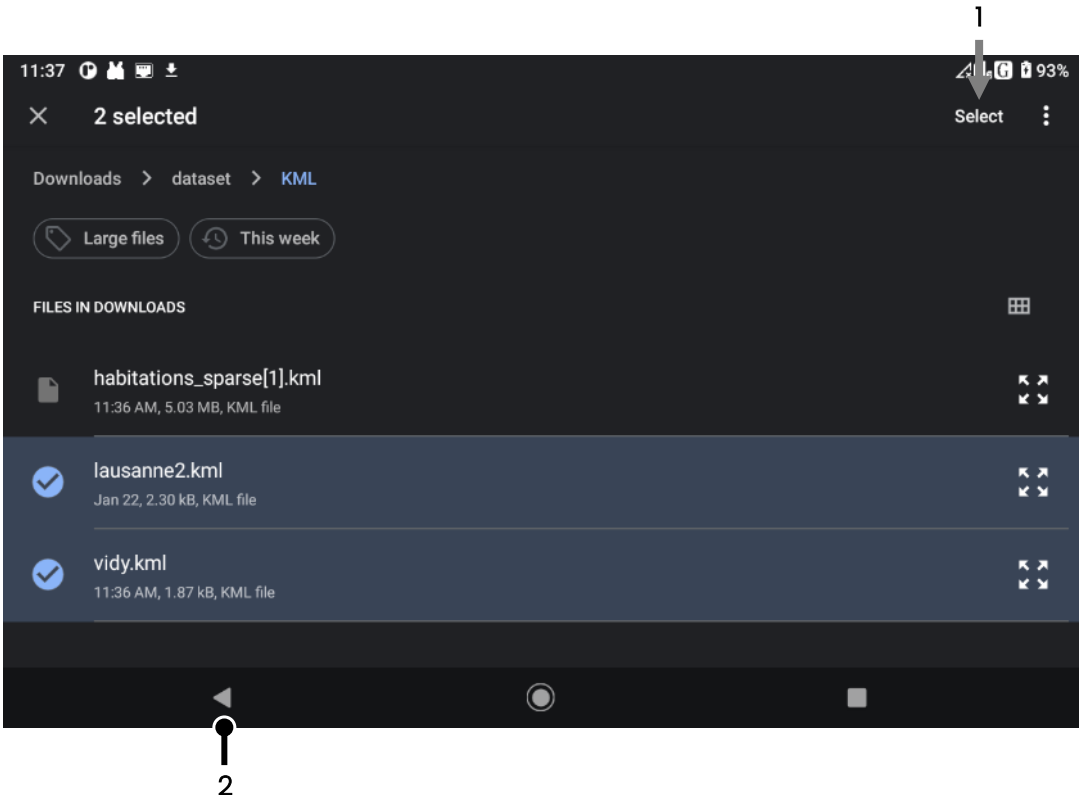


Figure 3-15 File selection demonstration

It is possible to cancel the picking by pressing *Back* (2) several times until the top of the filesystem is reached.

Once finished, an entry is shown on the left for each file imported, with the same name as the original, as shown below.

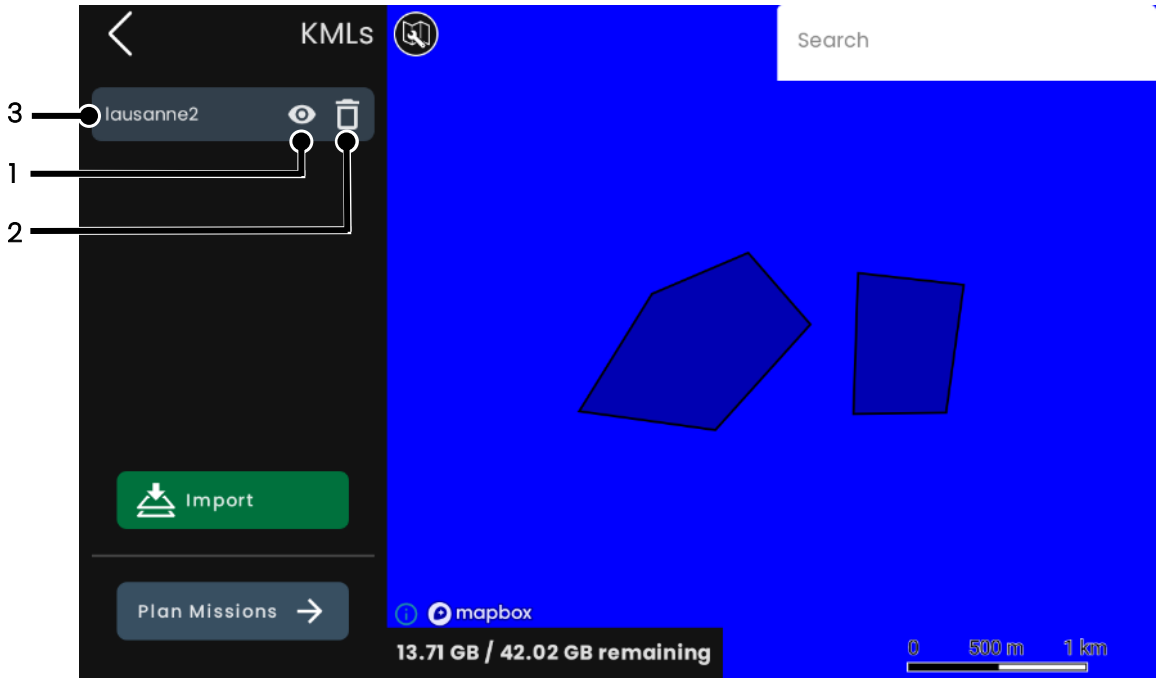


Figure 3-16 Map drawing and annotation management

For each entry, it is possible to

- Show – hide its content, by pressing on (1).
- Delete the file, by pressing on (2). Before deleting, a popup is shown to confirm the action
- Center the screen on the content by pressing on (3)

	Note
• Attempting to import a file with the same name as an existing entry will result in an error notification	

3.1.5 Caching data from the internet

The following screen shows how to download and cache data from Mapbox © and the manufacturer servers for an offline usage.
Ensure the application has access to the internet. Use the visible area of the map to define the region to download. Press (1) to confirm.

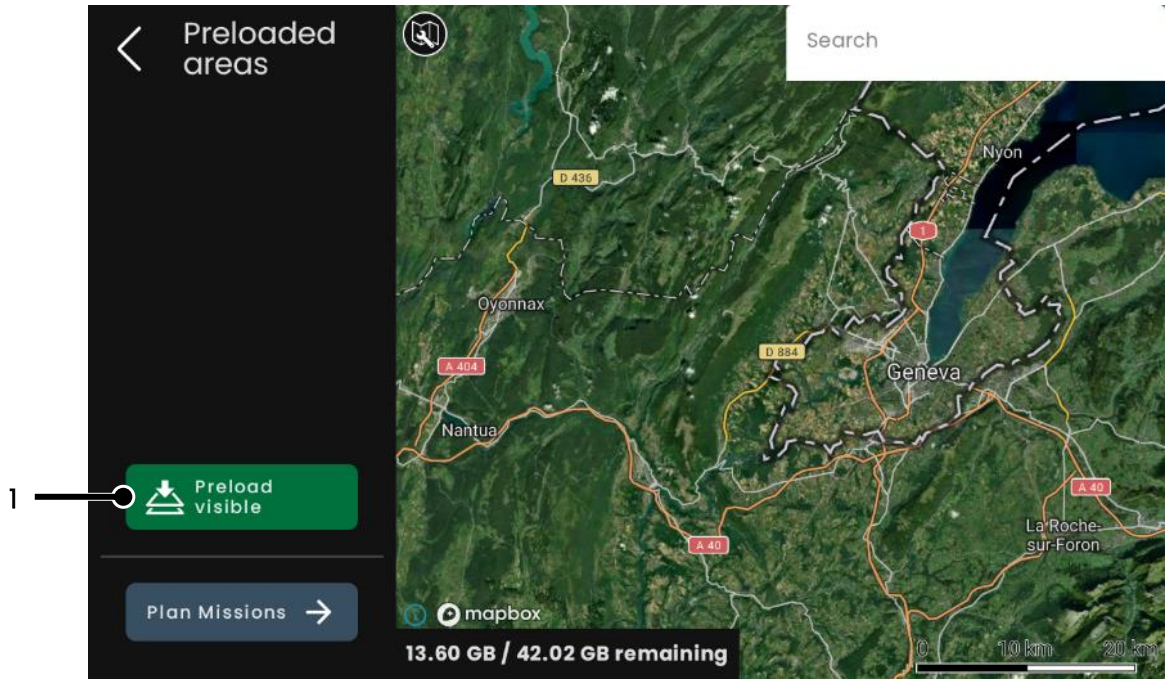


Figure 3-17 Preloaded areas screen

The process download is shown below

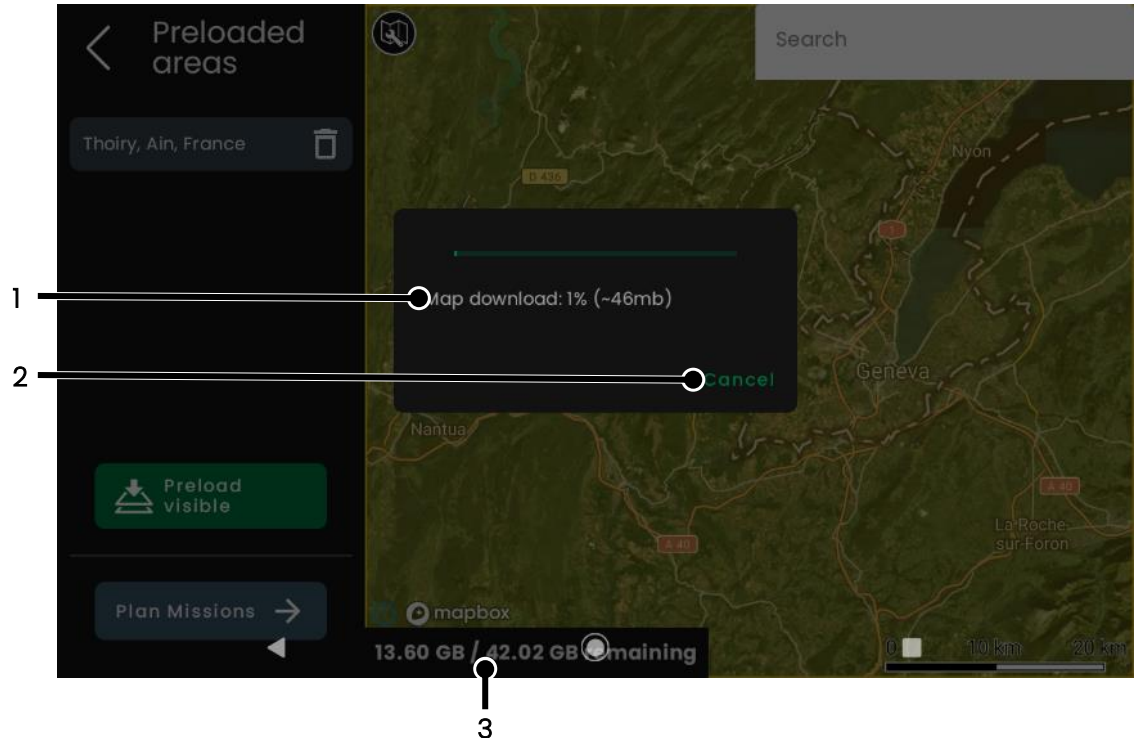


Figure 3-18 Preloaded areas download notification

An estimate of the size the application will use for this request is shown in (1). This does not represent the size of the area on device, as some data for the requested area may already be cached on the device. To know the amount of available storage on the device, refer to the label (3). One can cancel the current download process by pressing (2).

For each download, an entry is created, as well as the outline of the area that was downloaded, as shown below.

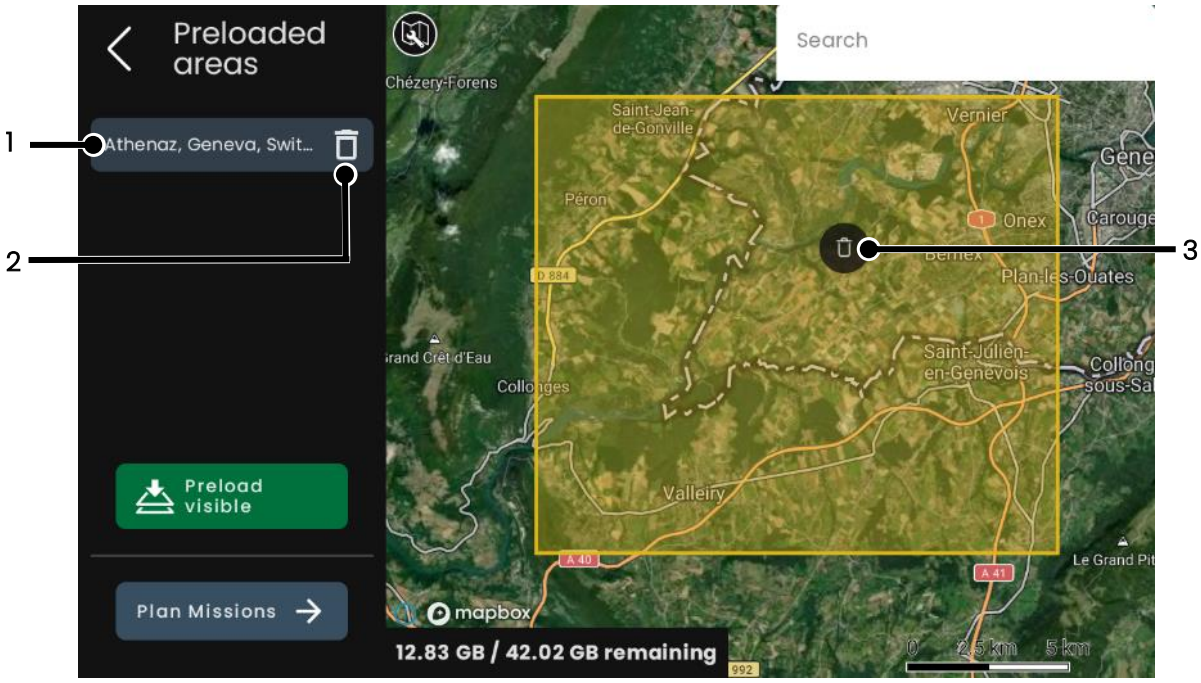


Figure 3-19 Preloaded area management

The entry's name is taken from the imported file and cannot be edited. However, for each entry, it is possible to:

- Center the map on area, by pressing (1)
- Delete the downloaded data, by pressing (2). **No confirmation is asked**
- Open a menu by doing along press anywhere on the area outline. This opens a contextual menu from which it is possible to also delete the data (3), without confirmation

ⓘ	Note
• The resolution of the tiles is the one displayed on the screen. To get detailed maps consider downloading several smaller areas rather than a large one, as shown below.	

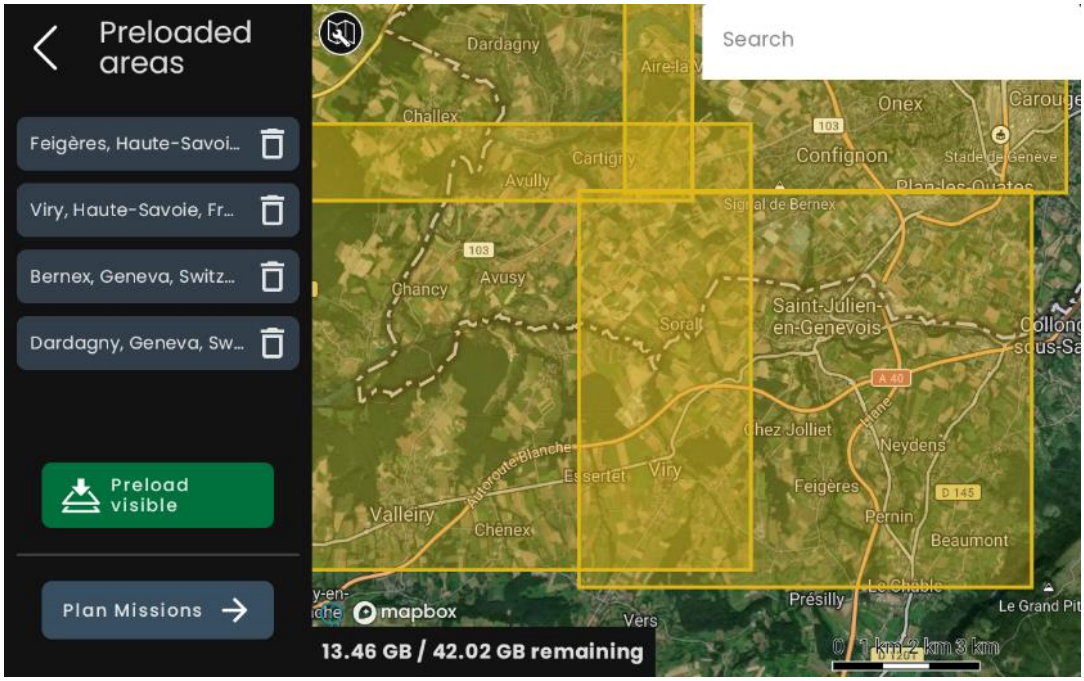


Figure 3-20 Multiple preloaded areas

The cumulative amount of unique maps tile packs from Mapbox © used in the offline regions cannot be greater than 750.

3.1.6 Exclusion zones

An exclusion zone is there to give visual information to the operator and doesn't prevent the drone from flying inside it. Instead, the drone will send a warning when it detects it is about to enter an exclusion zone to allow the operator to react. The exact condition to trigger a warning is as follows: the drone extrapolates its position 3 seconds into the future and if it approaches within 60m of a zone, it triggers the warning. See section 8.1.4 Warnings for more information.
The screen below lets the user import exclusion zones.

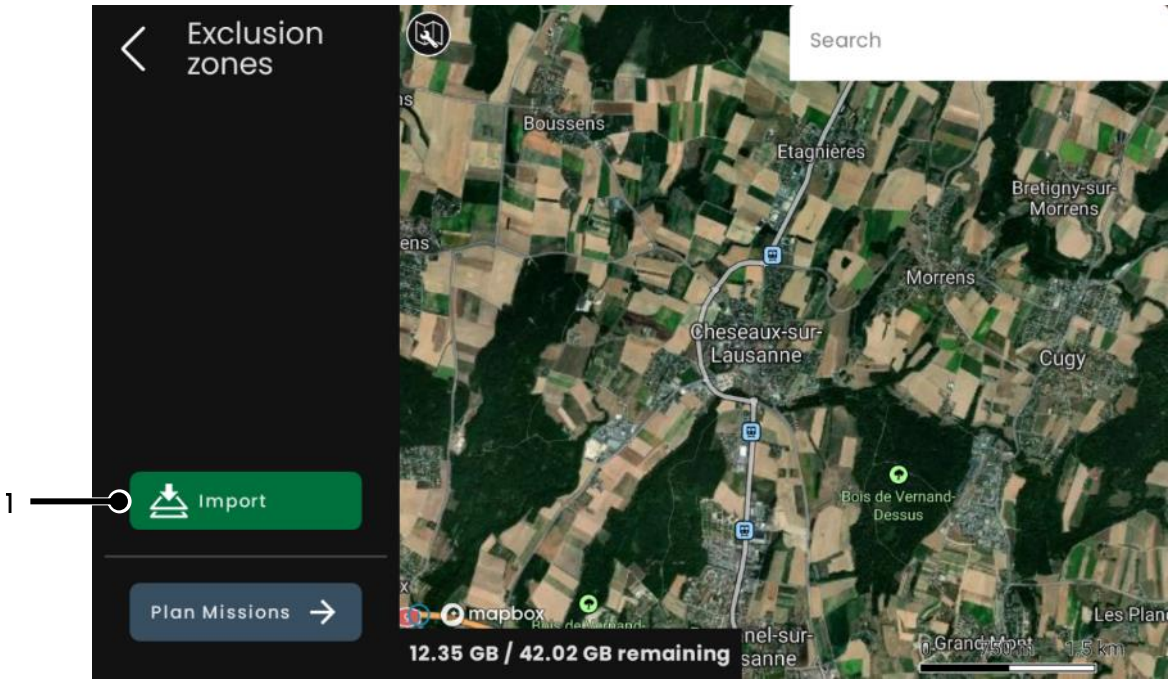


Figure 3-21 Exclusion zone screen

To select one or more files to import, press (1) and, using the Android file picker (figure shown below), pick the files you wish to import. The following formats are supported:

- kml
- kmz

ⓘ	Note
• Although the application will not prevent you to do so, opening a file with too many polygons (approximately a file size bigger than 10MB) will saturate the application and may crash it or may be unresponsive	

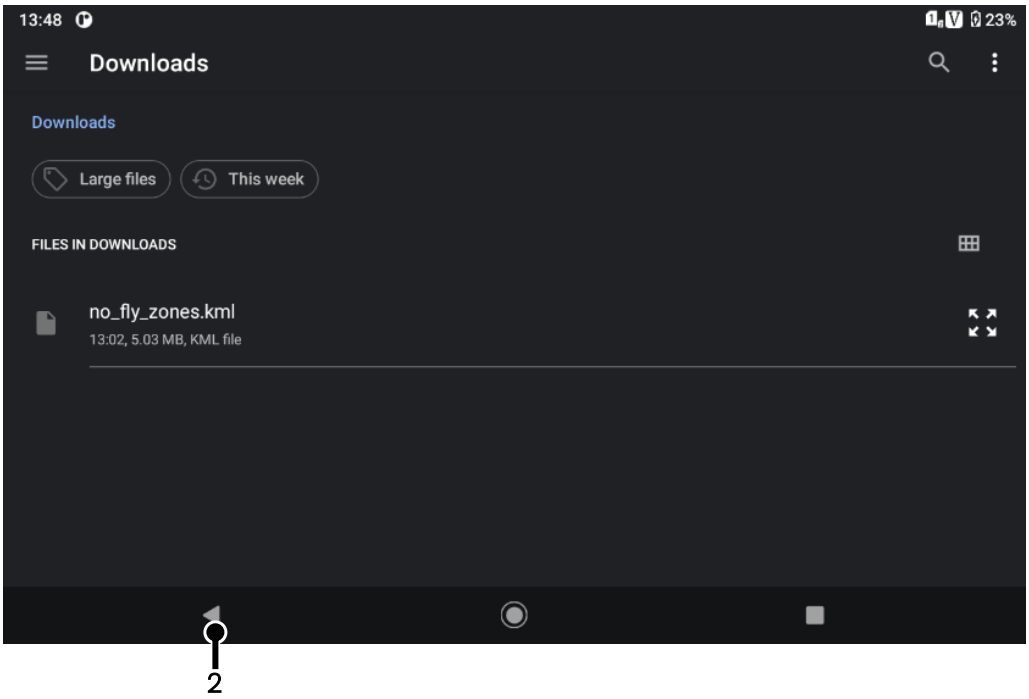


Figure 3-22 Import menu for exclusion zones

A simple press on a file will select it. To select multiple files at once, press for several seconds on one until the picker switches to selection mode, then simply press on the other files, and validate using *Select* on the top right corner (1), as shown below.

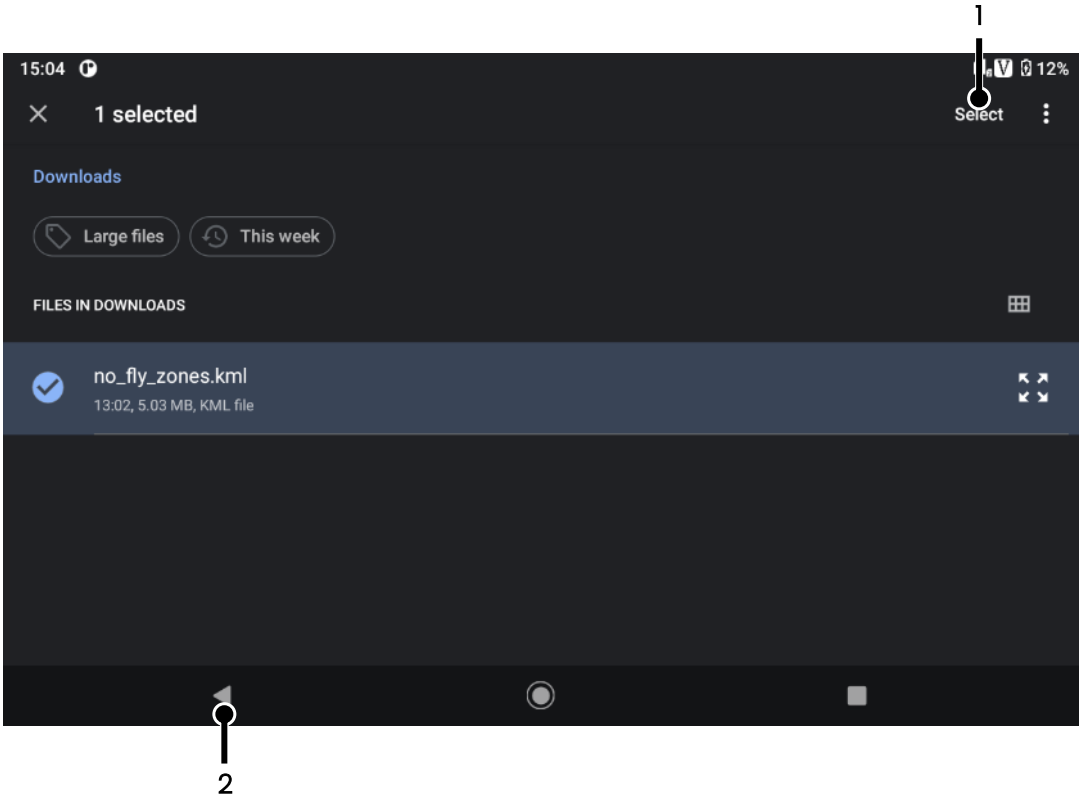


Figure 3-23 Import menu for exclusion zones

It is possible to cancel the picking by pressing *Back* (2) several times until the top of the filesystem is reached.
Once finished, an entry is shown on the left for each file imported, with the same name as the original, as shown below.

Figure 3-24 Exclusion zones screen with example zones

For each entry, it is possible to

- Show – hide its content, by pressing on (1). If hidden, it won't be sent to the drone
- Delete the file, by pressing on (2). Before deleting, a popup is shown to confirm the action
- Center the screen on the content by pressing on (3)

ⓘ	Note

- To reduce the amount of data to send to the drone, the polygons imported are simplified with a threshold of 65m and only the ones inside the geofence are kept. If there is no geofence set, then a radius of 20km around the drone is used and updated when the drone is more than 5km away from this point.

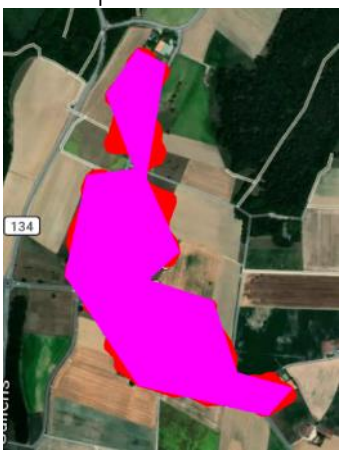


Figure 3-25 Example of polygon simplification. Pink is the simplified polygon. Red is original from file

3.2 Plan Missions

3.2.1 Flight plan block

The flight plan mode is primarily used to specify a series of waypoints for the drone to fly to and, secondarily, to add points of interest for the drone to observe. Unlike grid mapping and circular mapping, no automatic media acquisition is performed.

3.2.1.1 Add waypoints to a flight plan

Waypoints are added by a single press on the map.

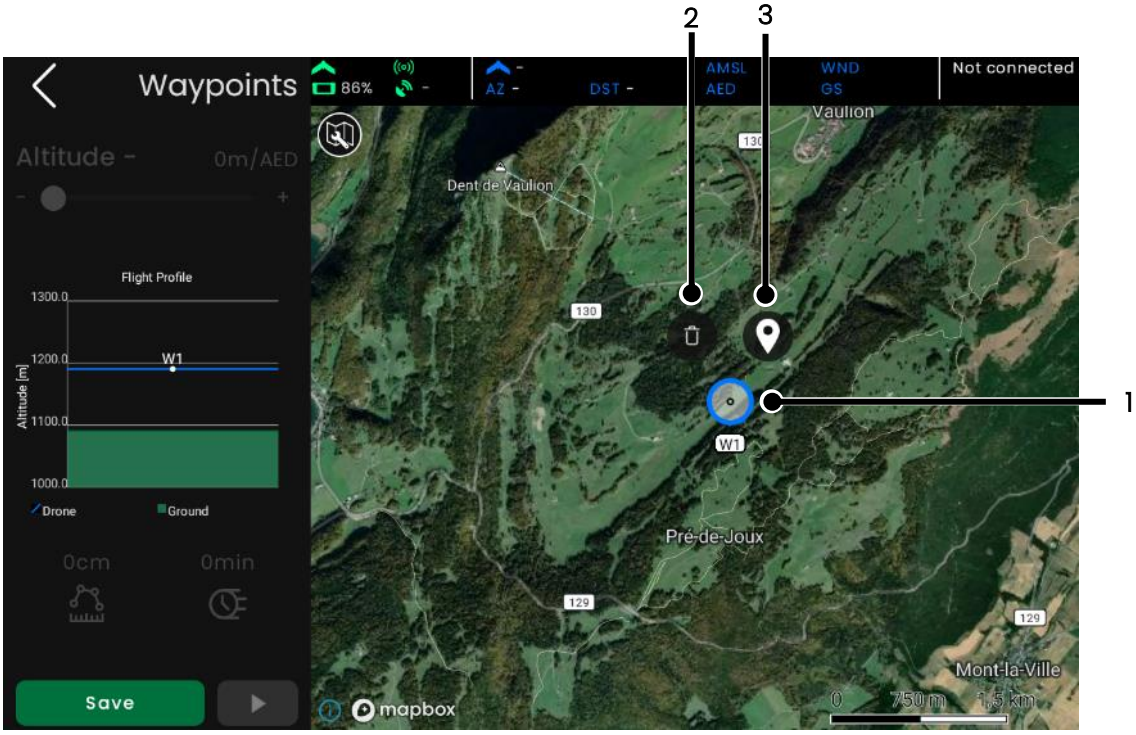


Figure 3-26 Waypoint management screen

Users can check the altitude profile live on the left side of the screen, as well as the length of the flight and its approximative duration.

Once a waypoint is defined, without selecting it, it is possible to:

- Move it: drag and drop to a new coordinate (1)
- Delete it by long pressing it and selecting the delete icon (2)
- Move it to a location entered by the operator by long pressing it, selecting the location icon (3), and then entering the desired coordinates with the virtual keyboard.

To change the altitude of a waypoint, first select it by tapping on it. The selected waypoint will be highlighted in white, as shown below where waypoint W4 is selected. To deselect a waypoint, simply tap anywhere on the map.

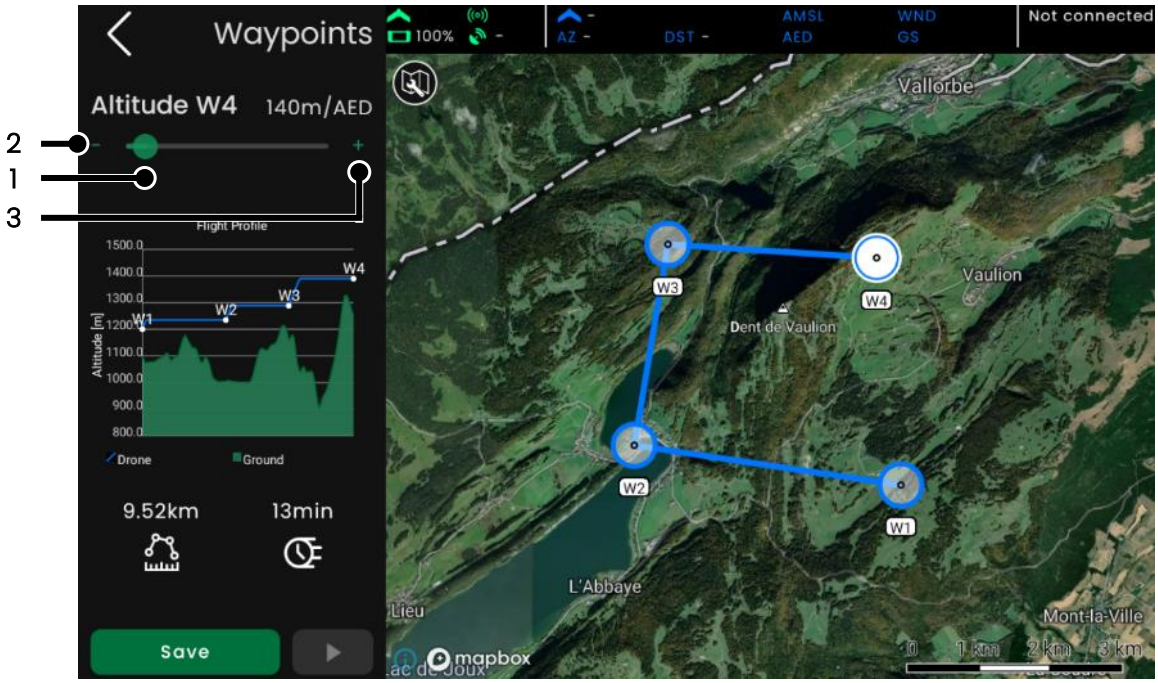


Figure 3-27 Multiple waypoint management

When selected, its altitude can be edited with the slider (1) and finely adjusted with the minus/plus icons (2,3). The slider's behavior is changed by the setting *AMSL* or *AED* (see section 3.5.2 Flight).

- In *AED mode*, it is only possible to change the altitude of a waypoint if elevation data is available.
- In AMSL mode, the altitude can be freely changed.

This setting also influences the default altitude when adding another waypoint:

- *AMSL mode*: the new waypoint uses the previous waypoint's ASML altitude.
- *AED mode*: the altitude above elevation data is kept between waypoints.

	Note
	• To save time, it is best to first select the desired altitude mode in the flight settings. Then, set the first waypoint at the desired location and altitude, and use the automatic altitude setting instead of manually adjusting each waypoint's altitude individually. • *AED* mode may result in a lot of altitude variation, which would affect both flight time and stealth.

The eBee VISION app will display a warning if the flight path could intersect with the ground denoting which waypoint traversal may be the issue.

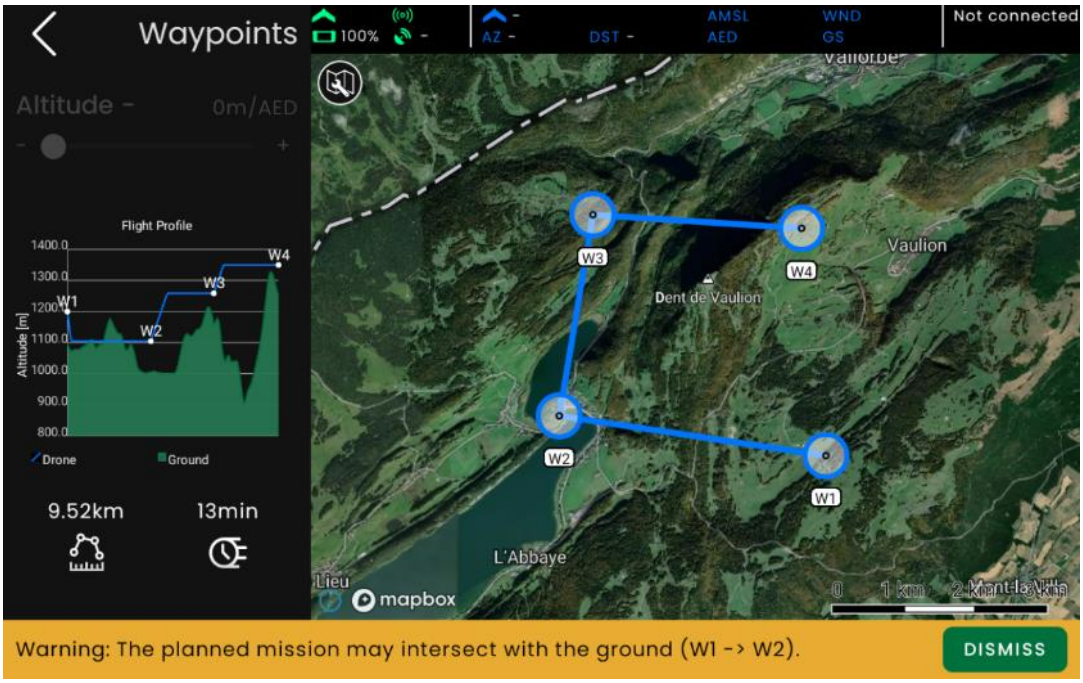


Figure 3-28 Warning demonstration

3.2.1.2 Defining points of interest

Points of interest are added by a long press on the screen.

ⓘ	Note
• To use a point of interest, elevation data must be available at the desired location, otherwise an error message will appear.	

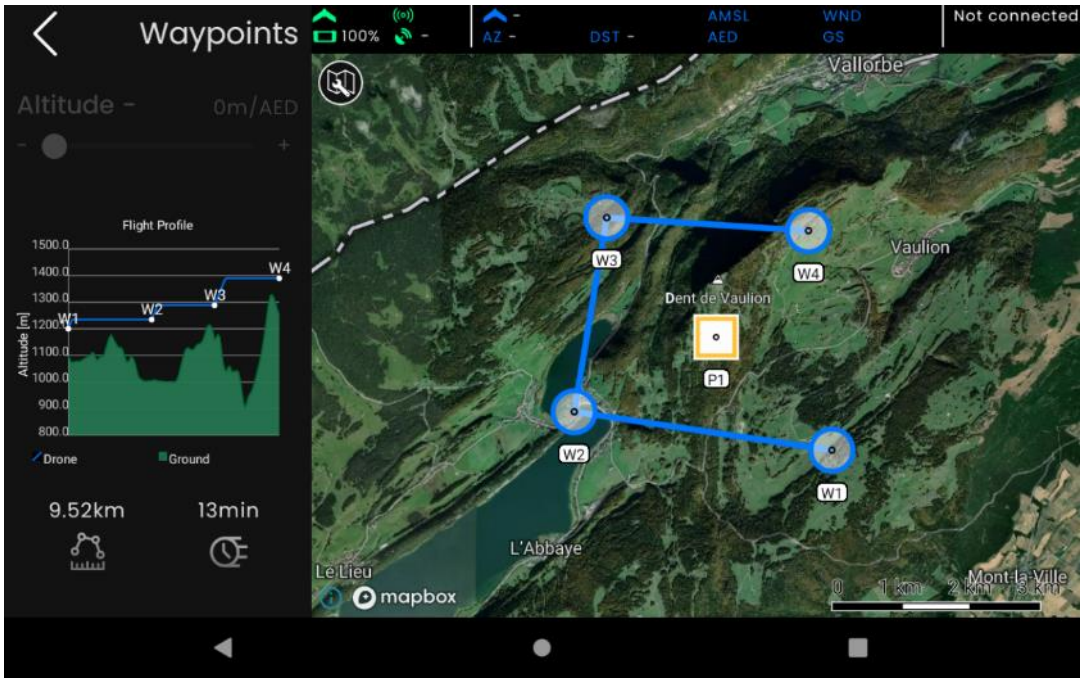


Figure 3-29 Point Of Interest demonstration

Once a POI is defined, it is then possible to:

- Move it: drag and drop on a given position (1).
- Delete it: long press it and select the delete icon (2)
- Move it to a location entered by the operator by long pressing it, selecting the location icon (3), and then entering the desired coordinates with the virtual keyboard.
- Change its classification and color by pressing one the colors (4):
    - Red is hostile
    - Green is neutral
    - Blue is friendly
    - Yellow is unknown

ⓘ	Note
• If a TAK integration is enabled (see section 3.5.7 TAK), then a POI classification changes the type of generated TAK messages for that POI (see section 3.5.7.4 Exchanging ground markers)	

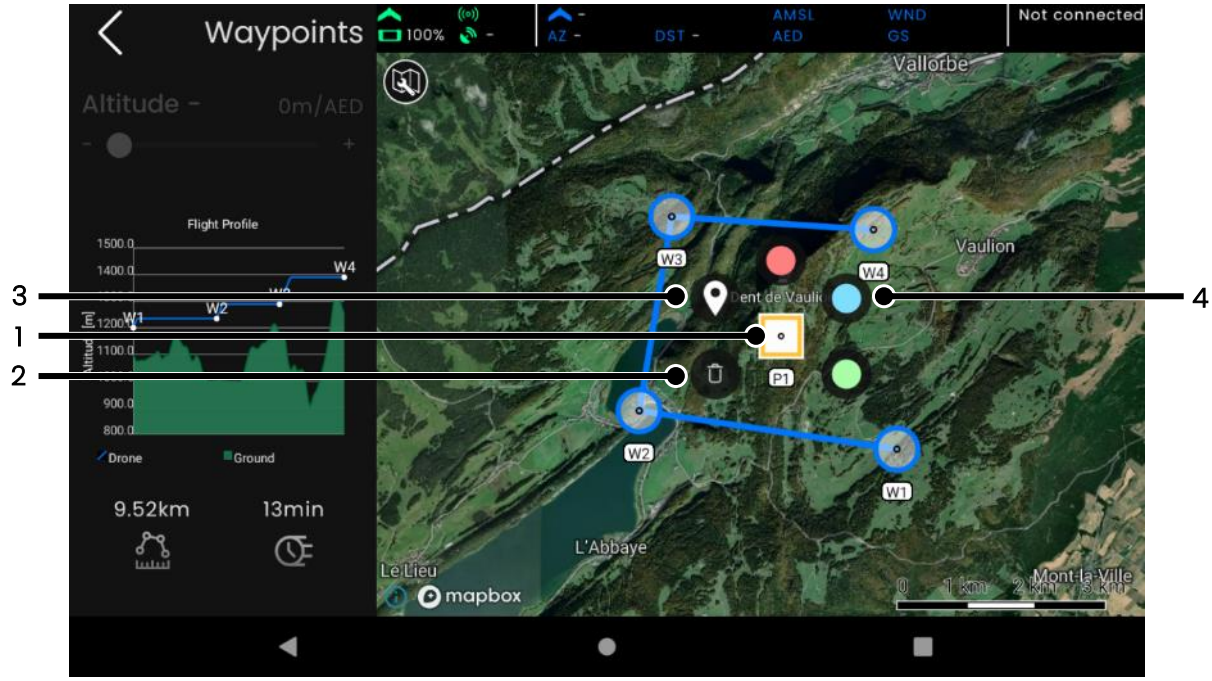


Figure 3-30 Changing Point Of Interest classification

3.2.1.3 Saving a flight plan

To save a flight plan with pending changes, scroll down to the bottom on the left panel and tap 'Save' at which point you will be prompted to enter a name. You can either confirm the default name or edit it.

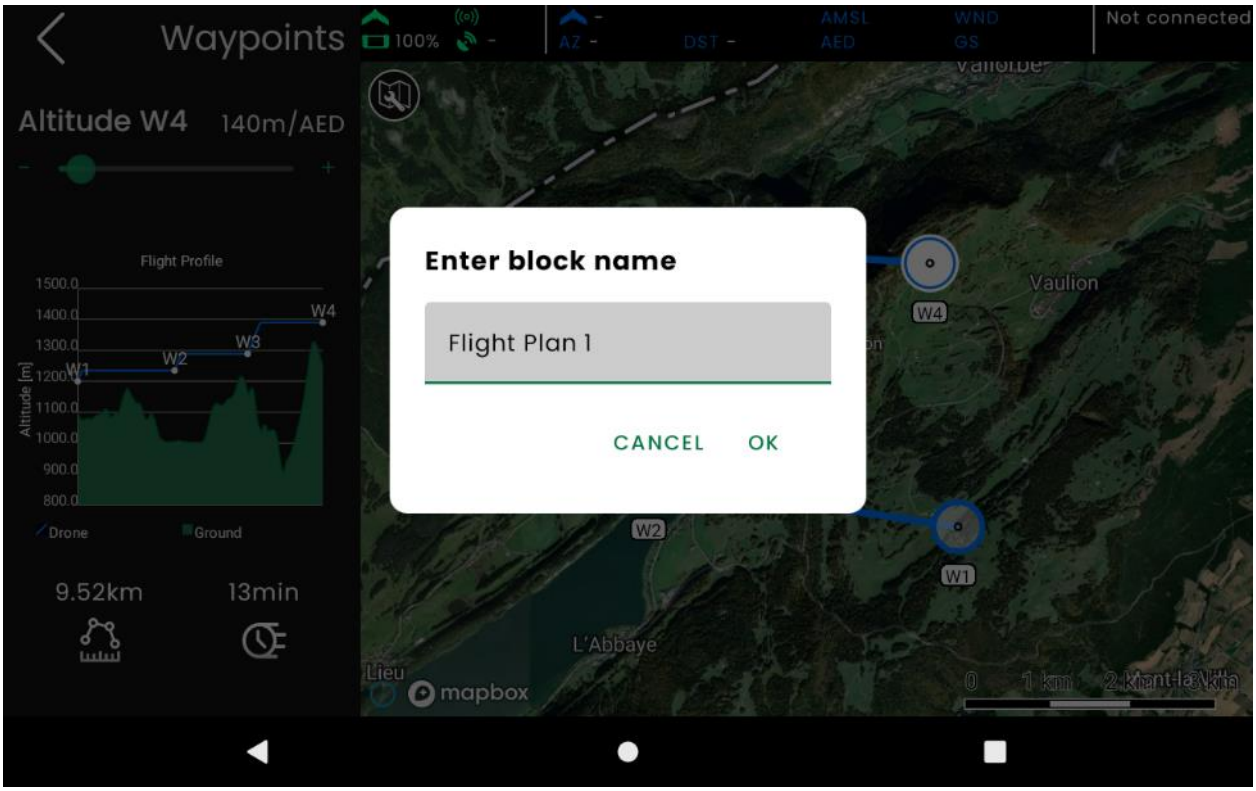


Figure 3-31 Saving flight plan notification

Once saved, the button is then disabled, until there are new pending changes.

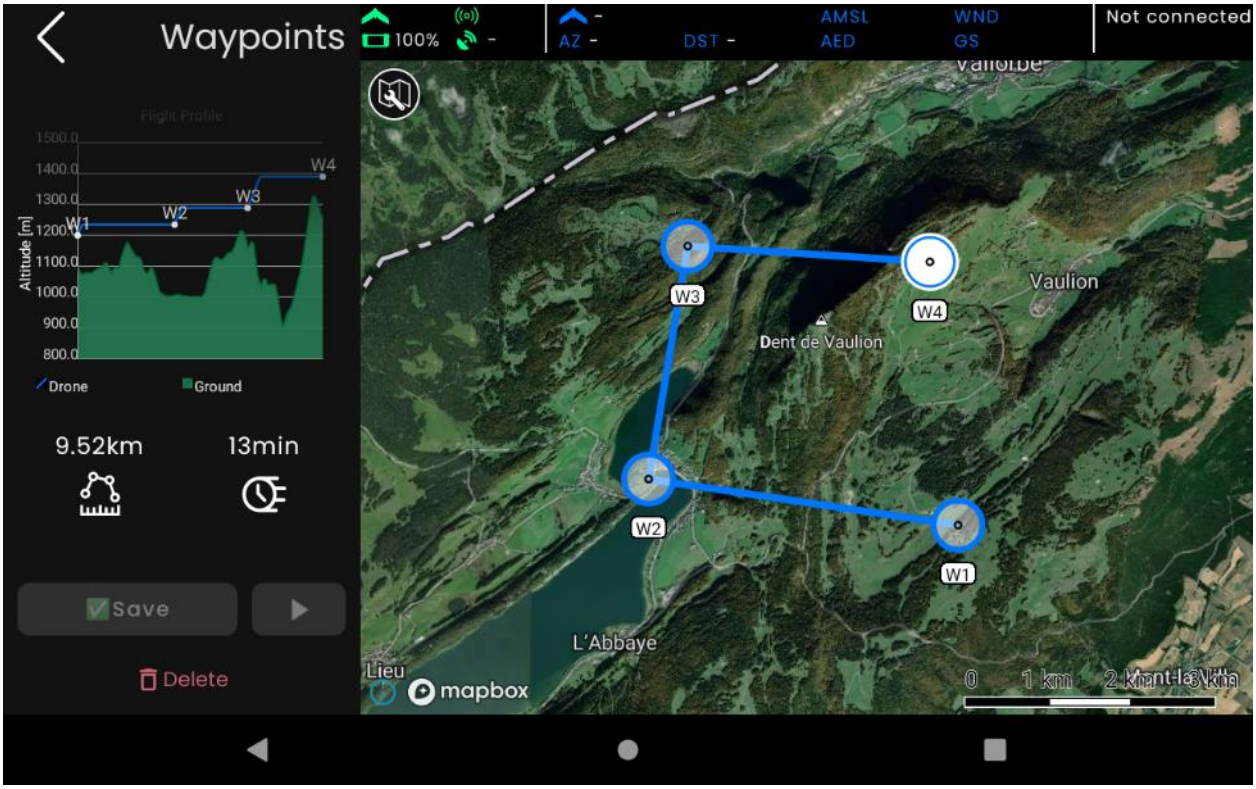


Figure 3-32 Disabled save button example

3.2.1.4 Loading and editing a flight plan

After saving a flight plan, it will be represented by an icon shown on the *Mission preparation* screen.

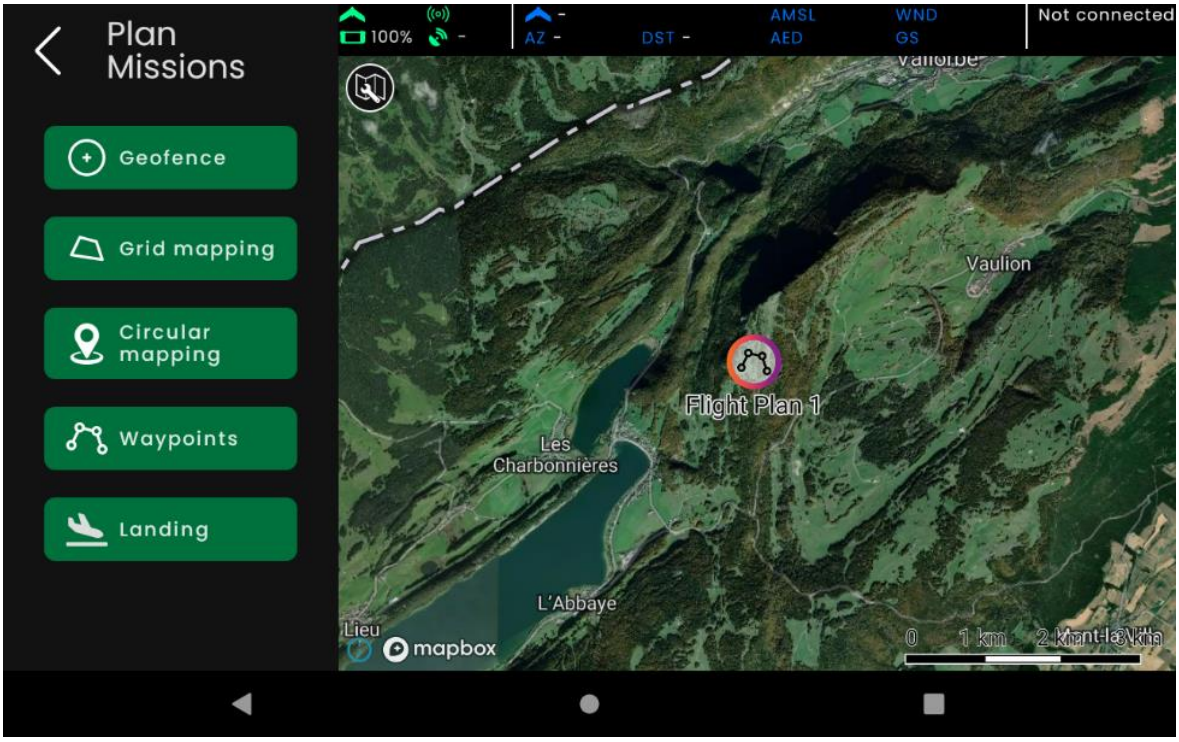


Figure 3-33 Flight plan icon demonstration

Simply tap the icon to open the flight plan, which will center the map on it. From there, edit the plan as usual. Saving the flight plan with the same name will update it as shown below.

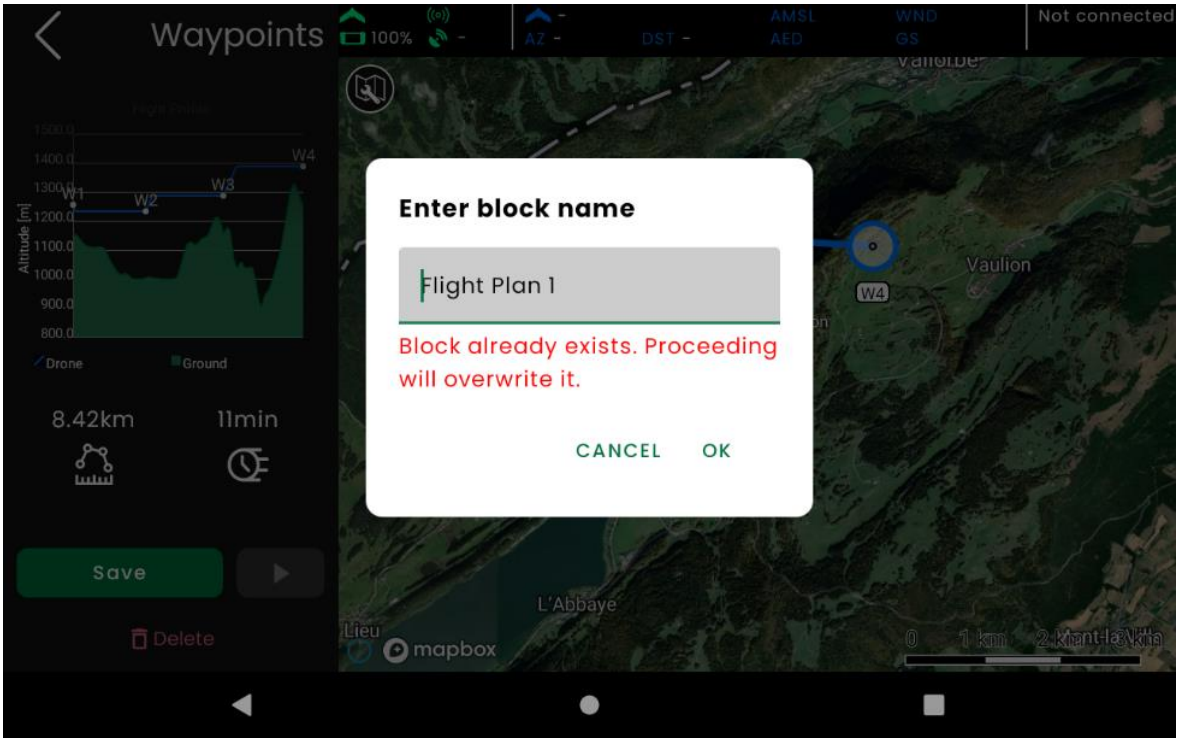


Figure 3-34 Updating an existing flight plan

Saving it with a new name will create a new flight plan.

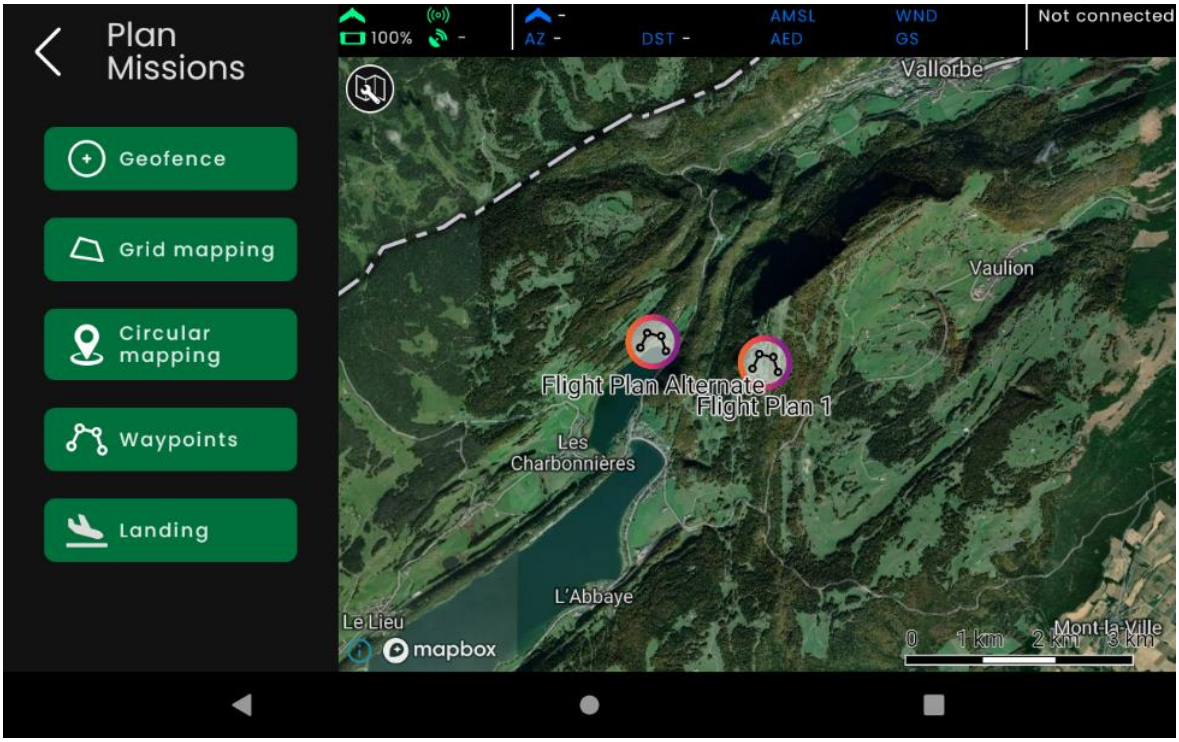


Figure 3-35 Viewing multiple flight plans

3.2.1.5 Deleting a flight plan

There are two ways to delete a flight plan:

1. While editing a previously saved plan, scroll down to the bottom of the left panel and press Delete, and then confirm. The block will be deleted and be brought back to the *Mission preparation* screen.

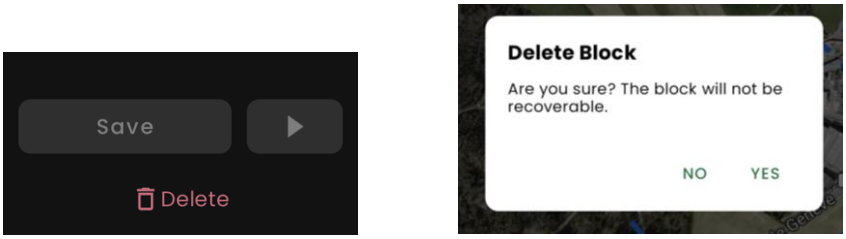


Figure 3-36 Flight plan deletion notification

2. On the *Mission preparation* screen itself, long press on the flight plan icon and then tap the trash icon. In such a case, no confirmation is asked.

3.2.1.6 Engaging a flight plan

To start a flight plan block, the GCS must first connect to the drone to enable command transmission (e.g., loiter or retrieve a currently executing mission). Once connected, the start button (i.e., play icon) will activate, allowing the operator to begin the flight. When tapped, the operator will automatically be navigated to the *Fly* screen, and the block will begin immediately if the transmission to the drone is successful.

If the block is new or has been modified but not yet saved, the operator will be prompted to save the changes or the new block before proceeding with the flight. It is recommended to save the block or changes before flying unless it is a one-off situation.

Figure 3-37 Unsaved flight plan notification

3.2.2 Geofence

A geofence is a volume in which the drone can be constrained during operation.

ⓘ	Note
• Although it is not technically necessary to define a geofence to operate the eBee VISION, it may be mandatory depending on the context and the applicable legislation. Please check your situation before operating the drone.	

The eBee VISION geofence is divided into 2 layers:

- An inner layer, as defined by the user (see below)
- An outer layer, which is 200m / 656ft outside and 20m / 66ft higher.

If the eBee VISION breaches the inner layer, it will engage a maneuver to go back inside the inner layer and perform a hold pattern once it has successfully entered it. In case the drone breaches the outer layer, it will start an STL (see section 4.2.7 Silent tactical landing) at the current location.
The geofence inner layer is characterized by its:

- Ground footprint
- Maximum altitude, expressed in the AMSL altitude reference

The eBee VISION supports 2 types of mutually exclusive footprints:

- A circle, defined by a center and a radius
- A convex polygon, defined by a set of points

The result is shown (sideway and top down) in the following figures for a circular footprint

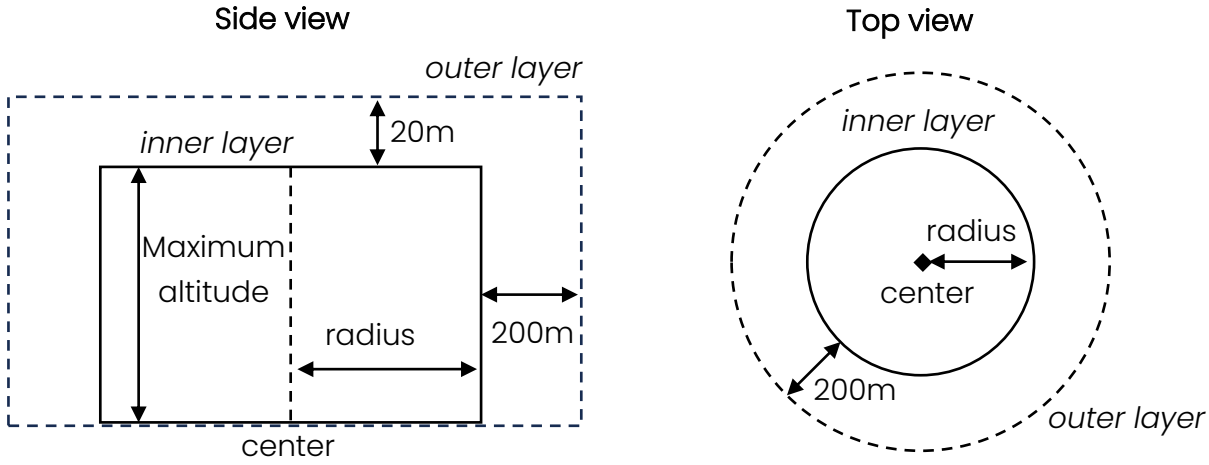


Figure 3-38 Circular geofence side and top views

The following figures show the result for a polygonal footprint:

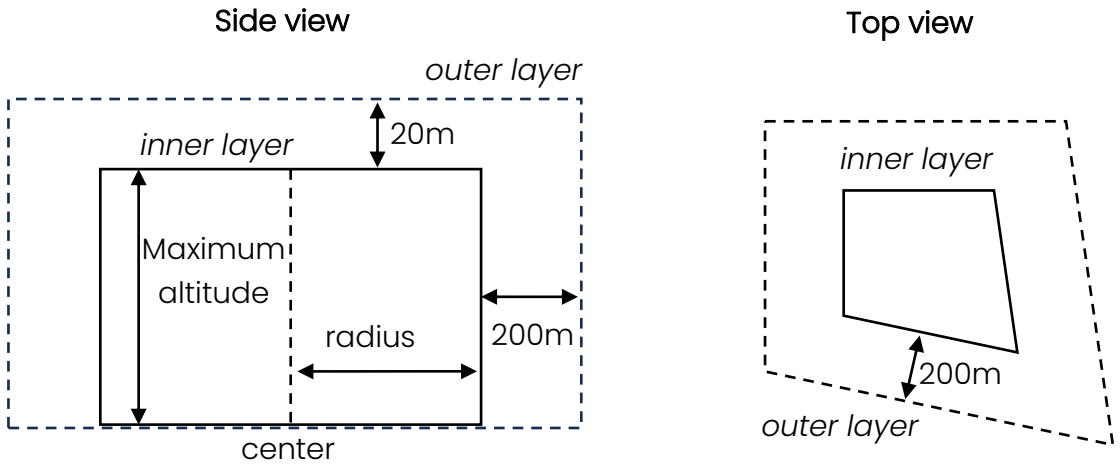


Figure 3-39 Polygonal geofence top and side views

3.2.2.1 Geofence visualization in Plan Mission screen

The mission preparation screen shows:

- The drone's current geofence, if the GCS is connected to a drone
- The geofence that is configured in the GCS and that will be send to the drone once the GCS is connected to it.

3.2.2.2 Geofence management

To create or edit the geofence, first go to *Plan missions* screen, and press *Geofence* button to land on the screen shown below. The screen is populated based on the current geofence that is saved within the GCS. There is no fence until one is defined and saved by the user.

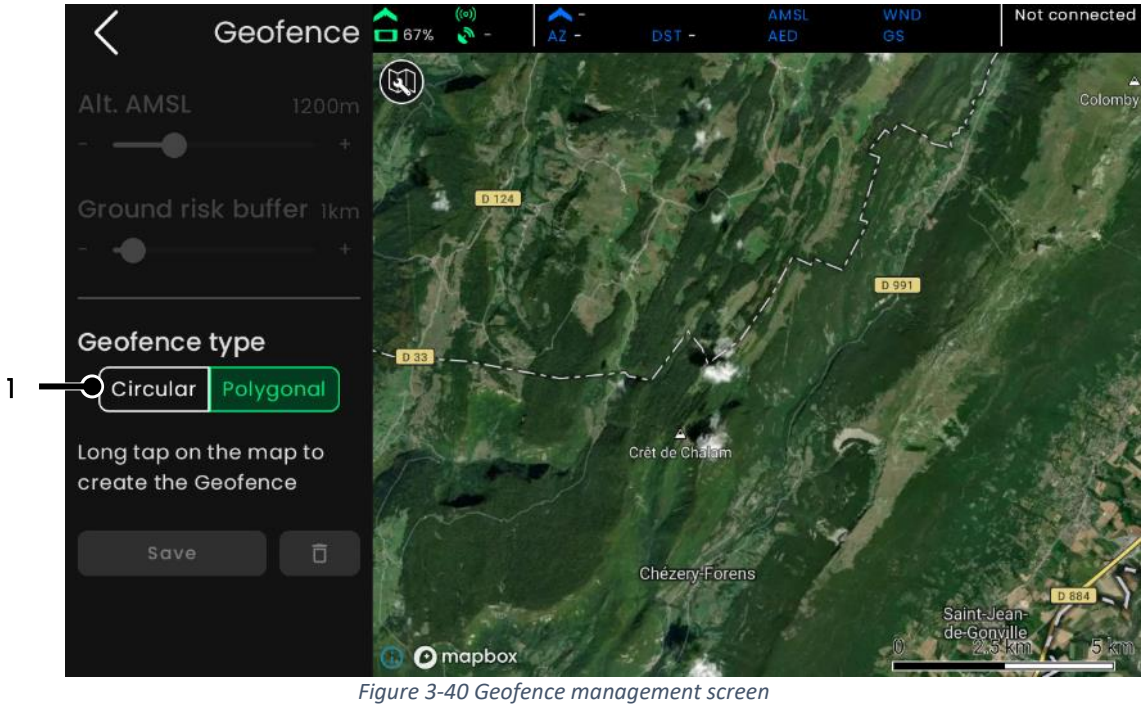


Figure 3-40 Geofence management screen

To switch between the two types of footprints, press (1). Switching to the other type will remove any modifications done to the current type.
To create a fence with default values, do a long press on the map. The default fence's properties are shown in the table below

	Circular footprint	Polygonal footprint
Altitude	1200m / 3600ft AMSL	
Footprint properties	5 km / 3.1 miles radius	10 km / 6.2 miles square

The result is shown below for polygonal fence.

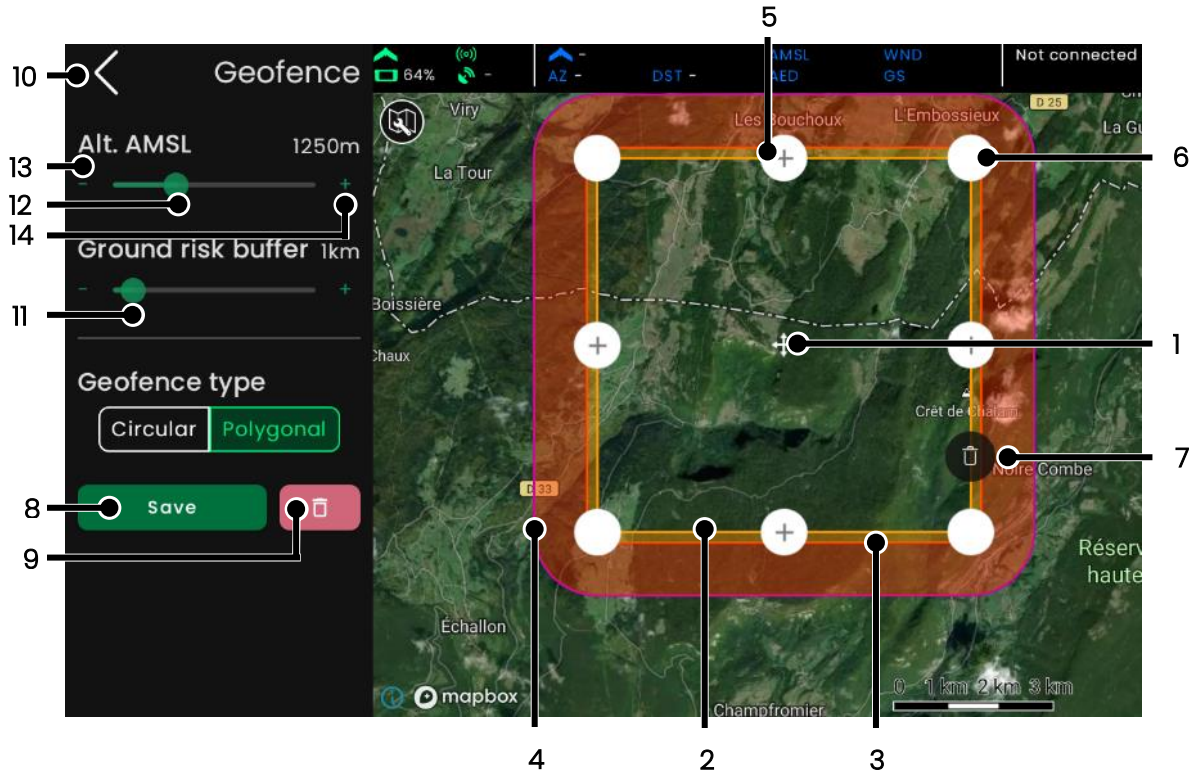


Figure 3-41 Geofence menu description

	Note
• Based on your map zoom level, it's possible that the default fence borders to be outside of your screen. You need to zoom out in such a case to see it.	

The inner yellow line represents the inner layer of the geofence (2). The outer layer of the fence is the orange line (3). Finally, the pink line (4) represents the end of the ground risk buffer, a visualization tool to help the operator see the potential zone covered by an STL in case of breach of the outer layer by the aircraft (see section 4.2.7 Silent tactical landing). Editing this value has no impact on the aircraft.
For both type of fences, it is possible to:

- Edit the maximum altitude by using the slider (12). It is also possible to reduce the value by 50m / 164ft by pressing (13), or to increase it by the same value by pressing (14)
- Moving the fence ground footprint by pressing and then dragging its center (1)
- Edit the ground risk buffer with (11).

For the polygonal footprint, it is also possible to:

- Add a new point to the polygon, by pressing (5)
- Move an existing point by dragging it (6)
- Delete an existing point by doing a long press on it and then pressing (7)

Please note that the points' movements are constrained such that the polygon remains convex. Furthermore, the delete option (7) will not appear for any point if its removal would result in the geometry becoming nonconvex.
Finally, to save any of the fence settings, press (8). The button is greyed out if there are no changes to save.
When the "Save" button is pressed, if the GCS is connected to the drone, the new geofence will be sent. The background of the "Save" button will indicate the upload status:

- Blue: upload is in progress
- Red: an error happened during the upload
- Green: Upload was successful

In any case, once the command is finished, the *Save* button returns to a neutral color.
To delete the geofence, press (9). A popup is shown to confirm the deletion. If validated, this action is automatically saved. Note there is no way to restore a fence that has been deleted.
At any time, pressing (10) opens the Map preparation screen, asking for confirmation before leaving if something has not been saved.

3.2.3 Grid mapping

Grid mapping is a type of flight block used for capturing an area for surveying purposes. The drone flies in a zig-zag pattern, capturing images at a prescribed distance interval based on user defined parameters. It is the intent that these images overlap such that when the user uploads the captured images to a photogrammetry engine they can stitch together into one, cohesive output.

3.2.3.1 User parameters

- Area – A ground polygon specifying the region boundary where images will be taken.
- Ground Sampling Distance (GSD) – Relating to a captured image, the distance from one pixel center to the next which is affected by the camera sensor parameters and altitude (AED) the image was taken. The units are in centimeters/pixel or inches/pixel with a lower GSD resulting in a higher resolution output and vice versa.
- Side Overlap – The lateral overlap of images taken across adjacent flight paths.

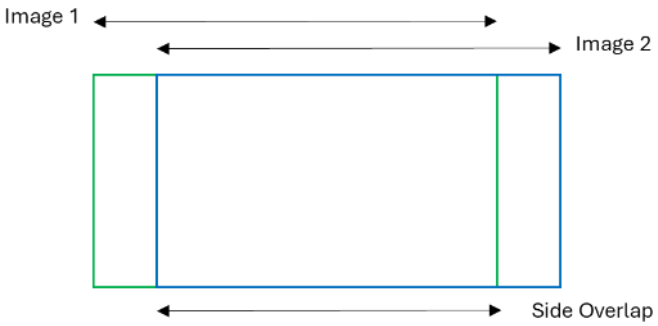


Figure 3-42 Side overlap schematic

- Front Overlap – The longitudinal overlap of images taken consecutively along the same flight path.

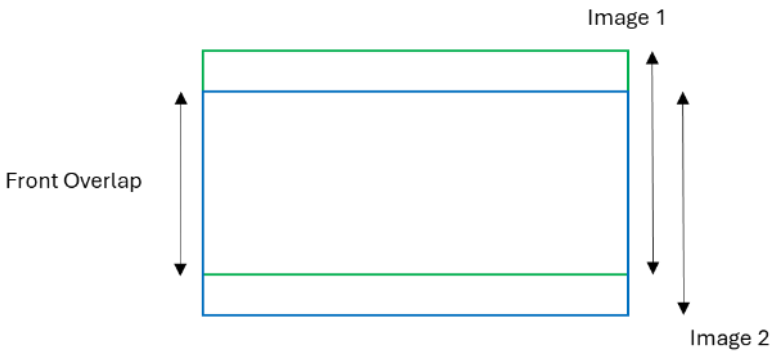


Figure 3-43 Front overlap schematic

- Altitude – AED altitude from which the images are captured

3.2.3.2 Flight planning

3.2.3.2.1 Creating a new block

To create a block on the map, long press in the desired location on the map. To adjust the GSD, Side overlap, or Front overlap, either drag the slider (1) or tap the '+' or '–' buttons (2).

Figure 3-44 Grid mapping screen

ⓘ	Note
• It is typically recommended that the operator choose a Side and Front overlap that is at 75% or above to allow for proper stitching during the photogrammetry process.	

3.2.3.2.2 Saving a new block

The operator can save a block by tapping 'Save' and assigning a name to the block or by using the default name that appears in the save prompt. Once the block is saved, it will be represented by an icon on the map.

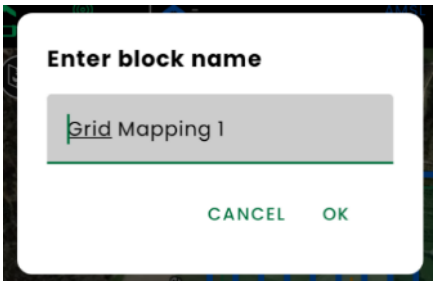


Figure 3-45 Grid mapping saving notification

3.2.3.2.3 Modifying an existing block

To modify a saved block, tap the icon on the map or continue editing the block if it is already open. Make changes to the block and tap the 'Save' button, which will present an option to save over the existing block or to save as a new block (by changing the name on the prompt text field) then press 'OK'.

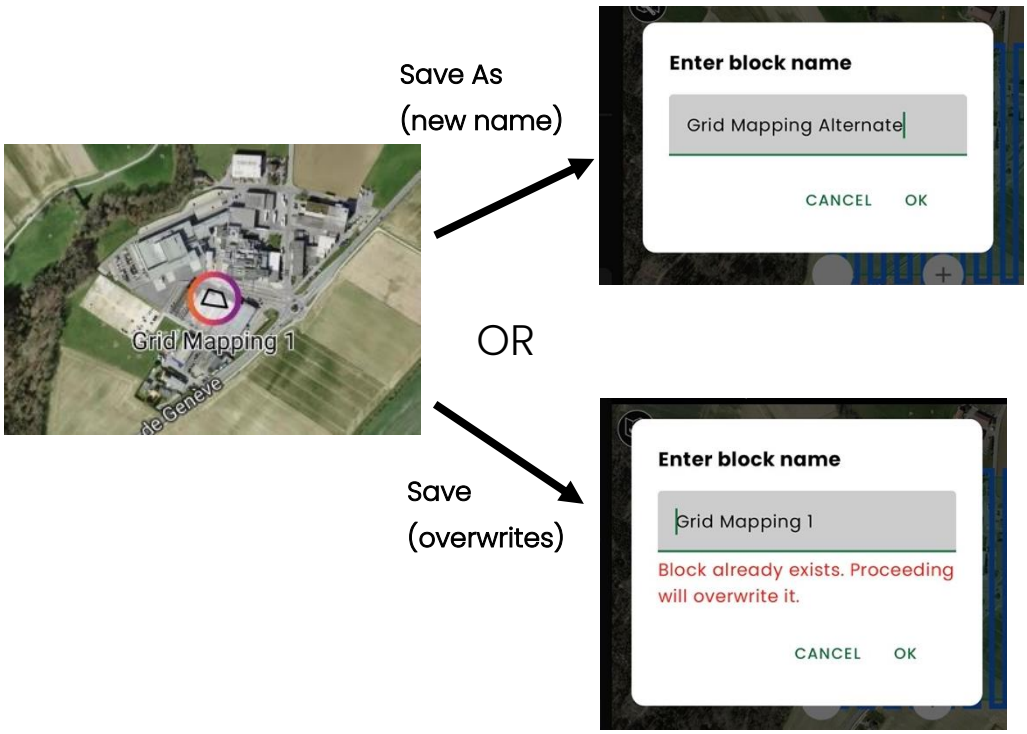


Figure 3-46 Modifying grid mapping notification

3.2.3.2.4 Deleting an existing block

To delete a block, open the block by selecting its icon on the map, scroll to the bottom of the lefthand pane and tap the 'Delete' button. Confirm the prompt and the block will be deleted.

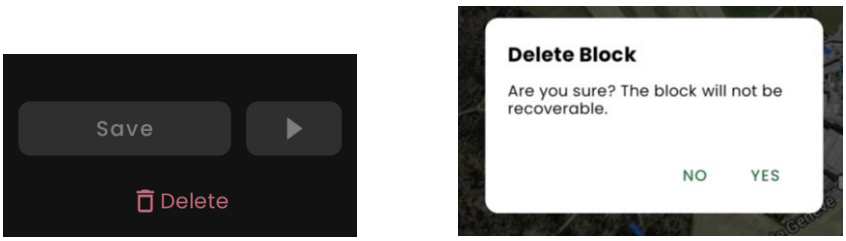


Figure 3-47 Deleting grid mapping notification

3.2.3.2.5 Camera and GSD

The type of camera chosen for the block will directly affect the altitude the drone requires to achieve a certain GSD. For the 'Wide' camera the drone will have to fly much lower to accomplish a lower GSD (higher resolution), therefore the user can also choose the 'Tele' (i.e., telephoto) option which allows the ability to obtain lower GSD at higher altitudes.

Figure 3-48 Grid mapping settings screen

1) (left to right) - AED altitude, flight time, flight area, and images to be captured
2) Drone starting point
3) Adds a vertex
4) Existing vertex
5) Bearing rotation tool
6) Camera lens choice – Wide or Telephoto
7) Flight path
8) Translation/move tool
9) Flight area

3.2.3.2.6 Moving, adding, deleting vertices

The operator can move any of the default vertices by dragging them (4), add additional vertices by tapping (3), or delete a vertex by long-pressing on an existing vertex (see below).

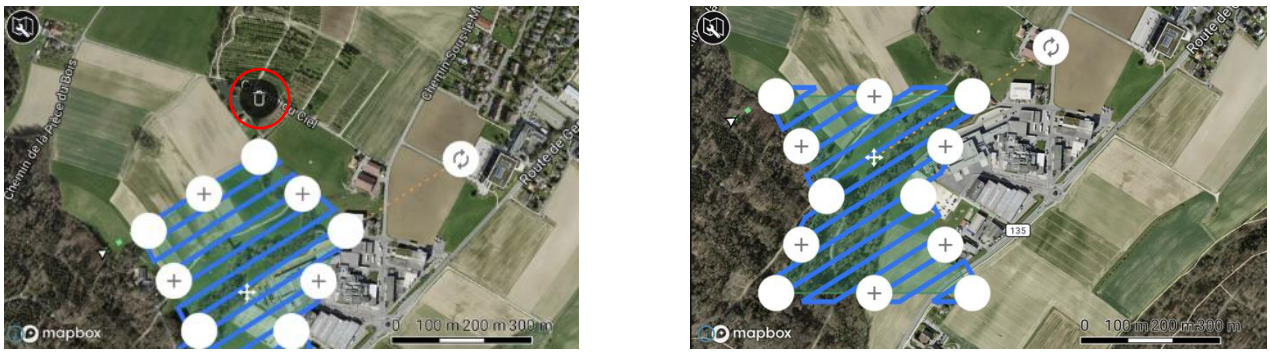


Figure 3-49 Grid mapping vertices adjustments

ⓘ	Note
• There must be at least 3 vertices. • Convex polygons are supported; however, the flight path will still travel over the convex portion and take images.	

3.2.3.2.7 Flight bearing

Drag the rotation handle in a circular motion to adjust the bearing (5).

Figure 3-50 Grid mapping bearing adjustment

3.2.3.2.8 Moving / translating

Drag the move icon in the center of the block (8) to translate the entire block while preserving the geometry.

Figure 3-51 Moving a grid mapping

3.2.3.2.9 Flying

To start a grid mapping block, the drone must first be loitering. At which point, the start button (play icon) will activate allowing the operator to begin the flight. When tapped, the operator will be automatically navigated to the 'Fly' screen while the block simultaneously starts.

Figure 3-52 Grid mapping flight view

If the block is new or has been modified but not yet saved, the operator will be prompted whether they would like to save the changes or new block before flying. Unless it is a one-off, it is recommended to save the block or changes before flying.

Figure 3-53 Unsaved grid mapping notification

When the flight is finished, the drone will loiter awaiting the operator's next instructions.

3.2.4 Circular mapping

Circular Mapping is a type of block that flies around and aims the camera at the point-of-interest on the ground while taking pictures at a prescribed distance interval. The distance interval is based on the radius parameter to achieve approximately 20 images in one revolution – the larger the radius, the larger the distance at which images will be taken. The operator can adjust height and radius and choose between 'Wide' and 'Tele' (telephoto) camera options. Its primary application is for photogrammetric 3D models.

	Note
•	It is recommended to fly multiple rings at varying angles to achieve the best processing output.

Figure 3-54 Circular mapping setting screen

1) Camera lens choice – Wide or Telephoto
2) Height (AED)
3) Ground point of interest
4) Flight radius
5) Start button
6) (left to right) GSD, Flight time, Images to capture

3.2.4.1 Creating a new plan

To create a flight plan on the map, long press in the desired location on the map. To adjust the flight inputs, either drag the slider (1) or tap the '+' or '–' buttons (2,3).

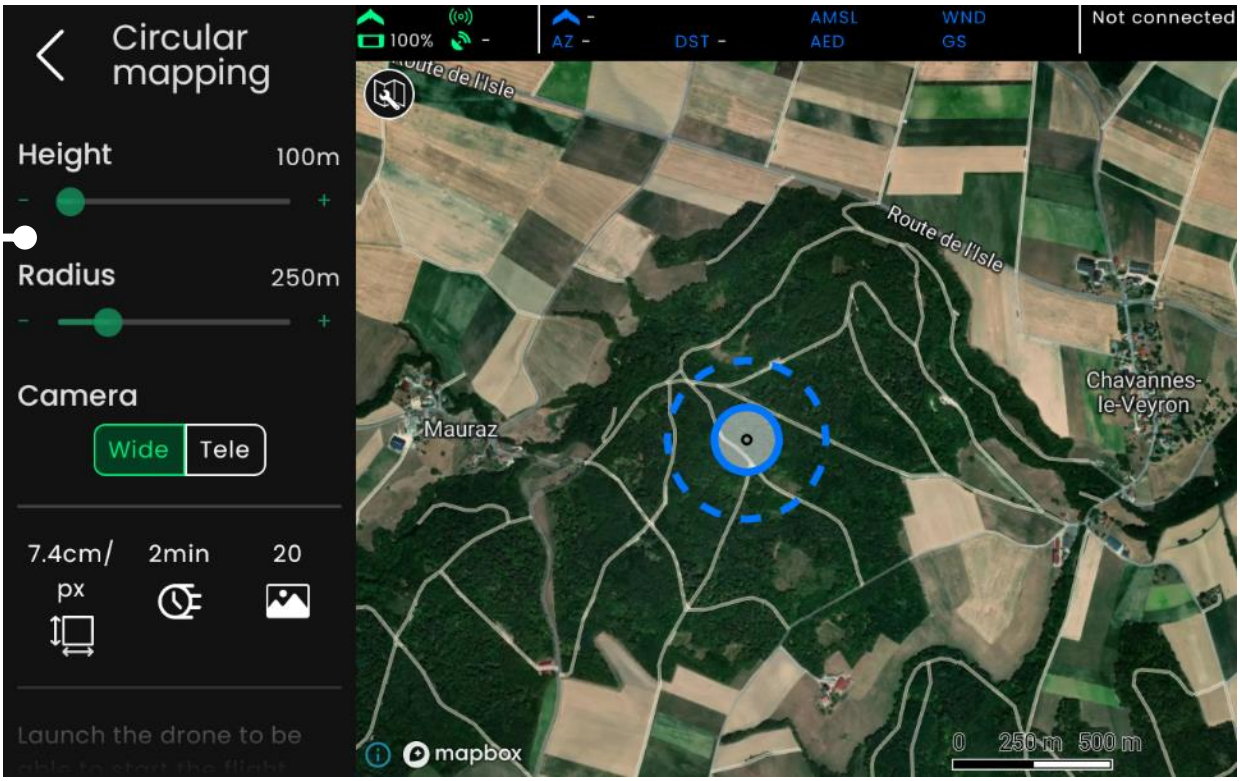


Figure 3-55 Circular mapping creation screen

3.2.4.2 Saving a new plan

On the lefthand panel, scroll down to the bottom and tap 'Save'.

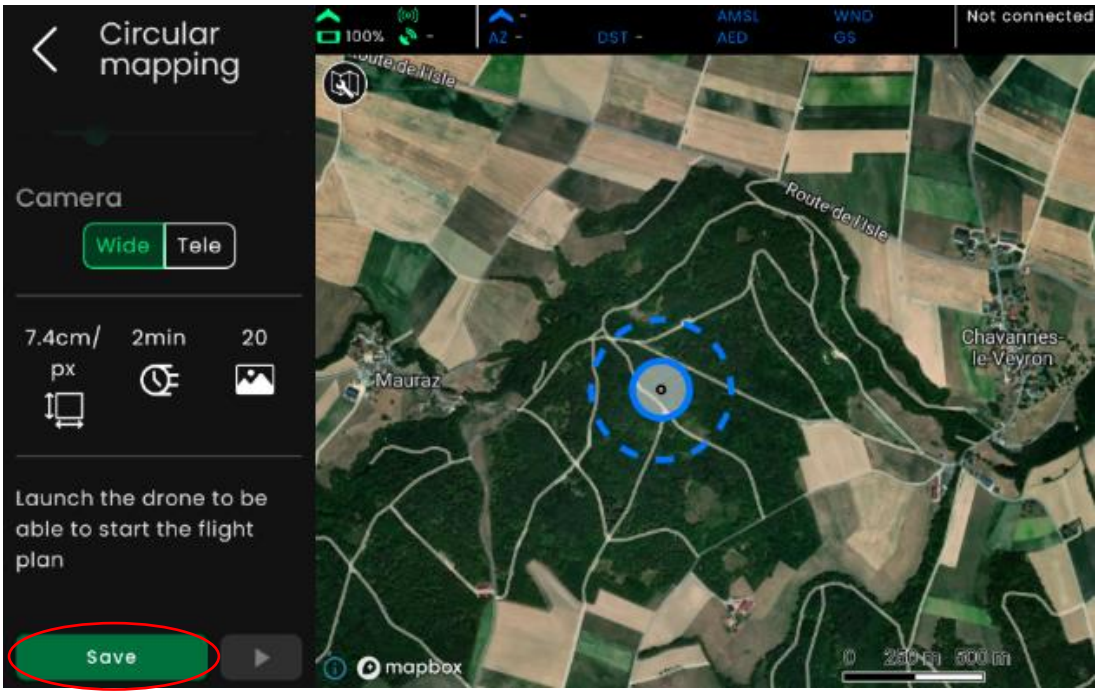


Figure 3-56 Saving a circular flight mapping

Assign a name to the plan or by using the default name that appears in the save prompt. Once the plan is saved, it will be represented by an icon on the map.

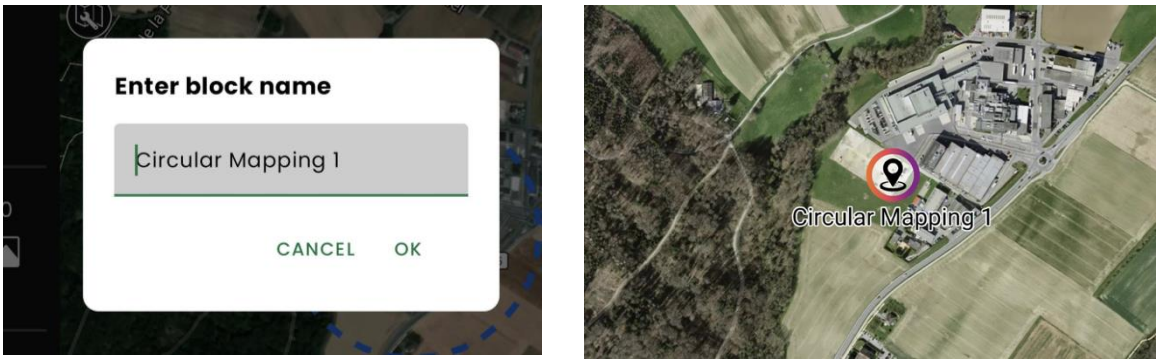


Figure 3-57 Circular mapping saving notification

3.2.4.3 Modifying an existing plan

To modify a saved plan, tap the icon on the map or continue editing the plan if it is already open. Make changes to the plan and tap the 'Save' button, which will present an option to save over the existing plan (keep the same name) or to save as a new plan (by changing the name on the prompt text field) then press 'OK'.

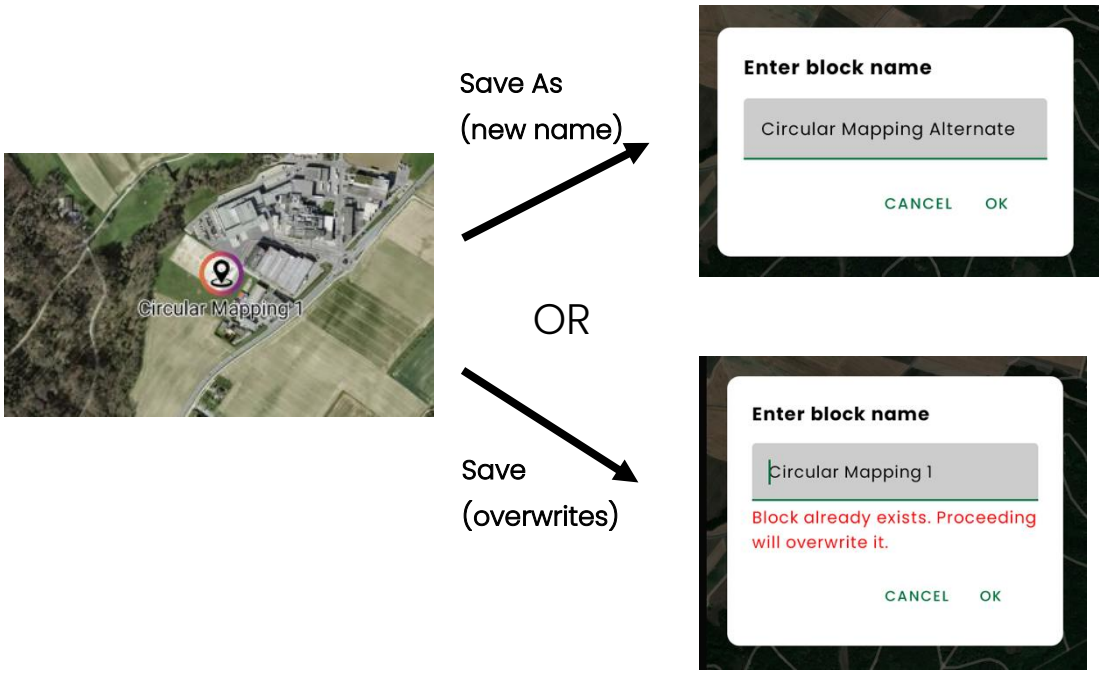


Figure 3-58 Modifying circular mapping notification

3.2.4.4 Deleting an existing plan

To delete a flight plan, open the plan, scroll to the bottom of the lefthand pane and tap the 'Delete' button. Confirm the prompt and the plan will be deleted.

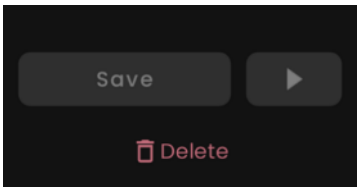


Figure 3-59 Deleting circular mapping notification

3.2.5 Landing

It is possible to plan for different landing sites ahead of time. An unlimited number of alternative sites can be defined.

3.2.5.1 Defining an alternative landing site

To define an alternative landing site, from *Plan missions*, press (1).

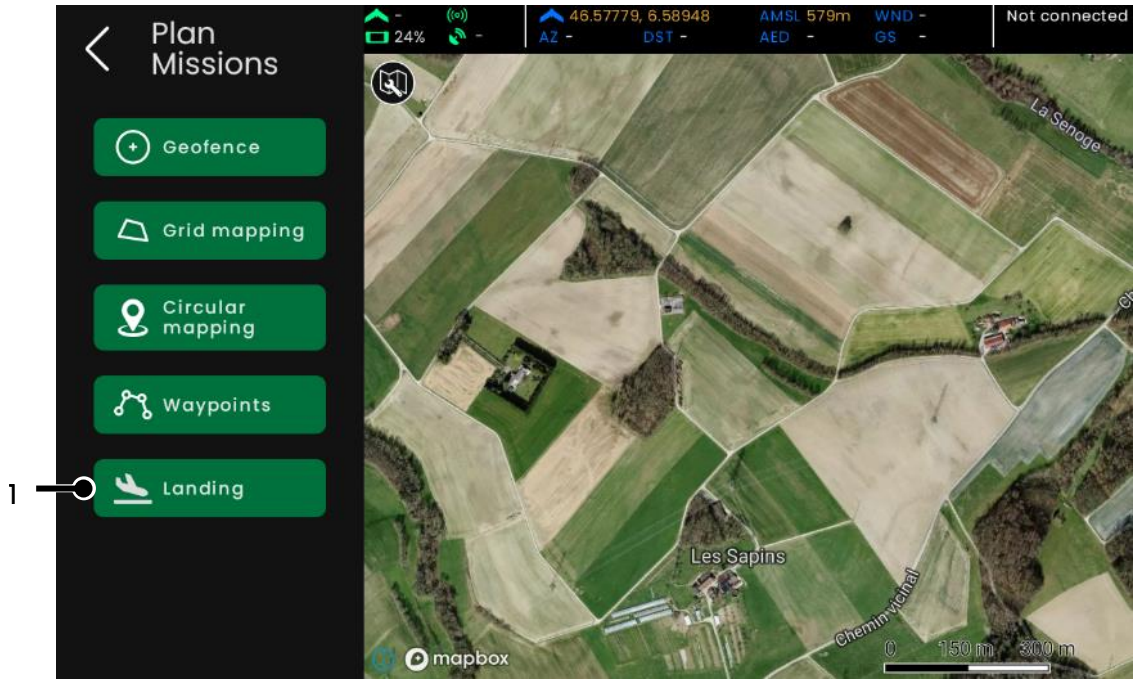


Figure 3-60 Landing menu selection

Then tap on the map to define the landing site.
You can further adjust the landing direction with rotation handle (1). It is possible to move the landing by dragging its center (2). To save this landing site, press (3). Saving is enabled only if there are some pending changes.
At any time, pressing (4) will bring you to the *Plan mission* screen, asking for confirmation if there are any pending changes.
To delete a landing site, press (5). This button is only enabled if the landing site has been saved once. Before deleting, confirmation is asked.

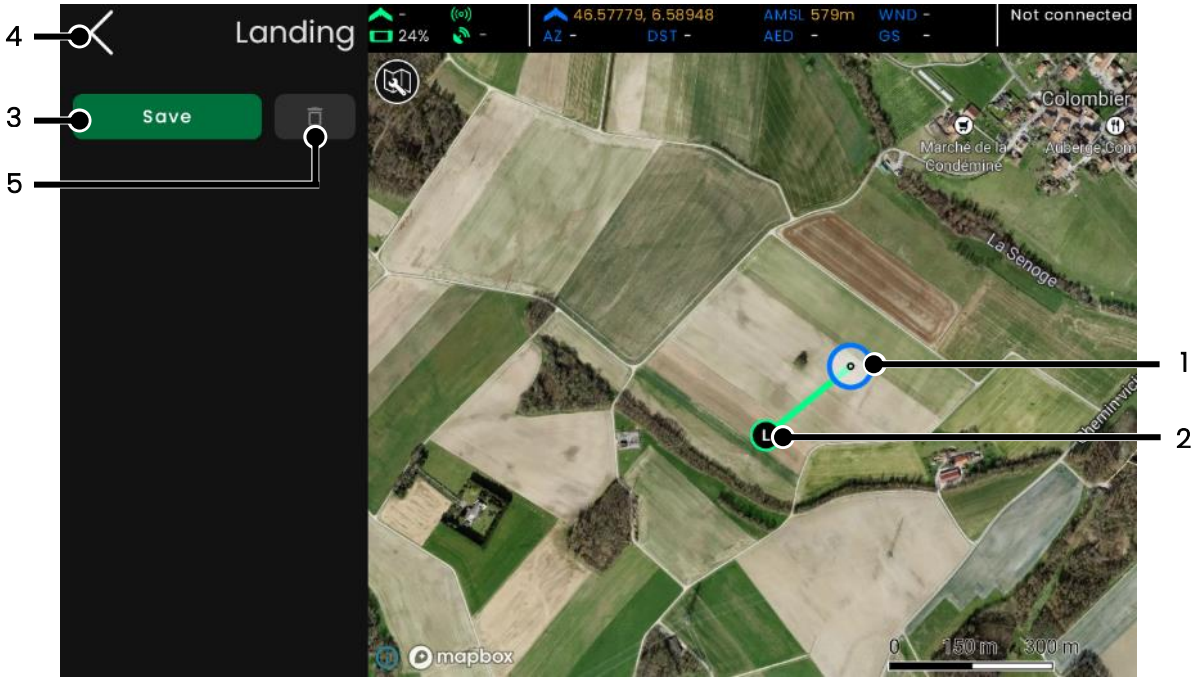


Figure 3-61 Landing menu settings

Existing landing sites are shown on the *Plan missions* map. It is possible to delete them from this screen, by doing a long press on it (1), then pressing (2), as shown below. In this case, no confirmation is asked.

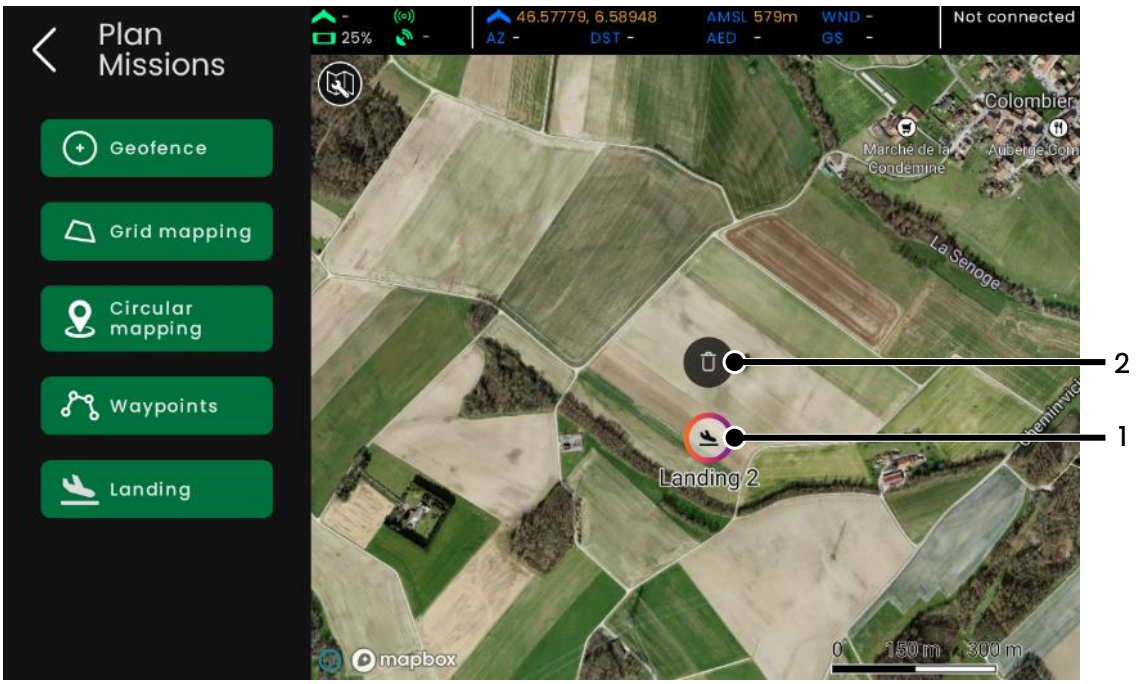


Figure 3-62 Deleting a landing

To start editing an existing landing site, simply tap on its icon on the map (1).

3.2.5.2 Using an alternative landing site

To use an alternative landing site, once connected to a drone, simply do a long press on the landing site to use. This will move the drone's landing position according to what was configured, as shown below. The drone landing's position can still be freely edited by the drone's operator.

ⓘ	Note
• If an alternative landing site is enabled before the drone takes-off, then the drone will not create a landing site at its take-off location.	

Figure 3-63 Alternative landing site selection

3.3 Fly

3.3.1 GCS commands

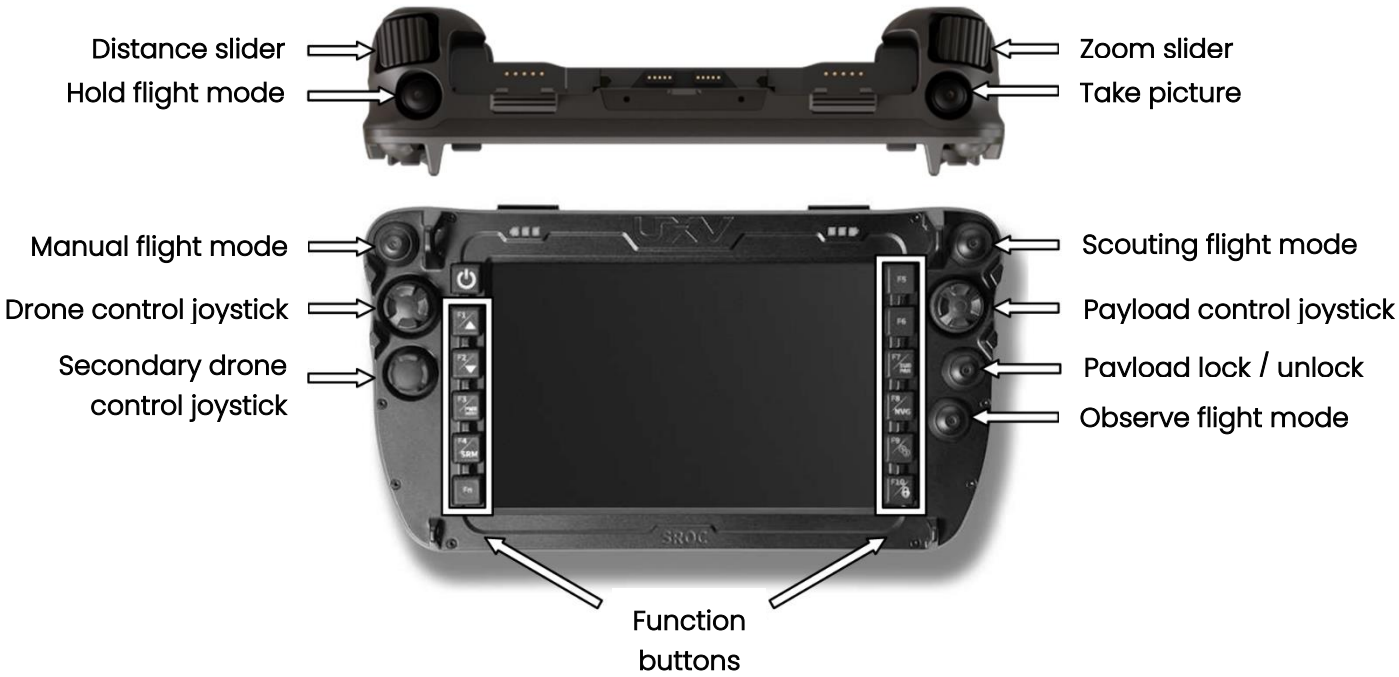


Figure 3-64 GCS button layout

3.3.2 Functions buttons & functions ribbons

Both sides of the GCS contain functions buttons that are coupled with functions ribbons on the touchscreen. Users can access all the main flight functions with gloves using the physical buttons or use the touchscreen depending on the situation.
The function ribbons show the user the action attached to the associated physical button and its availability.

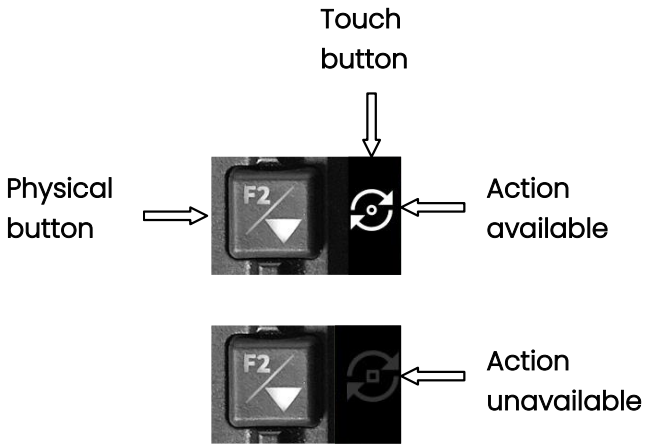


Figure 3-65 Function button operation

3.3.2.1 Drone functions

The left side of the GCS is dedicated to drone functions.

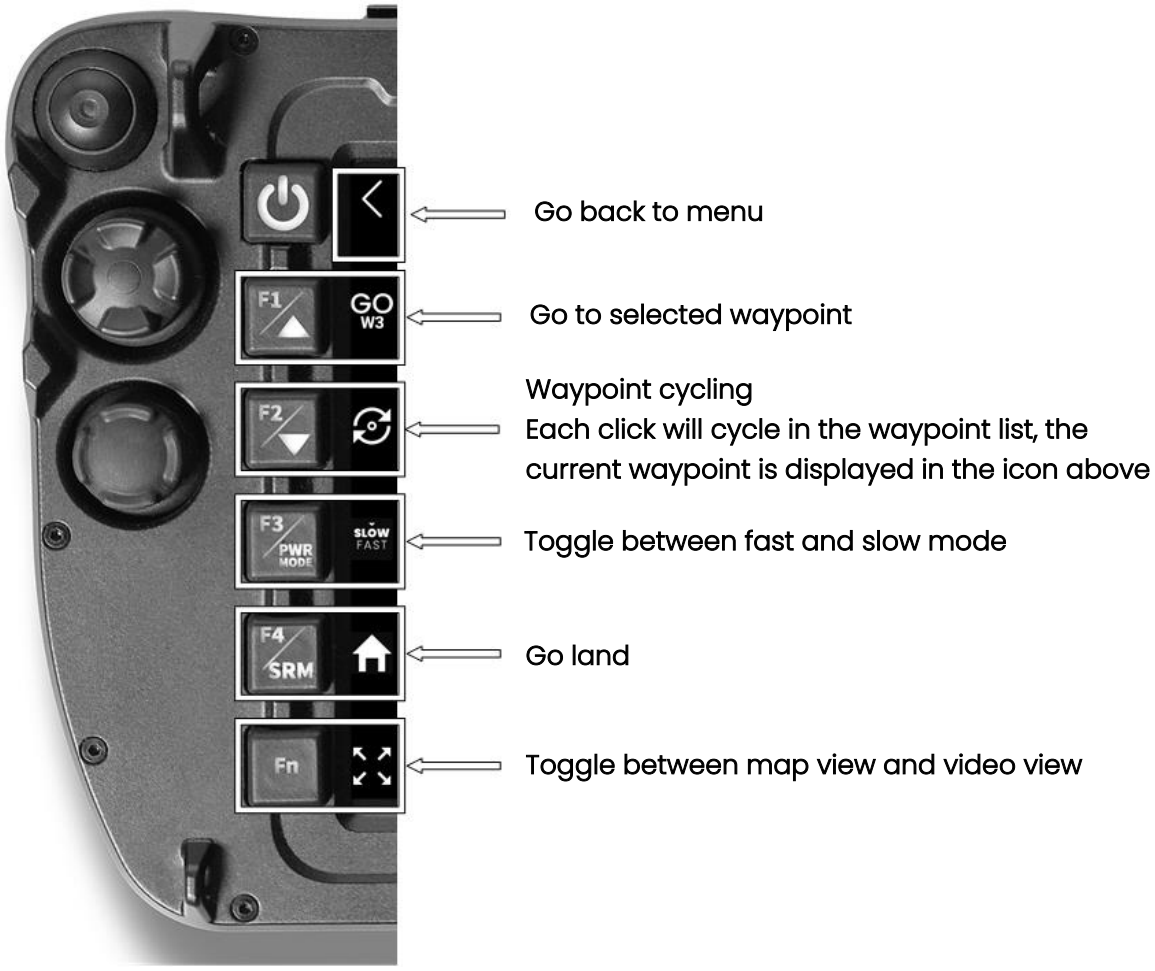


Figure 3-66 GCS left function buttons description

3.3.2.2 Payload functions

The right side of the GCS is dedicated to payload functions.

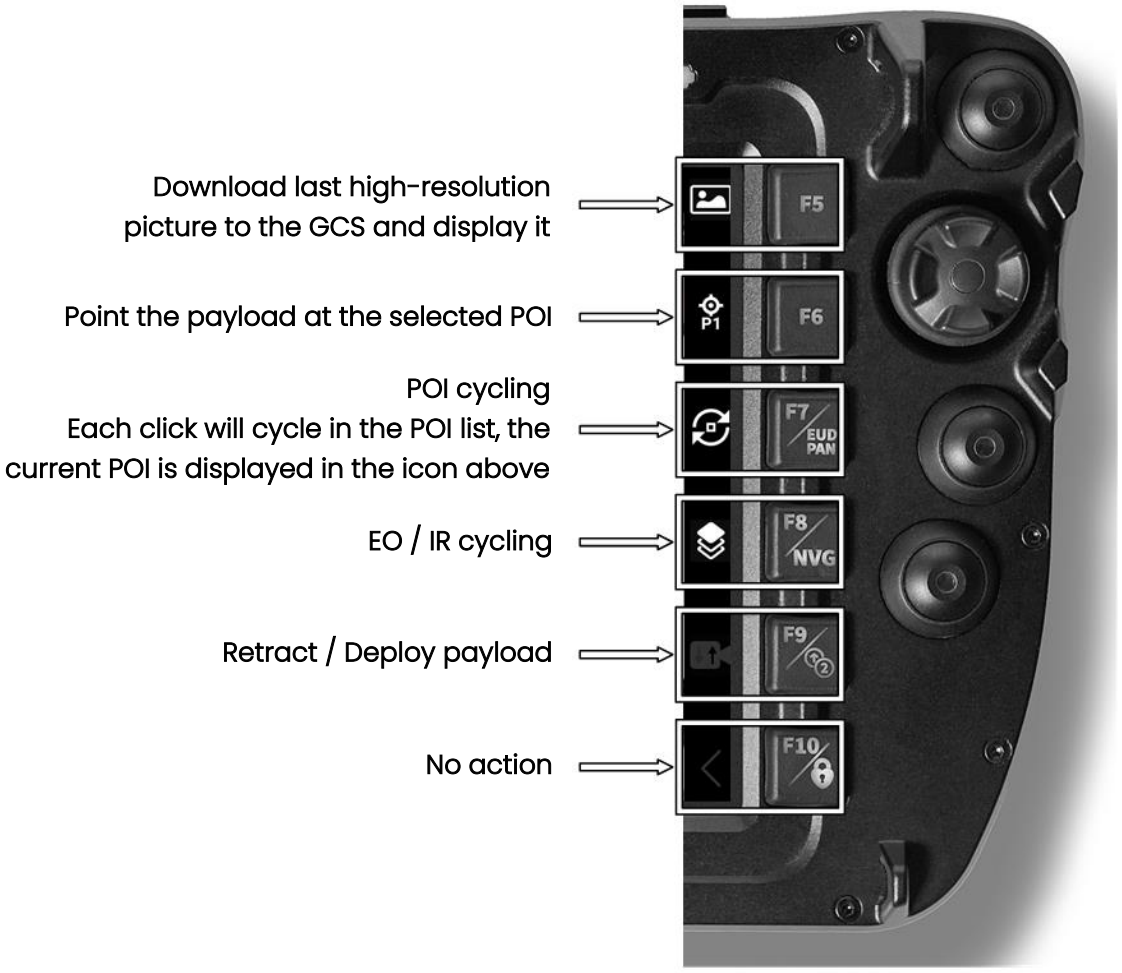


Figure 3-67 GCS right function buttons description

3.3.3 Telemetry ribbon

The telemetry ribbon is composed of 4 sections:

- System
- Drone
- Target
- Time

Figure 3-68 Telemetry ribbon description

3.3.3.1 Telemetry ribbon: system information

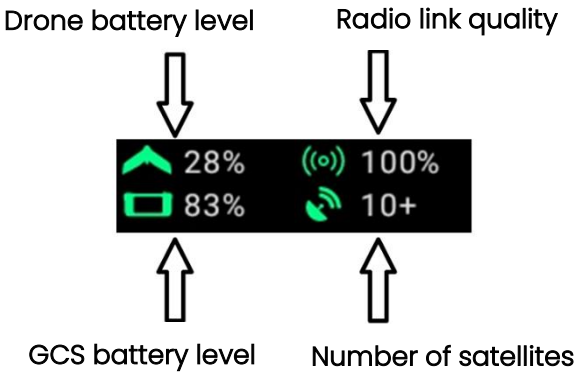


Figure 3-69 Telemetry ribbon system information details

3.3.3.2 Telemetry ribbon: drone information

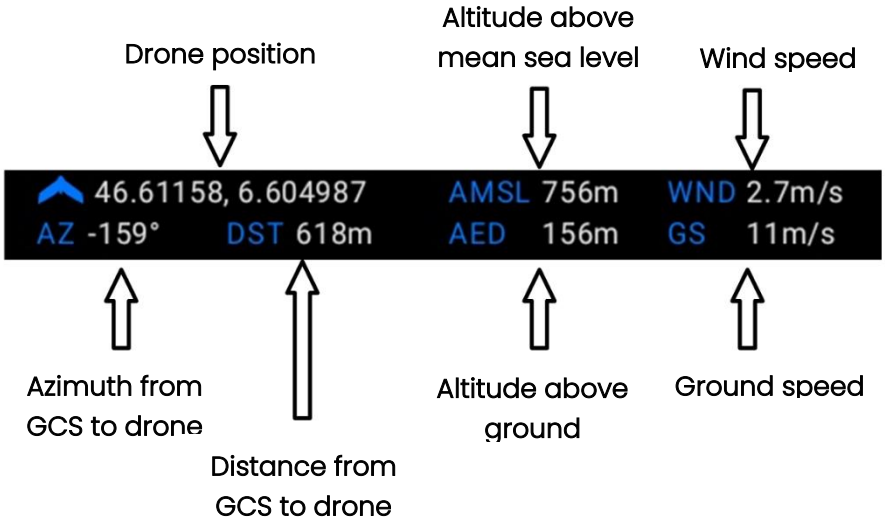


Figure 3-70 Telemetry ribbon drone information details

ⓘ	Note

- Click on the drone position to center the map on the eBee VISION
- Altitudes can also be checked by using the terrain profile (click on secondary drone control joystick)
- Units can be changed in the interface settings (see section 3.5.1 General information)

3.3.3.3 Telemetry ribbon: target information

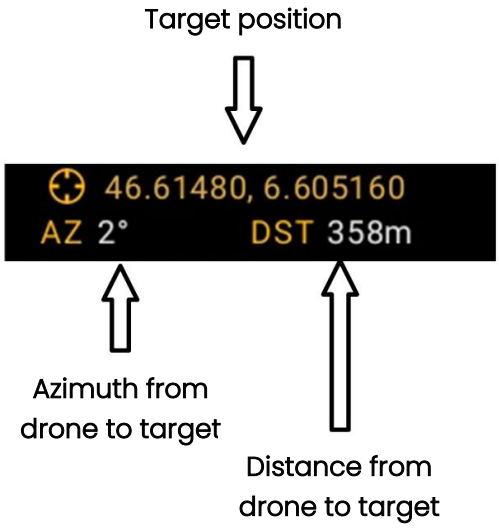


Figure 3-71 Telemetry ribbon target information details

ⓘ	Note
• The color of the target position reflects the estimated precision (see section 5.1 Coordinate of target accuracy) • Units can be changed in the interface settings (see section 3.6.1 General information)	

3.3.3.4 Telemetry ribbon: time

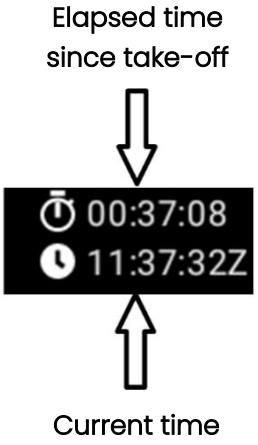


Figure 3-72 Telemetry ribbon time details

ⓘ	Note
• Time reference can be changed in the interface settings (see section in 3.5.1 General information)	

3.3.3.5 Telemetry ribbon: how to interpret it?

The data displayed on the telemetry ribbon is equivalent to a map.
The following graph shows how it can be projected onto a map.

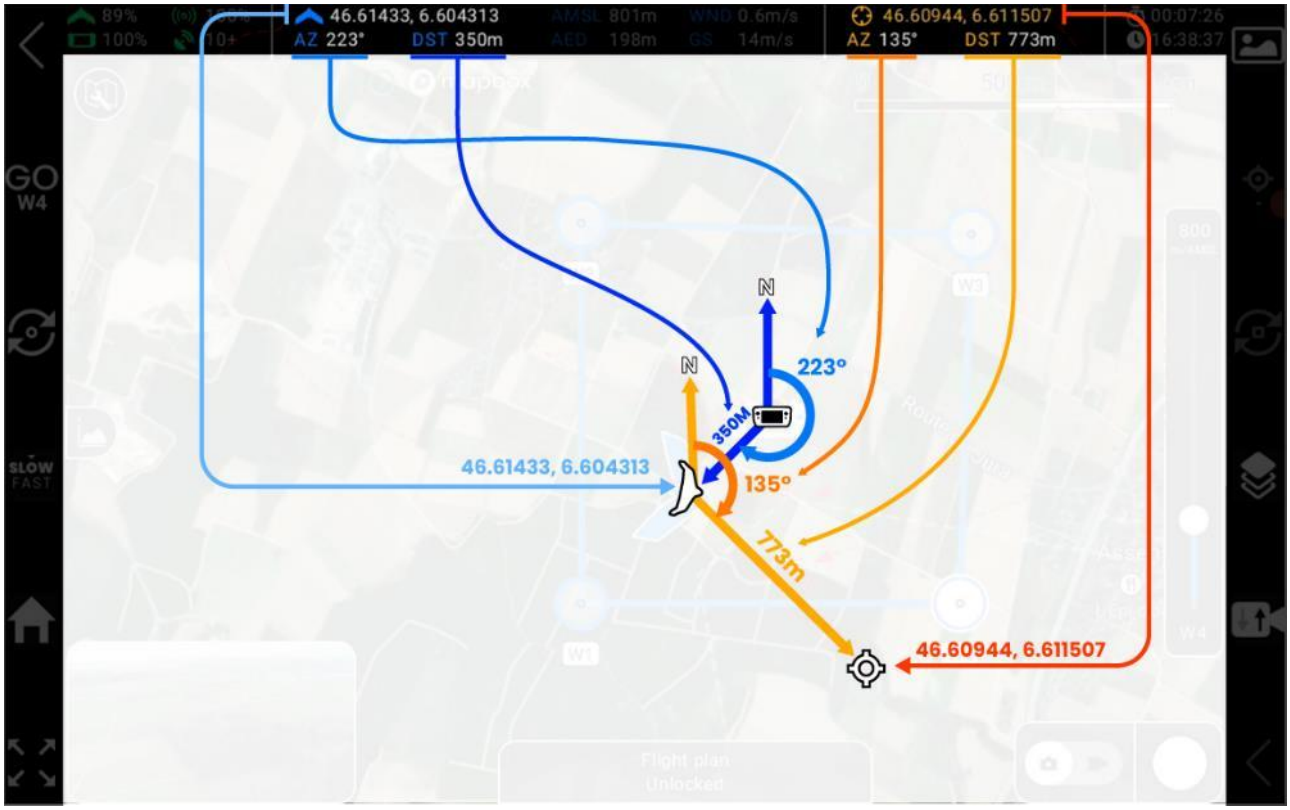


Figure 3-73 Telemetry ribbon location interpretation

3.3.4 Pilot views

Pilot can switch between video and map view. All the eBee VISION app is thought so that the operator can focus on the video view and needs to switch to map as little as possible.

3.3.4.1 Map view

The Map view is used to:

- Display the drone flight plan
- Move the position of waypoints, change their altitude
- Add/remove Points Of Interest (POI)

If no flight plan was created using the mission planning tools, a default flight plan is created when entering the Fly screen. This default flight plan contains four waypoints placed around the current location.

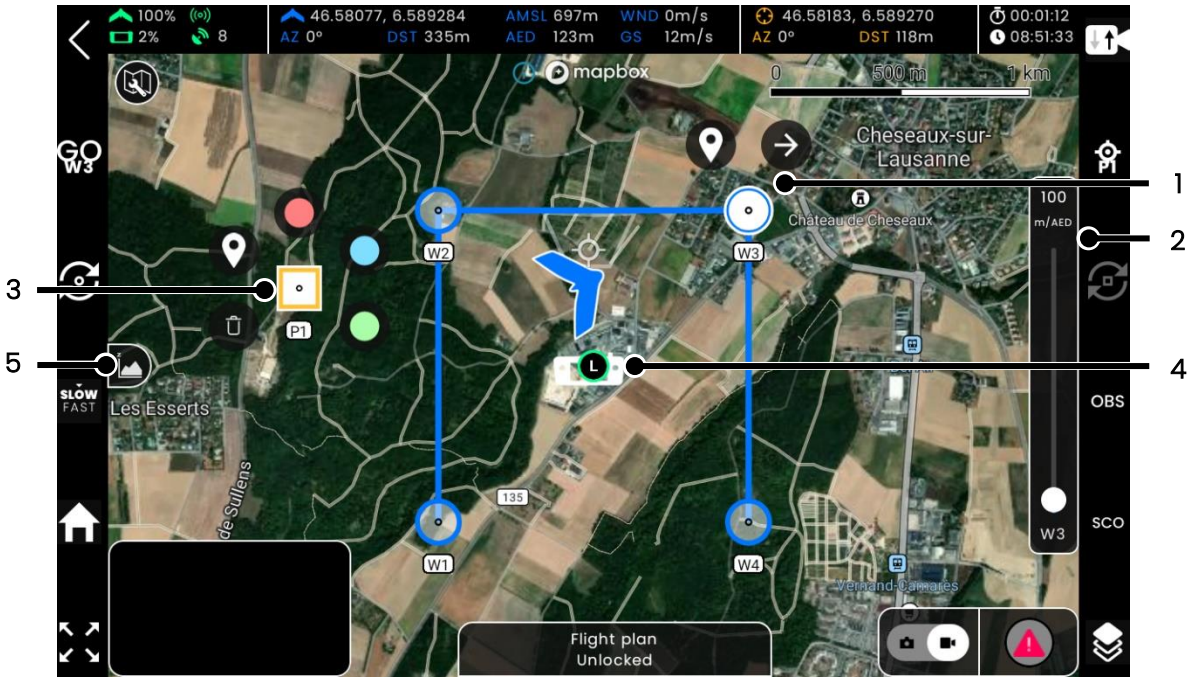


Figure 3-74 Map view details

3.3.4.1.1 Waypoints management

- To move a waypoint, press and hold the waypoint (1) and drag it to the desired location.
- To change the waypoint altitude while flying the flight plan, press on the waypoint to make a slider (2) appear on the right of the screen. Then drag the slider (2) to choose the waypoint altitude.
- The altitude of current waypoints can also be checked in the altitude profile (5), see section 3.3.5 Altitude profile

ⓘ	Note
• The altitude of the waypoint cannot be modified while the drone is holding its position (i.e. not following its flight plan)	

3.3.4.1.2 Landing path management

When zooming on the landing point (1), the landing path (2) is displayed, along with the approach trajectory if landing was triggered. (see section 4.2.6 Landing).

- To move the landing point, press and hold it, then drag it to the desired location.

Figure 3-75 Landing path management

- To change the landing direction, press/hold and drag the associated handle (3).

3.3.4.1.3 Points of interest management

Points Of Interest (POI) are locations where the drone camera should look at.

- To create a POI, press and hold on a point of the map until a square marker (3) is displayed.
- To change the POI color or to delete it, press and hold an existing POI until tool icons appear.
- Once created, POIs can be selected/activated as described in 4.3.1 Select and activate POI.

3.3.4.1.4 Using precise locations

To move a waypoint/POI to a given latitude/longitude or MGRS location, press and hold it until the tool icons (3) from Figure 3-75 appears. Then press on  to display the waypoint location editor and enter the desired coordinates.

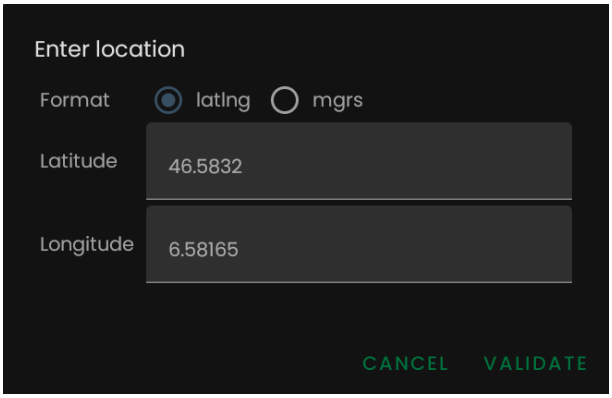


Figure 3-76 Using precise landing location

3.3.4.1.5 Assigning a mission

When a "flight plan block" is saved, it will be represented on the map by a small icon (see (1) on Figure 3-77Multiple flight plan blocks elements (1). Grid Mapping 1 was long pressed and shows its start button (2).). To start a flight plan block, the drone must be flying. On the Fly view, long-press on the block to start, a start button will appear (see (2) on Figure 3-77). Tap on this start button to start the mission right away. The mission is then expanded and its trajectory visible (see Figure 3-78).

Figure 3-77 Multiple flight plan block elements example

Multiple flight plan blocks elements (1). Grid Mapping 1 was long pressed and shows its start button (2).

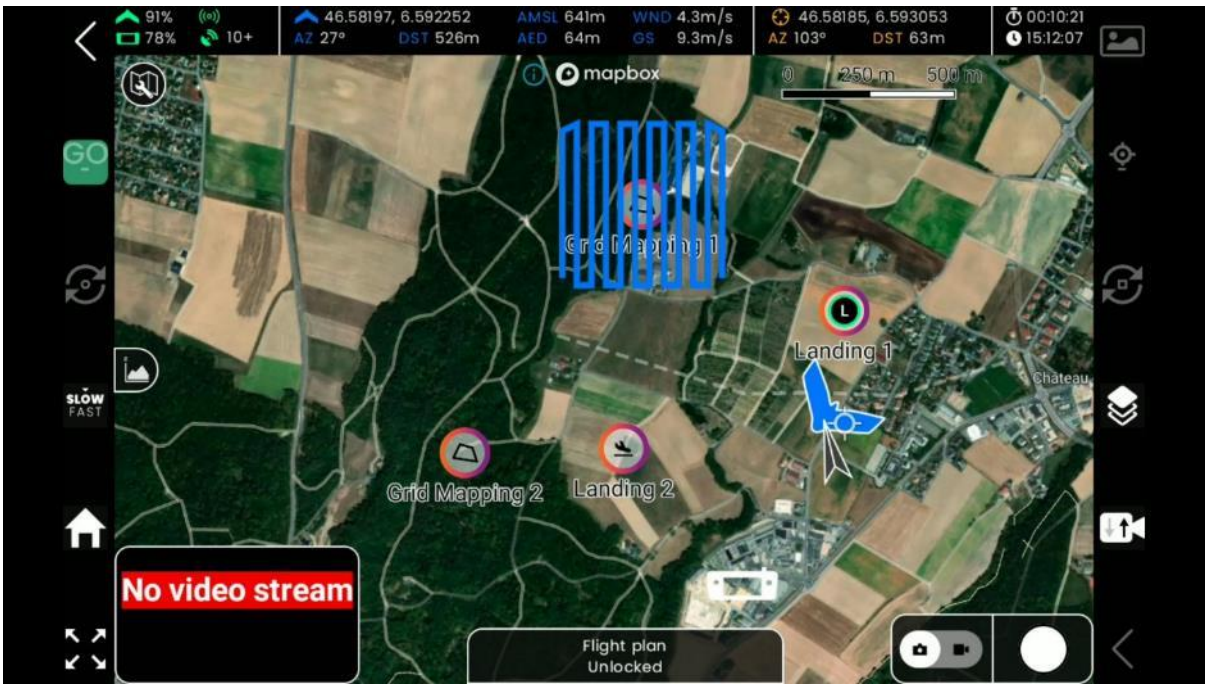


Figure 3-78 Grid Mapping 1 flight plan block is started.

3.3.4.2 Video view

Figure 3-79 Video view details

(1) Compass
(2) Reticle
(3) Exposure setting
(4) Landing point direction
(5) Wind direction

Camera zoom factor (1) appears when the zoom level is changed and fades out after 3 sec.

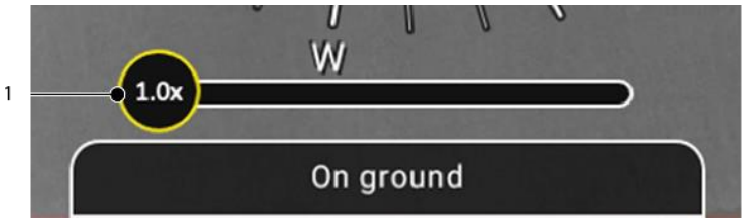


Figure 3-80 Camera zoom slider

ⓘ	Note
• Use landing's direction to find your way home in manual or scouting mode. • Use wind direction to position yourself and maximize furtivity. • Use compass to decide your fast escape direction.	

3.3.5 Altitude profile

At any time during operation, the pilot can press the secondary drone control joystick or drag the altitude profile icon to the right to display the altitude profile.
During flight operation, the altitude profile shows information about the next 3 minutes.
In flight plan edition, the altitude profile displays the complete flight plan.

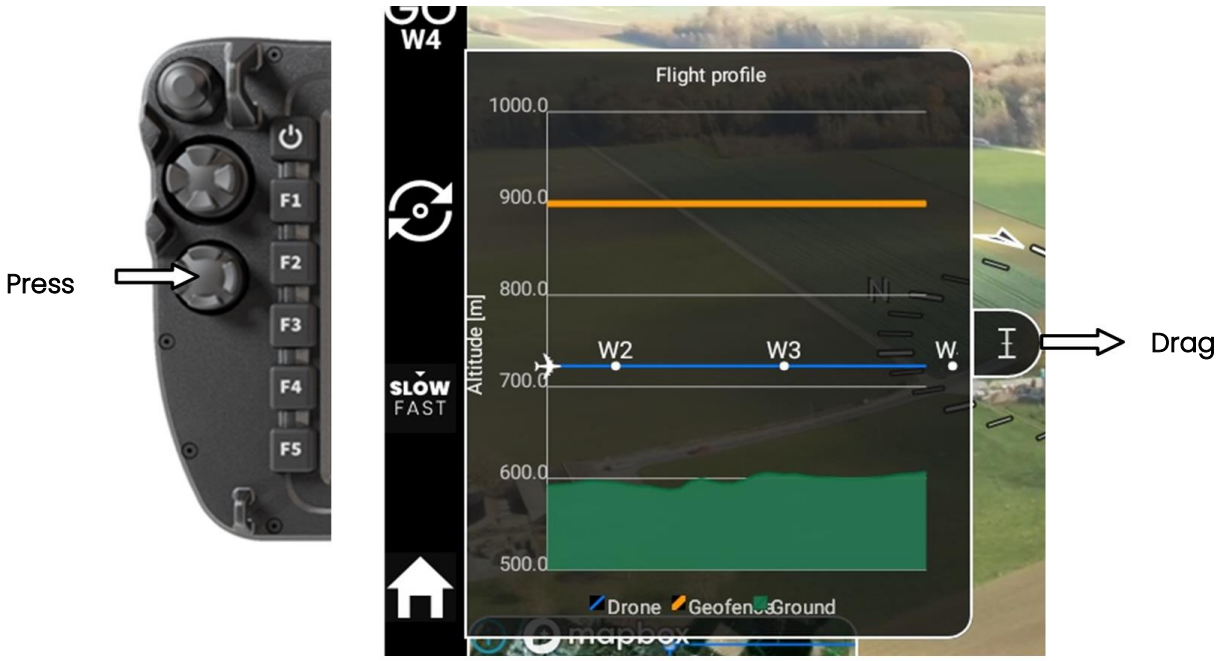


Figure 3-81 Altitude selection panel

3.3.6 Status bar

The status bar at the bottom of the screen always shows both the drone state and payload state.

Figure 3-82 Status bar location

3.3.6.1 eBee VISION states

Title	Description
On ground	Drone is on the ground, running its preflight checks.
Ready for take-off	Drone is on the ground ready for take-off.
Motor ramping	Drone motor is ramping up and payload is calibrating.
Taking-off	Drone is climbing before being able to begin a user action
Hold	The drone is performing a hold
Scouting	The user has activated the scouting mode.
Observe	The user has activated the observe mode
Flight plan	The user has activated the flight plan mode
Flying manual	The user has activated the manual mode.
Going to base	eBee VISION is going to landing point
Waiting for landing clearance	eBee VISION is waiting for confirmation to initiate descent.
Landing	eBee VISION is landing.
Aborting landing	User pressed Abort Landing button.
Low pass	eBee VISION detected mismatch in landing point altitude and is performing low-pass.
Aborting take-off	Take-off has been aborted, eBee VISION is gliding to the ground.
Escape	User activated the escape mode.
Fast climb	User activated the fast climb mode.
Fast descent	User activated the fast descent mode.
STL	eBee VISION is performing STL
Emergency	The drone is performing a short emergency maneuver (Ground avoidance or Spin Exit)

3.3.6.2 Payload states

Title	Description
Locked	Payload is locked, it maintains current target in sight.
Unlocked	Payload is unlocked, it looks in a constant direction.
Forward-facing	Payload is looking forward to help piloting.
Retracted	Payload is retracted to protect the cameras
Transit	Payload is retracted with the cameras looking down. Used to reduce drag while keeping environment awareness.

3.4 Gallery

View and manage images and videos from the drone and the CGS.

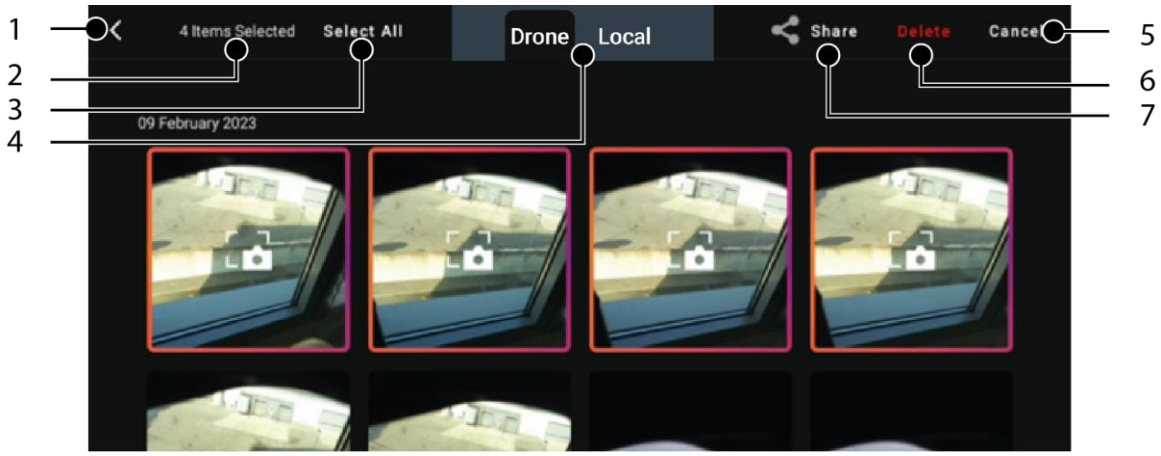


Figure 3-83 Gallery details

Gallery information:

(1) Back

(2) Number of items selected

(3) Select individual or all data

(4) Select Drone or Locawing2l memory (internal memory of the GCS)

(5) Cancel selection

(6) Delete individual or all data

(7) Share and save single images from the drone to the internal memory of the GCS.

ⓘ	Note
• eBee VISION must be connected to use the drone gallery	

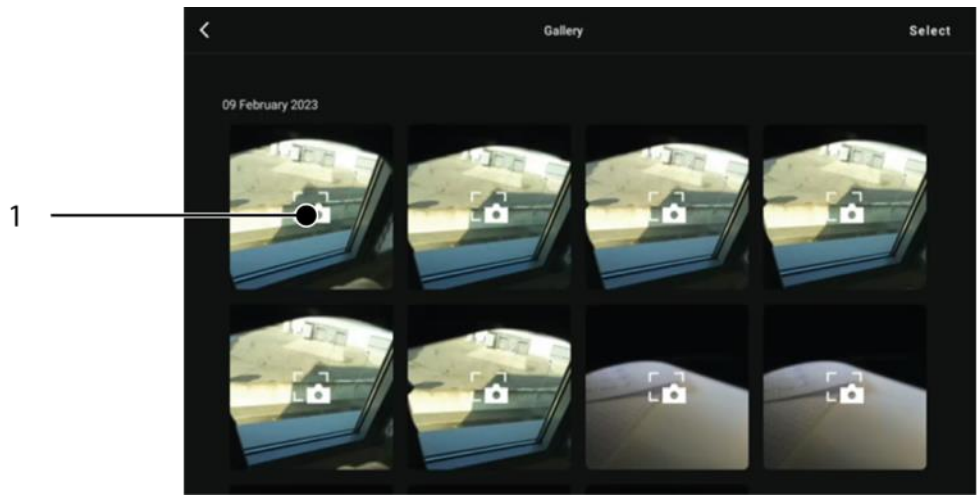


Figure 3-84 Opening a picture

1. Press on a thumbnail (1) to open the picture or video Fullscreen view.

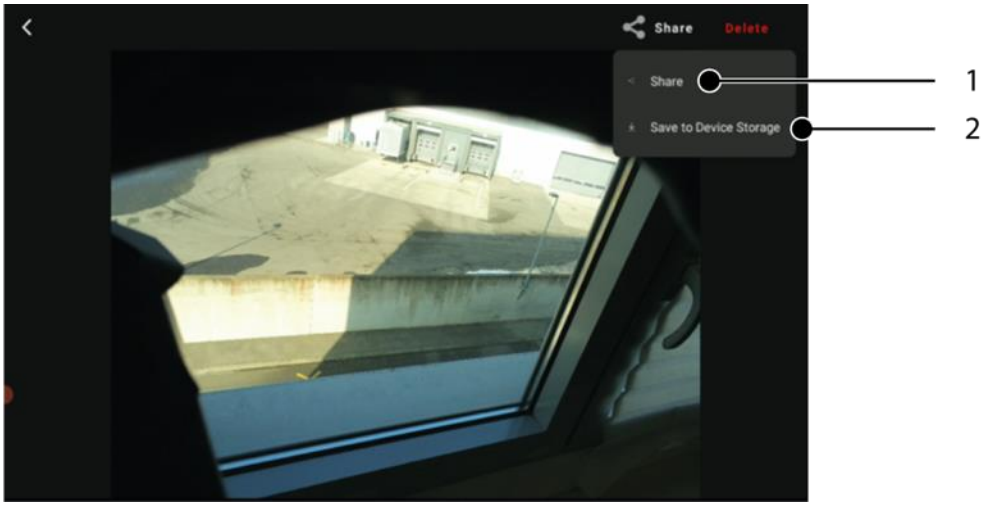


Figure 3-85 Sharing a picture

2. Connect a removable device to the GCS and select ***Share*** (1) to export media to the removable device or select ***Save*** (2) to export a single image from the drone to the internal memory of the GCS.

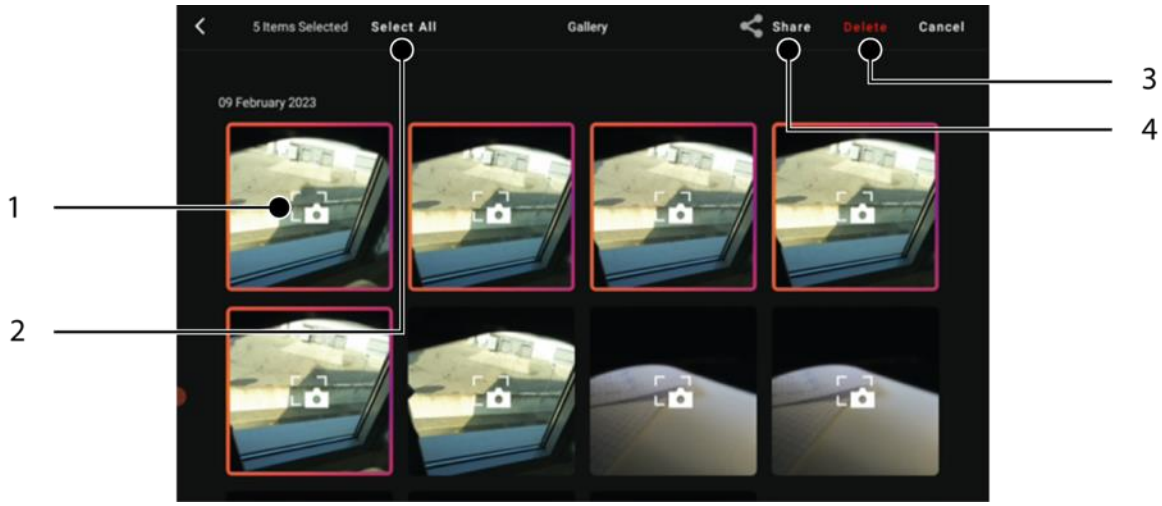


Figure 3-86 Selecting multiple images

3. Make a long tap on a thumbnail (1) to enable individual selection of images and video or select all (2).
4. Connect a removable device to the GCS and select ***Share*** (4) to export the selected medias from the drone to the removable device or to export the selected medias from the drone to the internal memory of the GCS. Select ***Delete*** (3) to delete the selected media.

3.5 Settings

3.5.1 Interface

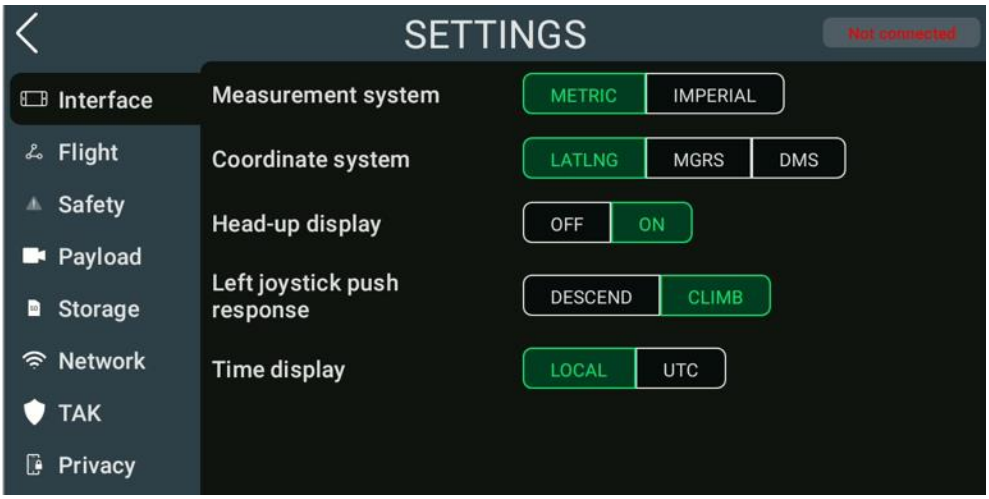


Figure 3-87 Interface settings screen

- **Measurement System**: select **Metric** or **Imperial**.
- **Coordinate System**:
  - **LatLng**: Latitude Longitude
  - **MGRS**: Military Grid Reference System
  - **DMS**: Degree Minutes Seconds
- **Head-up display**: display or hide the compass widget on the video view.
- **Left joystick push response**: select expected behavior when pushing main drone control joystick for manual flight.
- **Time display**: whether local time or UTC (Zulu) time must be displayed in the telemetry ribbon.

3.5.2 Flight

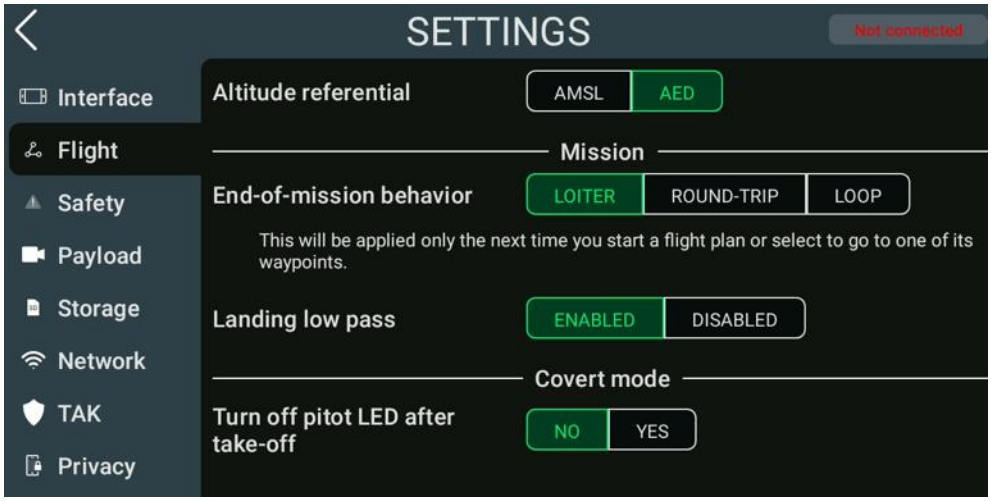


Figure 3-88 Flight settings screen

- Altitude referential:
  - AMSL: the drone will fly at constant altitude.
  - AED: the drone will fly at constant height above the terrain.
- End-of-mission behavior:
  - Loiter: the drone will loiter around the last waypoint after the mission.
  - Round-trip: the drone will fly the mission in reverse.
  - Loop: after the last waypoint the drone will continue again from first waypoint.
- Landing low pass:
  - Enabled: the drone will do a low pass over the landing site for maximum landing accuracy if needed.
  - Disabled: the drone will land without low pass with reduced landing accuracy.
- Turn off Pitot-LED after take-off: select Yes or No

3.5.3 Safety

3.5.3.1 Return to home

The Return-to-home (RTH) is the first step of a landing. It defines the trajectory between the drone's current position and the base waypoint. It is used when a "Go-Land" is triggered, whether manually by the operator or automatically by a safety action.
The RTH trajectory is defined as follows:

- The horizontal path is a straight line from the drone's current position to the home point.
- The vertical path (altitude) depends on the "Altitude Referential" selected in the Safety setting. Three options are available: AMSL / AED / Terrain following.

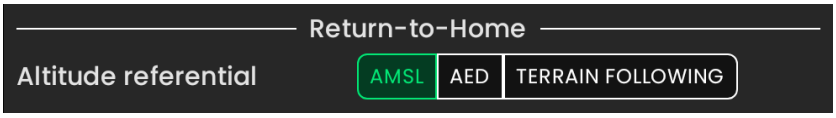


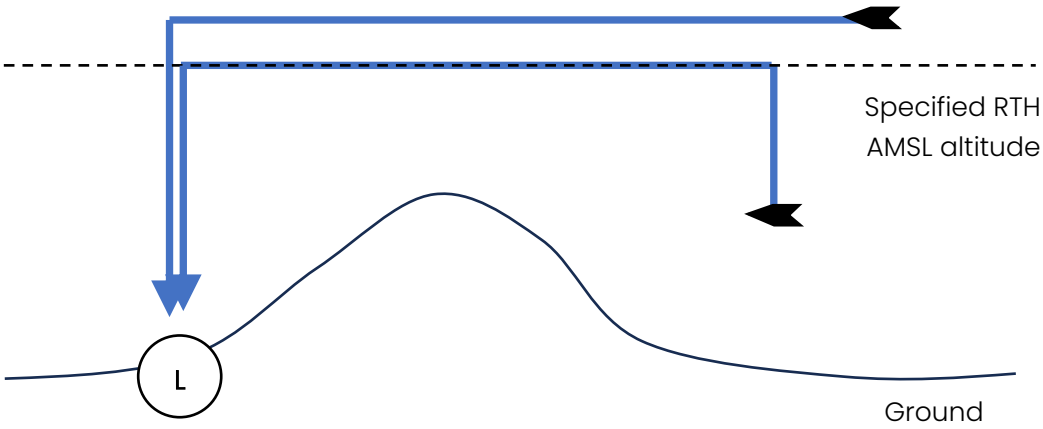
Figure 3-89 Return to home altitude referential

3.5.3.1.1 AMSL

If the AMSL option is chosen, the user must specify an RTH AMSL altitude. During the RTH, the drone will reach this altitude before flying to the base.

ⓘ	Note

• The specified RTH AMSL altitude must be seen as a minimum altitude, as the drone will fly higher in the following situations:
  ○ If the drone is already higher than the specified AMSL altitude when the "Go-Land" is triggered, the drone will keep its current altitude during the RTH.
  ○ If the specified AMSL altitude would lead to an intersection with the terrain, the RTH altitude is increased in a way to ensure a height over terrain of at least 60 m (200 ft) all along the RTH trajectory (i.e. AED option).	



RTH Altitude referential:

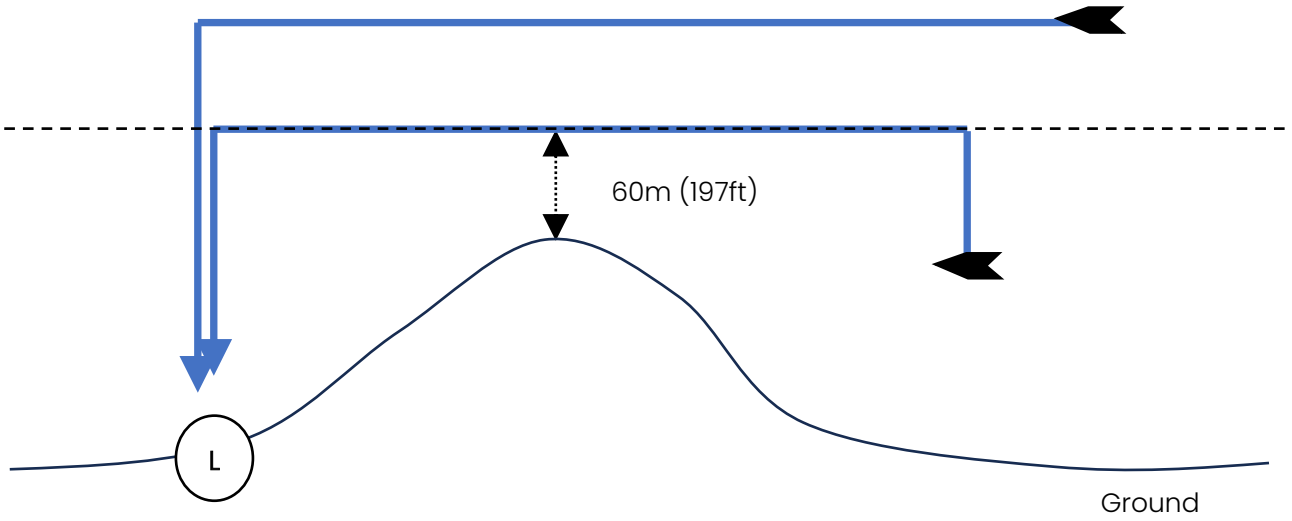
AMSL

Figure 3-90 RTH altitude referential AMSL schematic

3.5.3.1.2 AED

If the AED option is chosen, the RTH altitude is the altitude that ensures a height over terrain of at least 60 m (200 ft) all along the RTH trajectory. During the RTH, the drone will reach this altitude before flying to the base.

ⓘ	Note
• If the drone is already higher than the minimum AED altitude, the drone will keep its current altitude during the RTH.	



RTH Altitude referential:

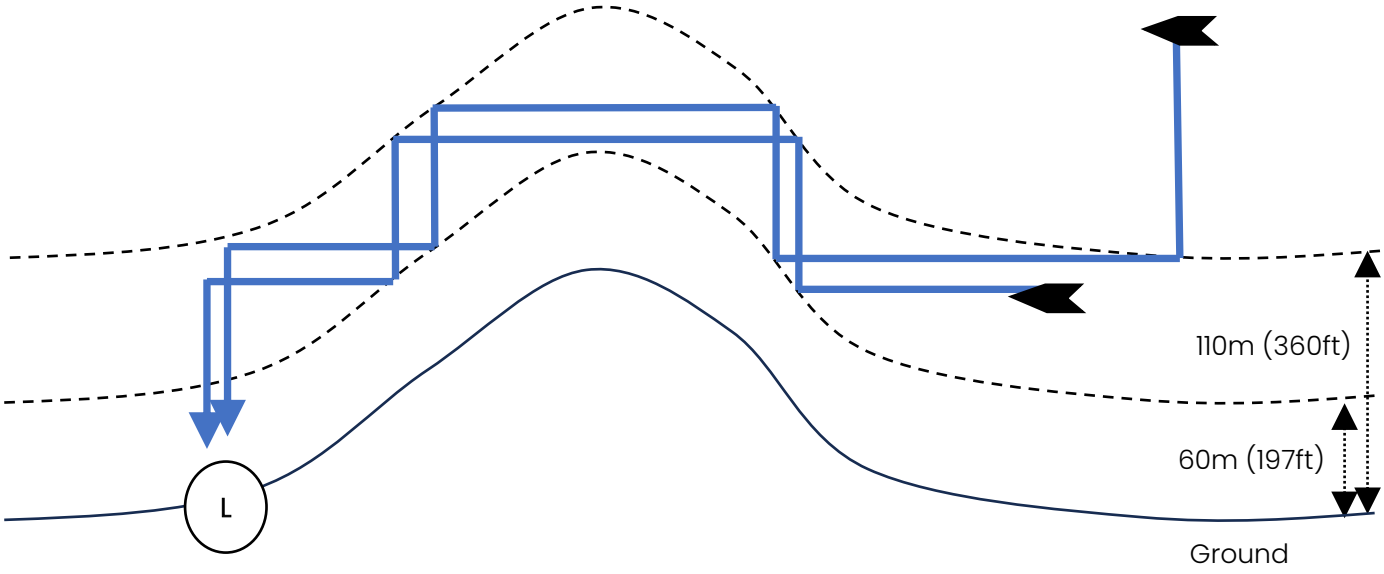
AED

Figure 3-91 RTH altitude referential AED schematic

3.5.3.1.3 Terrain Following

If the terrain following option is chosen, the drone will change altitude during the RTH in a way to constantly remain between 60 m (200 ft) and 110 m (360 ft) over the terrain.

ⓘ	Note
• If the drone is higher than 110 m (360 ft) over the terrain, the drone will descent below 110 m (360 ft) before flying to the base.	



RTH Altitude referential: **Terrain Following**

Figure 3-92 RTH altitude referential following schematic

3.5.3.2 Safety actions

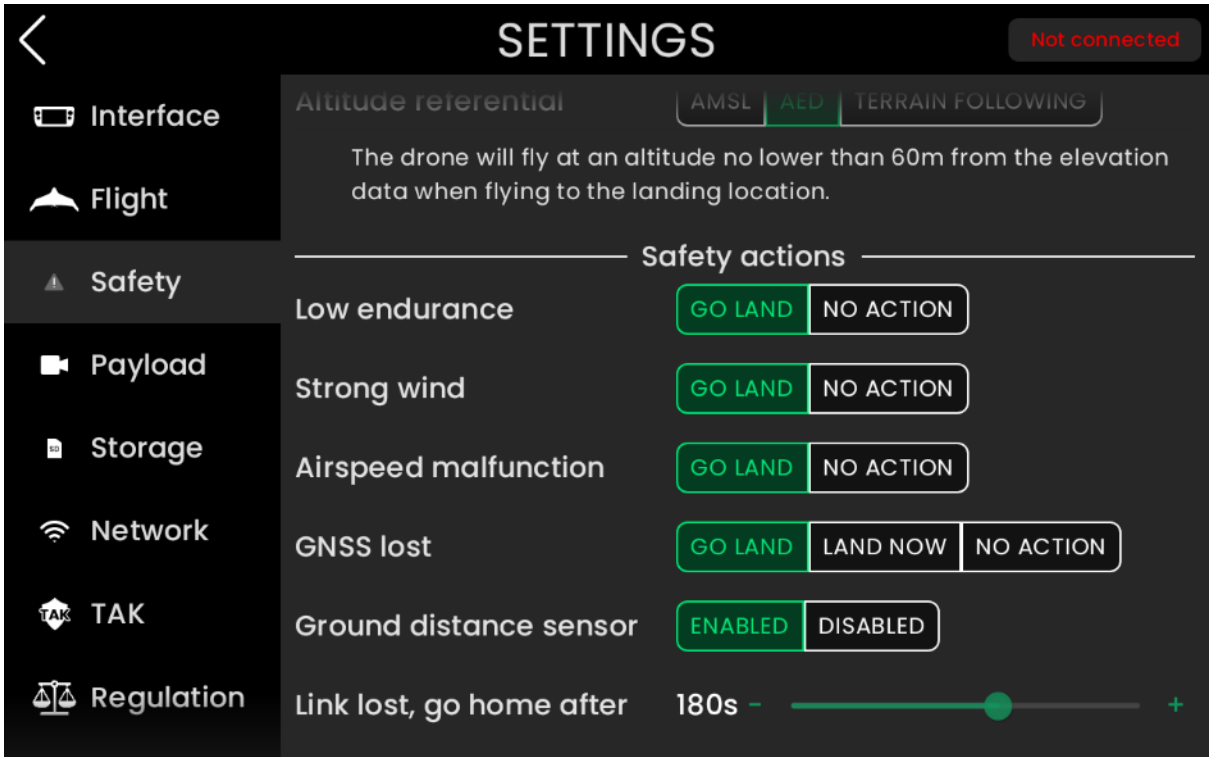


Figure 3-93: The Safety actions sub-menu

3.5.3.2.1 Low endurance

The “Low endurance” safety warning gets triggered when the energy left in the battery allows eBee VISION to return Home and have just enough battery left to allow aborting a couple landings. When the corresponding safety action is set to “GO LAND”, eBee VISION will then automatically return Home. When set to “NO ACTION”, the warning will be displayed, but eBee VISION will continue its mission.

⚠	Warning
• When Low endurance is set to NO ACTION, eBee VISION might not be able to land at the defined landing point. Consider bringing the landing point to a location closer to the drone, ultimately eBee VISION will perform an STL when battery runs out.	

3.5.3.2.2 Strong wind

When estimating a wind speed above 17 m/s (38 mph) [ref necessaire], eBee VISION triggers a “Strong wind” warning. When the corresponding safety action is set to “GO LAND”, eBee VISION automatically engages a “go land”. When set to “NO ACTION”, the warning is ignored by eBee VISION, which continues its mission.

⚠	Warning
• If wind goes above 22.5 m/s (50 mph), eBee VISION will be carried away by the wind, when this occurs, first try to “GO LAND” in “FAST” mode, or initiate an STL before losing contact with the drone.	

3.5.3.2.3 Airspeed malfunction

eBee VISION can detect an issue with the pitot tube. When this happens, the “Airspeed malfunction” warning is triggered and eBee VISION will continue flying under the assumption that the wind remains steady. User can choose if eBee VISION should perform a “GO LAND” or keep flying by setting the corresponding safety action to “GO LAND” or “NO ACTION”, respectively.

⚠	Warning
• If the wind is unsteady eBee VISION flight quality will be degraded, this will be most visible at landing.	

3.5.3.2.4 GNSS lost

eBee VISION can fly during a GNSS outage. When this happens, as for pitot tube issues, eBee VISION will assume that the wind is constant to keep flying. In this mode, the position accuracy degrades over time due to the accumulation of errors. When selecting the “GO LAND” safety action, eBee VISION will head back Home with its degraded position estimate, with the hope to get away from the source of jamming/spoofing and eventually recover the GNSS signal. When selecting the “LAND NOW” safety action, eBee VISION will initiate an STL on its current position. When set to “NO ACTION”, eBee VISION keeps flying with a degraded position estimate. (see section 4.2.11 GNSS denied)

ⓘ	Note

- eBee VISION's GNSS antenna features low gain from the region below the drone which makes it more resilient to simple GNSS jammers.
- eBee VISION should be operated at around 200m / 656ft AGL which makes it out of reach of most simple GNSS jammers.

⚠	Warning

- eBee VISION is not able to detect spoofing.
- If the GNSS signal is not recovered by the time eBee VISION reaches its BASE waypoint, eBee VISION will initiate an STL on the "BASE" waypoint with potentially a largely degraded position estimate. At this point, we recommend maneuvering eBee VISION manually and visually instead and trigger an STL once eBee VISION gets over a proper landing spot.

3.5.3.2.5 Ground distance sensor

The eBee VISION's ground distance sensor has a range of approximately 100m (328ft). It can be used to avoid collisions with unexpected obstacles on the ground. When an obstacle is detected at less than 20 m (66 ft), eBee Vision performs a fast climb and then holds 60 m (197ft) above elevation data. The user can override this behavior by disabling the ground sensor in the safety actions menu.

⚠	Warning

- Clouds or fog are perceived by eBee VISION as obstacles and will trigger unwanted ground proximity warnings. In cloudy or foggy conditions, disable the ground sensor during the mission and enable it back before landing if the conditions allow it.
- Disabling the ground sensor removes the ability to perform a low pass at landing, therefore reduces the landing accuracy.

ⓘ	Note

- eBee VISION's ground sensor features a wavelength of 905 nm. The reflections of the laser beam on the ground can only be seen with night vision devices at very low altitude (below 50m / 164ft).

3.5.3.2.6 Link lost, go home after *N* s

When the eBee VISION's radio link is lost for a while, eBee VISION will eventually go home by itself and if the link is still not recovered the moment eBee VISION reaches its BASE waypoint, eBee VISION will land automatically on the last landing point it was assigned. The delay before returning Home can be set with the corresponding slider between 5s and 300s.

⚠	Warning

- Ensure the landing is set up properly in advance to account for any unexpected loss of connection.

3.5.4 Payload

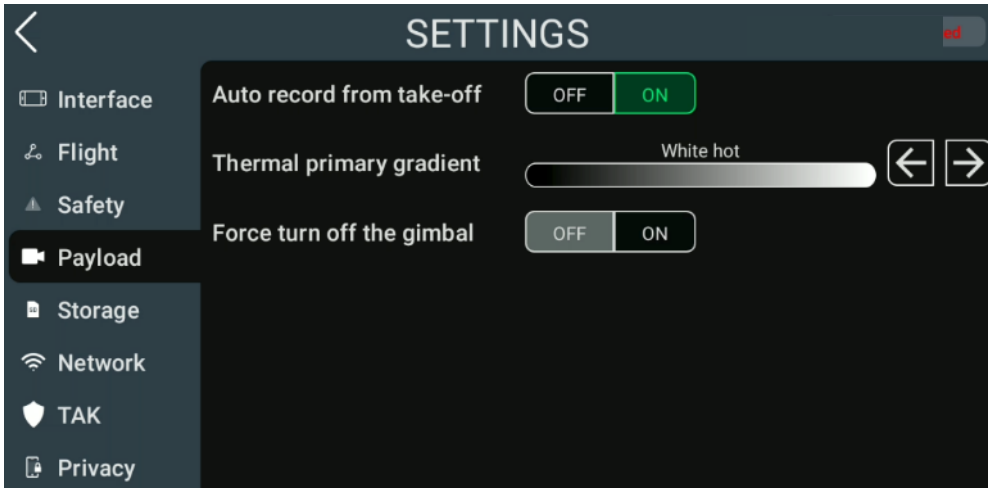


Figure 3-94 Payload settings screen

- **Auto record from take-off**: if enabled, video recording will be activated after take-off.
- **Thermal Color Gradient**: color setting for the thermal camera (white hot / black hot).

Force turn off the payload: Disable the payload for the flight. The payload doesn't calibrate at shake-shake and isn't deployed during the flight.

3.5.5 Storage

3.5.5.1 Encrypting microSD card on the drone

1. Go to ***Settings*** -> ***Storage***.

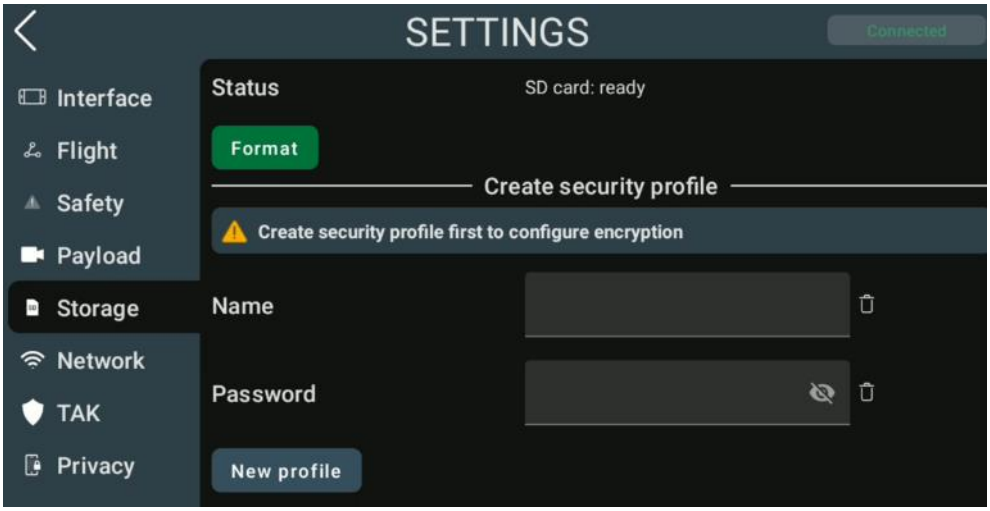


Figure 3-95 Storage encryption settings screen

2. Create a security profile by providing ***Name*** and ***Password*** then tap on ***New profile***.

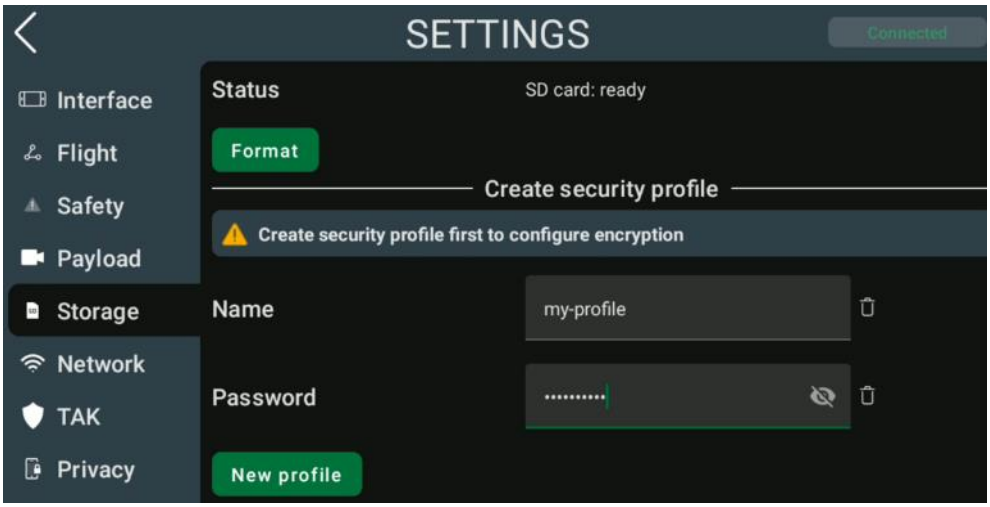


Figure 3-96 Storage encryption credentials

3. Once you have created the Security Profile and GCS is connected to the Drone, select ***Encryption ON*** (1) to start the SD Card formatting.

Figure 3-97 Storage encryption's toggle

⚠	Warning
• Encrypting an SD card deletes all its content.	

4. Tap ***Yes*** to start encryption.

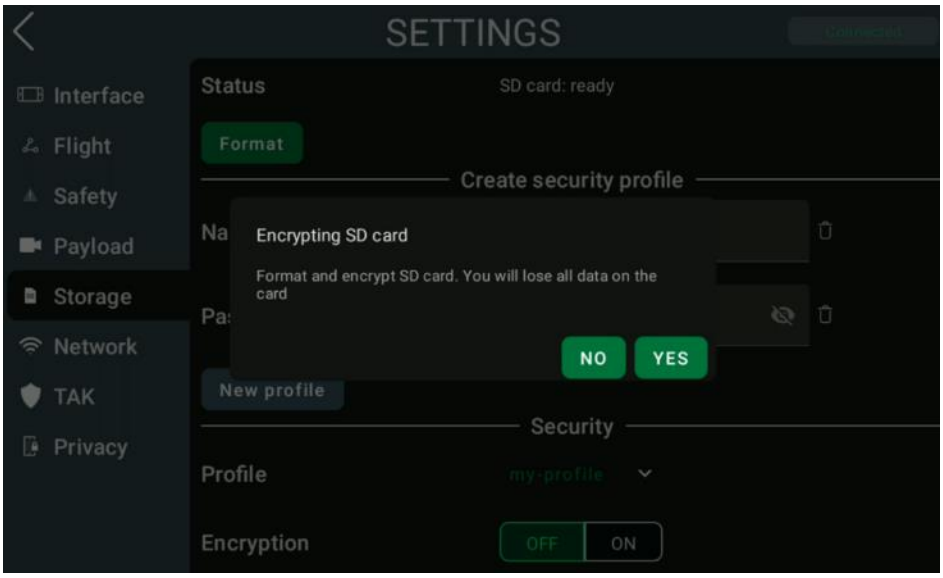


Figure 3-98 Storage encryption confirm notification

5. Once the formatting is complete the SD card on the Drone is encrypted and you can only access the data stored on this SD card by connecting the Drone to the GCS and using this profile on this GCS.

3.5.5.2 Retrieving encrypted data from the drone

To retrieve encrypted data from the SD card:

1. Ensure drone and GCS are powered on and both are connected.
2. Insert the SD card in the drone.
3. Connect the drone to a computer using the USB-C connector available in the battery bay.

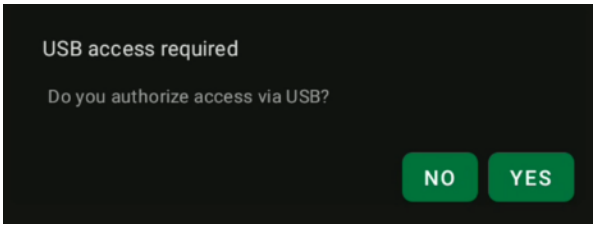


Figure 3-99 USB access authorization notification

4. Click **Yes** when asked for access authorization
5. The removable device appears on the computer. You can browse the contents of the SD card.

3.5.6 Network

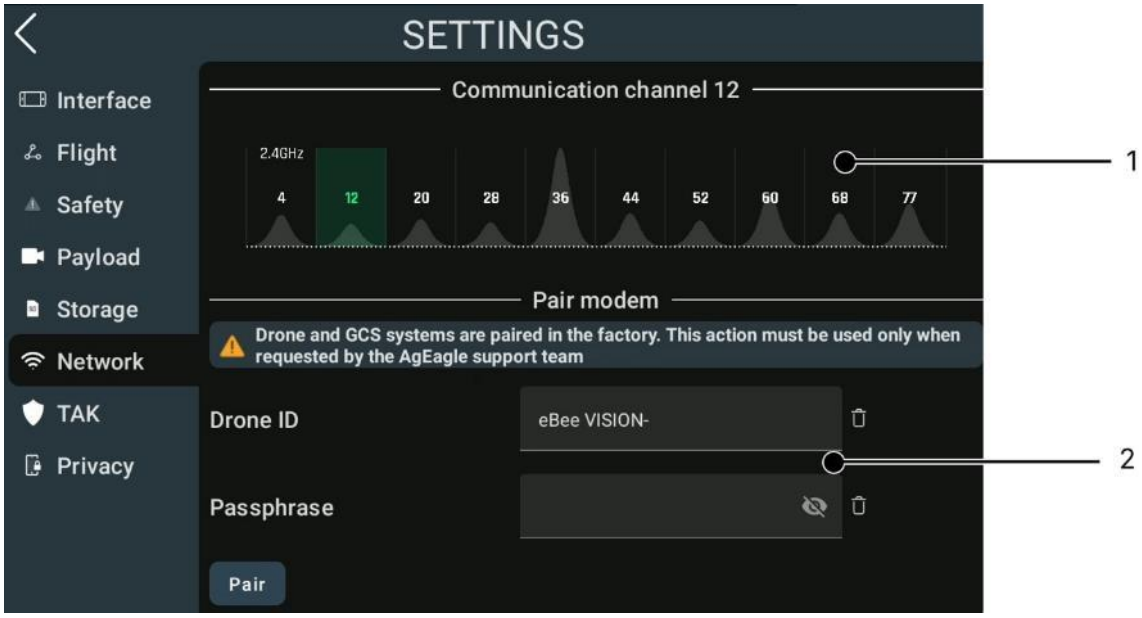


Figure 3-100 Network settings screen

(1) **Radio channel selection**: you can choose your preferred channel for the radio. Selecting a channel changes the radio channel on both the GCS and the Drone.

- Click on the channel band to select another channel. Currently active channel is highlighted in green.
- A popup will ask you to confirm the channel selection.

ⓘ	Note
• The graph represents the occupation on these channels. It is here as a hint and doesn't replace a real scan with dedicated hardware. It can take up to 10 seconds to update.	

(2) **Modem pairing**: in case the user needs to pair a new drone with the GCS:

- Power ***ON*** the new Drone and wait about 2 minutes to be sure it has completely booted.
- Go to ***Settings*** -> ***Network*** -> ***Pair modem***.
- Set ***SSID*** and ***Password***, provided with the new Drone.
- Click ***Pair***.

GCS will change its modem's settings and try to connect to the drone.

⚠	Warning
• This process is only intended to pair a GCS with a drone. It should not be used to resolve connectivity issues with an already paired drone. See section 8.1 Pilot notifications	

3.5.7 TAK

TAK is a tool used for situation awareness and sharing geospatial data.
The eBee VISION has a built compatibility with TAK servers.
From the eBee VISION GCS, it is possible:

- Send the drone and GCS positions to TAK server
- Receiving other drones' positions
- Receive, classify, and send background markers.
- Upload pictures to a TAK server as data package

This section requires:

- To properly configure and use a second network interface on your GCS
- A TAK server. Please note TAK servers are not provided by the drone's manufacturer

3.5.7.1 Configuring connection to TAK server

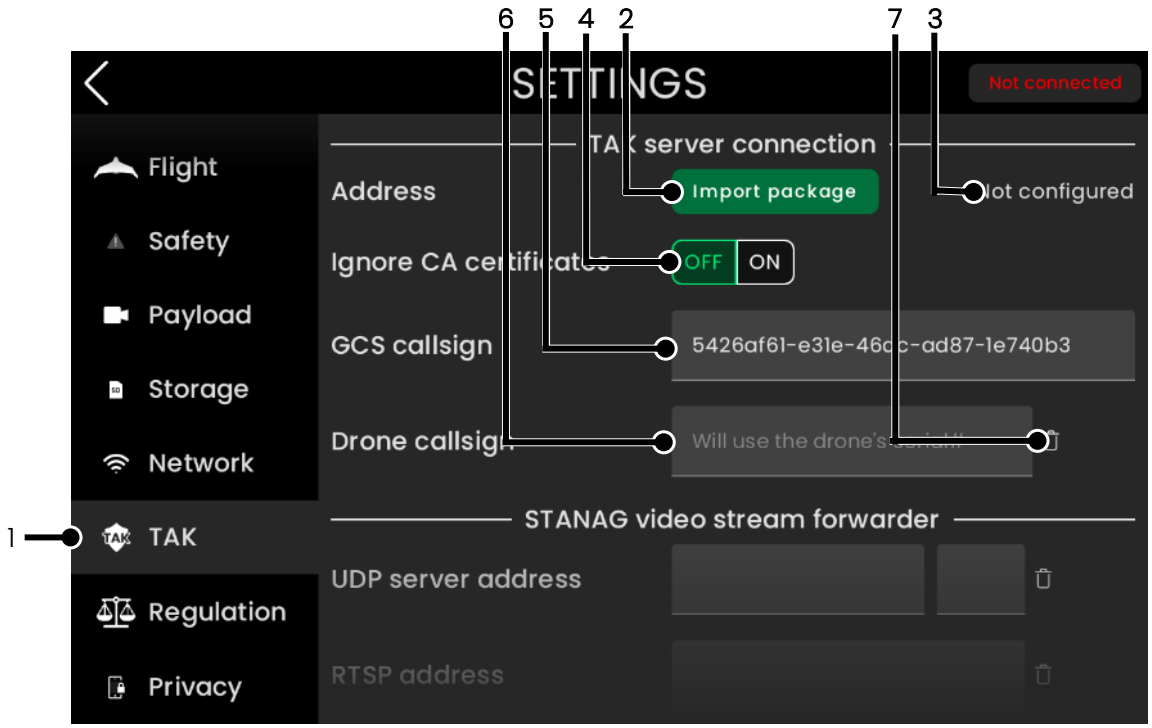


Figure 3-101 TAK settings screen

Click import package (2) to open the Android file picker, and then select the TAK authentication package for your device that was given to you by your TAK server's administrator. In case of issues with the server certificate, it is possible to disable central authority (CA) certificate verification when establishing a connection to the server by pressing (4).
It is possible to configure the callsign of the GCS and the drone used in TAK messages by using (5) and (6), respectively. The GCS callsign is initialized with a per-device random identifier. One can completely erase the drone callsign by pressing (8). Please note that no confirmation is asked before erasing.
The result of successfully configuring a TAK server is shown below.

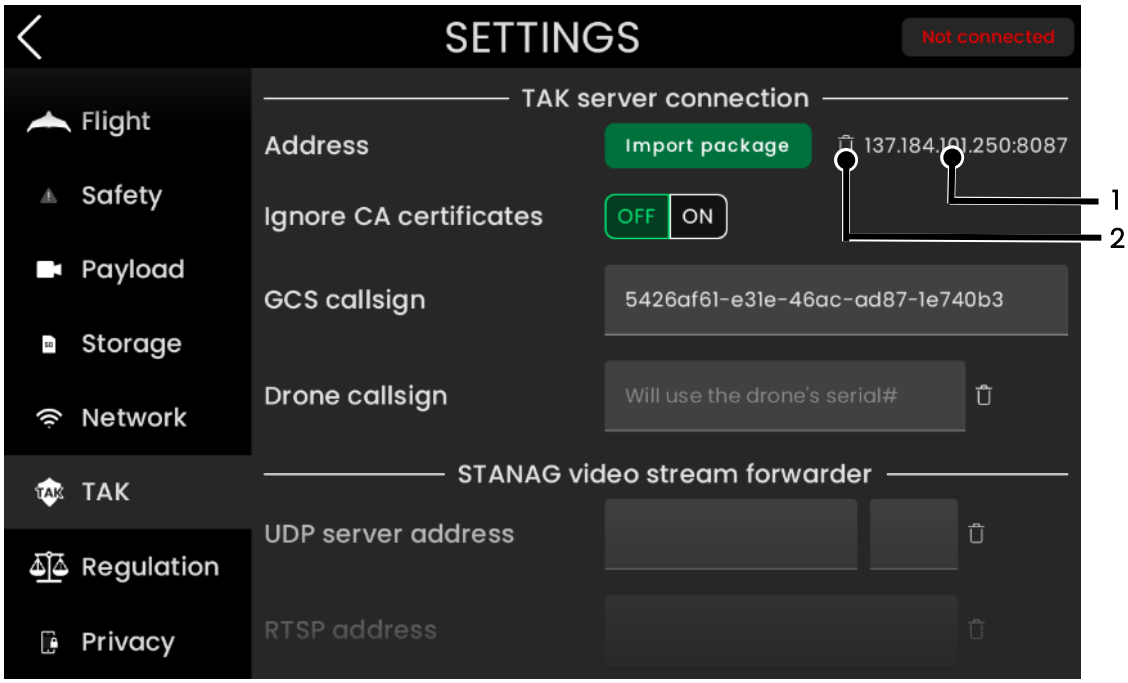


Figure 3-102 Configured TAK server example

The network address of the server is displayed in (1). To remove the server, press (2). This cuts the connection to the TAK server if was established. Please note that only one server can be configured.
Statistics regarding the connection to the TAK server can be accessed from the *Home* screen, by pressing "Info" (1).

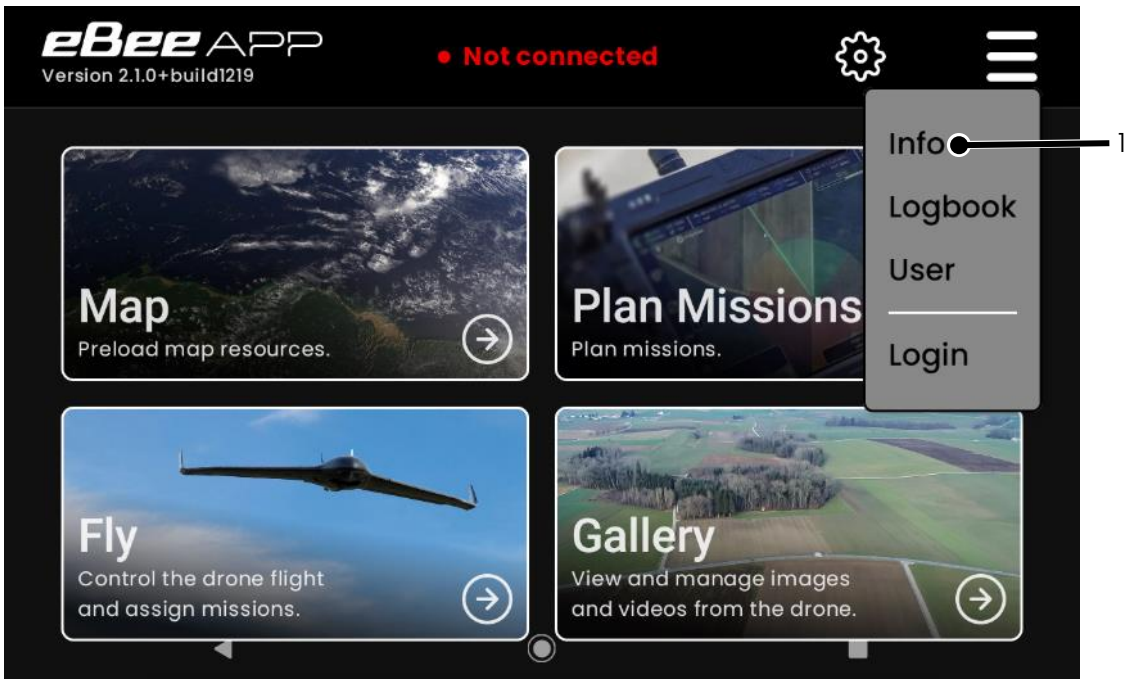


Figure 3-103 Accessing the information panel

And then (1) in Figure 3-104.

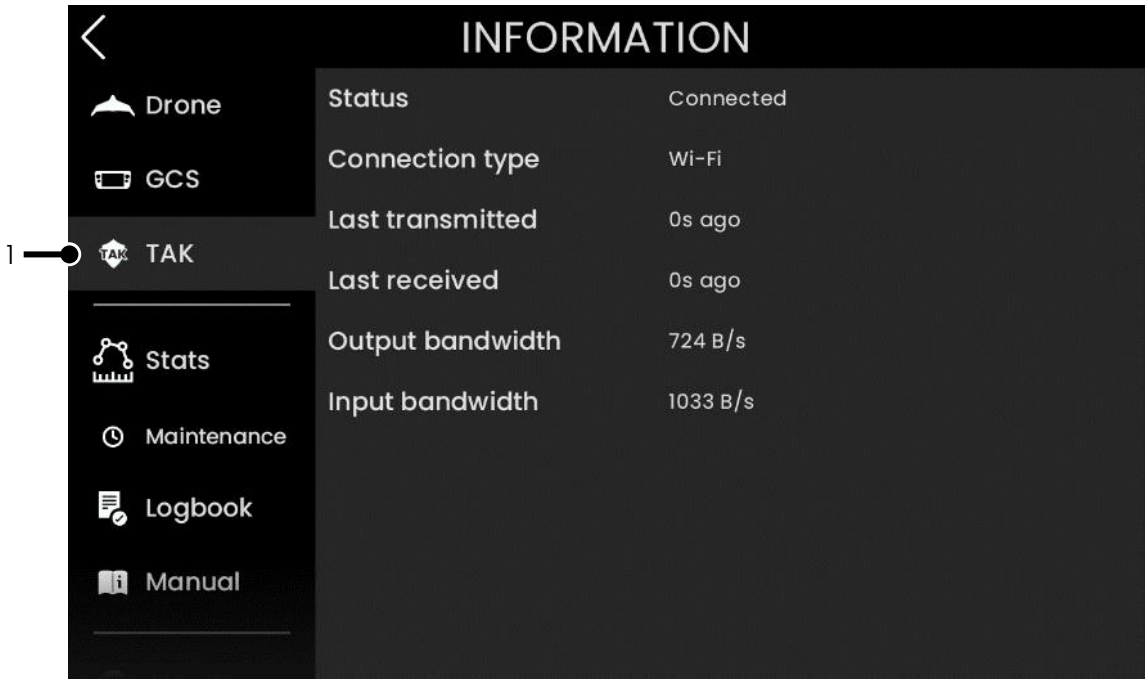


Figure 3-104 TAK information screen

Statistics are only shown if there is an active connection to the TAK sever. If the connection to the TAK server is lost, the GCS will attempt to reconnect to it, with a 5 second delay between each attempt.

3.5.7.2 Sending drone and GCS positions

Once a connection to a TAK server is established, the GCS automatically broadcasts TAK messages for the GCS and drone position (if connected to a drone).
Those markers have the following base properties:

	GCS	Drone
Type (as per *MIL-STD-2525*)	a-f-G-U-C	a-f-A-M-F-Q
Broadcast period	500 ms	
Unique identifier (*used to identify the object in TAK network*)	Per install GCS unique identifier, generated at first launch	Drone serial number
Staleness	30s	
Detail-contact (*to use in exchanges between humans*)	GCS callsign	Drone callsign (fallback to drone serial number if empty)

If the video forwarding RTSP address is configured, then this information is embedded into the drone's messages and broadcasted to the TAK server

3.5.7.3 Receiving other drone positions

All messages typed "a-f-A-M-F-Q" that are broadcasted by the TAK server and received by the GCS are assumed to be friendly UAVs. For each identifier, the latest message content is displayed on the *Fly* screen, as shown below:

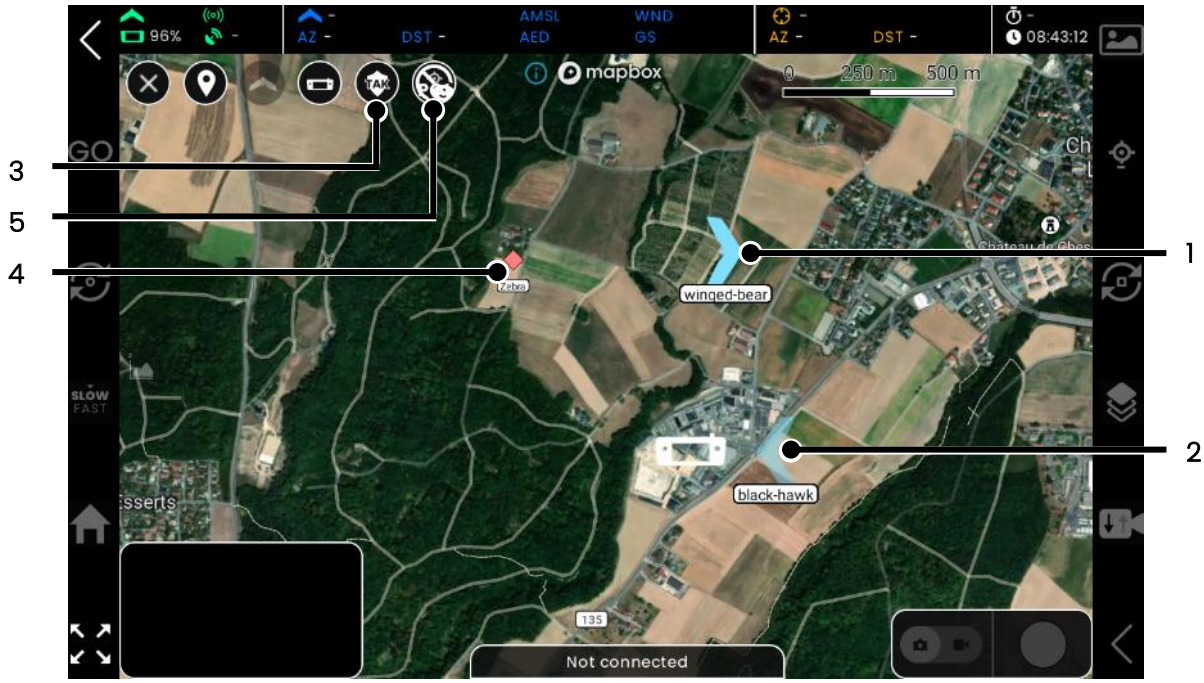


Figure 3-105 TAK data displayed on the map screen

Drones are displayed using the default icon, but with a different color (1) and with their call sign under it. Drones whose information are stale, but not older than 90 seconds are shown with some transparency (2). Drones whose latest message is older than 90 seconds are not shown.
It is possible to hide – show all markers that come from a TAK server using (3).

3.5.7.4 Exchanging ground markers

3.5.7.4.1 Receiving ground markers

From the stream of incoming messages, if a message

- Has a type that starts with a-f-G, a-h-G, a-n-G or a-u-G
- Was human typed (*how* is "h-t") or human generated (h-g-i-g-o)

Then, the application generates a point of interest marker for it on the *Fly* screen, as displayed in (4). By pressing Figure 3-105 (5), it is possible to then engage those points like points of interest that are created within the application, using the point of interest selection and engagement interface (see section 3.3.4.1.3 Points of interest management). If (5) is disabled, then those markers are just visual elements on the map.

3.5.7.4.2 Sending ground markers

All points of interest created within the application are broadcasted automatically to the TAK server. The type of the marker is based on the classification of the point of interest, as shown below.

Figure 3-106 Setting ground markers

Markers are classified as follow:

- Yellow as unknown (1)
- Red as hostile (2)
- Blue as friendly (3)
- Green as Neutral (4)

It is possible to change a marker classification by doing a long press on it to open the menu (5) and selecting the new classification. The markers are broadcasted to the TAK server with the following base properties

	Marker
Type (as per *MIL-STD-2525*)	with a-f-G, a-h-G, a-n-G or a-u-G based on the classification
Broadcast period	5s
Unique identifier	Randomly generated
Staleness	10 minutes
Detail-contact-callsign	Callsign of the GCS + the poi internal index, if the callsign of the GCS is not empty

3.5.7.5 Sending pictures to a TAK server

Pictures that have been downloaded from the drone onto the GCS can be shared to a TAK server. Pictures can be shared to a server from either the local gallery (1) or from the Gallery map (2).

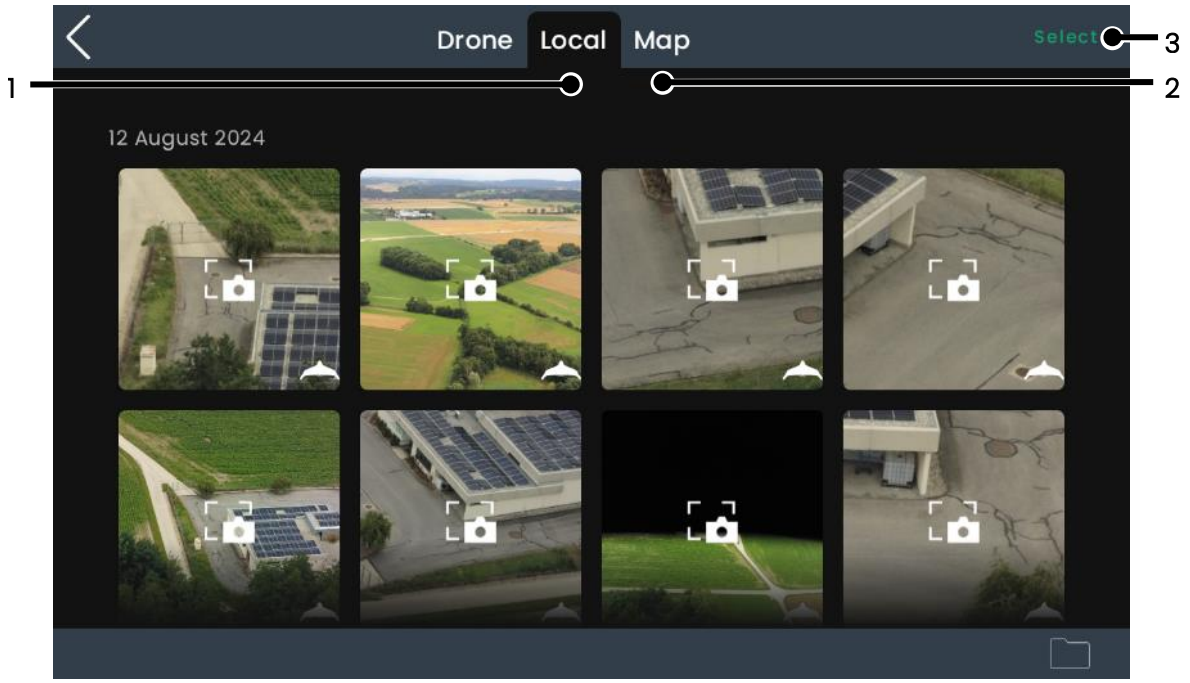


Figure 3-107 Picture gallery menu

3.5.7.5.1 Sharing from local gallery

In the *Local* gallery, press *Select* (3) from above picture to enter selection mode (shown below), then tap on pictures to add it or remove it from the selection. Selected pictures have an orange border (1).

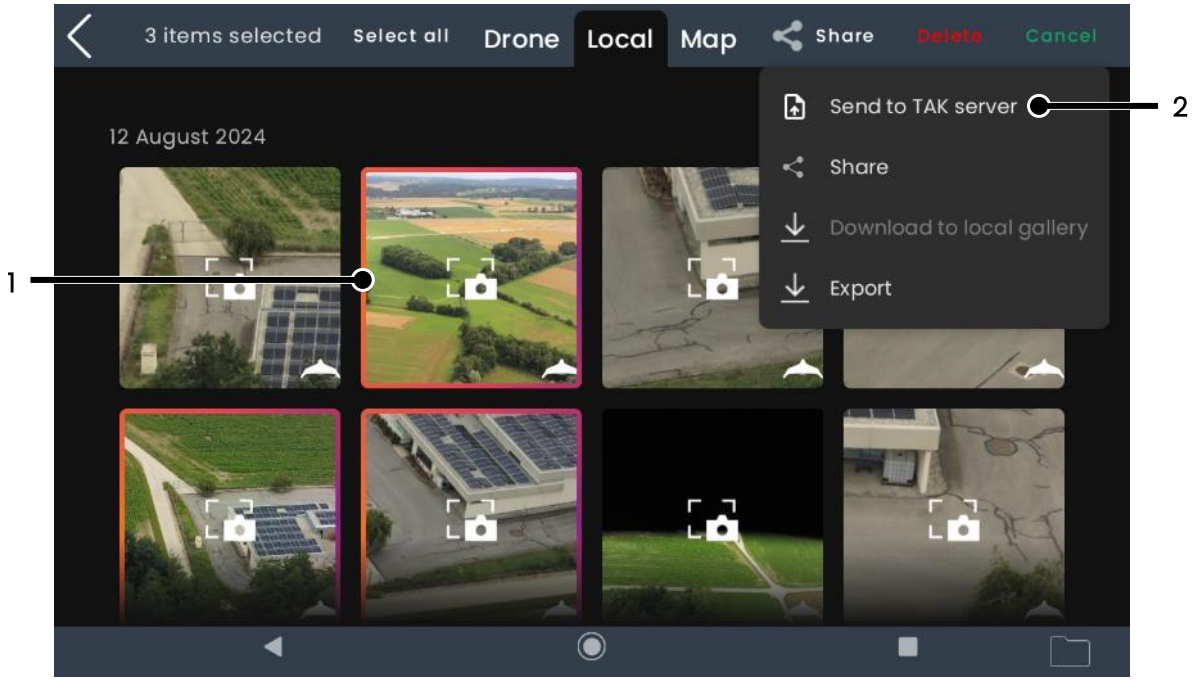


Figure 3-108 Sending pictures to TAK server

Finally press (2) to open the share menu and then press (3) to open the upload mode selection popup, shown below.

There are two available upload modes:

- *One TAK marker per picture*. Each picture will be uploaded individually and located on the map where the picture was taken (1)

- *One TAK marker for the whole group*. All pictures will be on the same TAK marker. If there is a point of interest selected then that the marker location will be used, if not then the average of the pictures' locations will be used (2)

The default (randomly generated) name of the file to send is shown in (3) and can be edited. Finally, press (4) to send the pictures. The *send* button is disabled if there is no connection to a TAK server. It is also possible to press (5) to cancel, in which case, the selection is cleared.

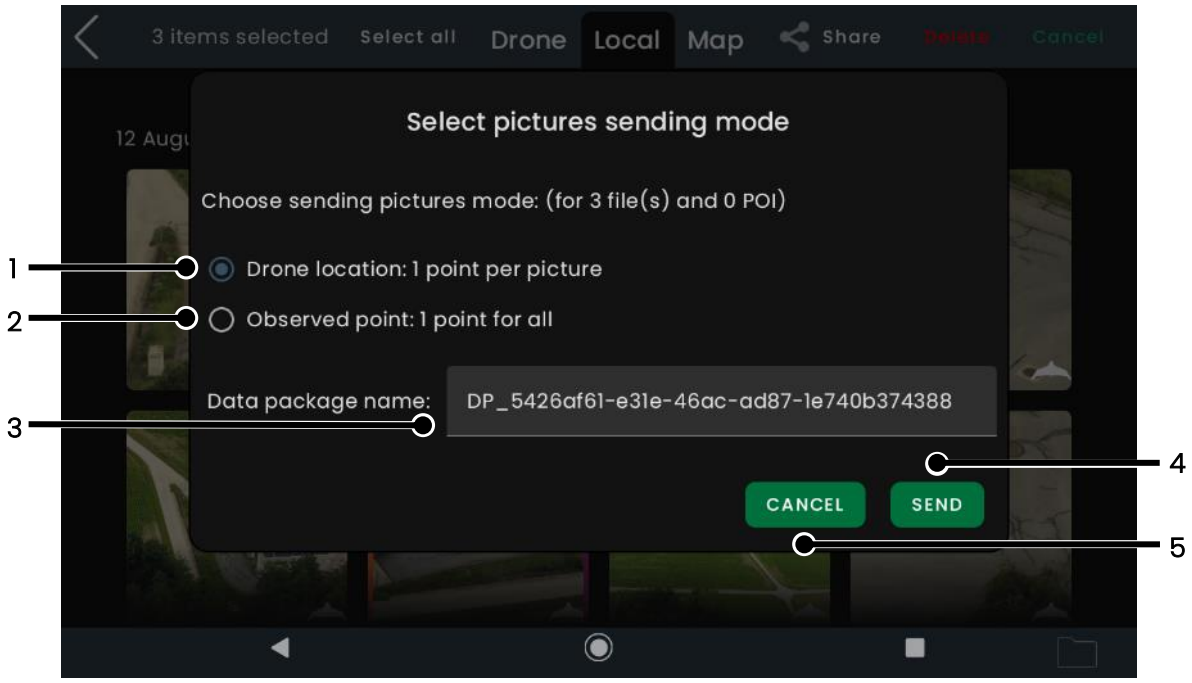


Figure 3-109 TAK sending picture

In case of confirmation, the upload progress is displayed in the following popup. It's possible to cancel the upload by pressing (1).

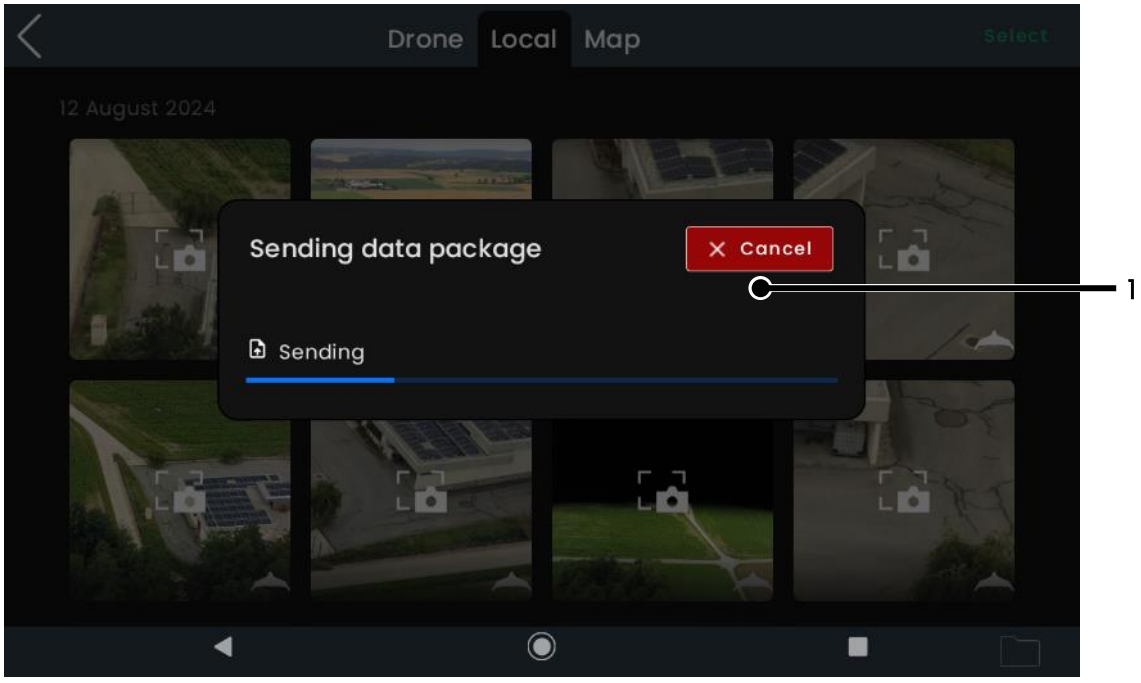


Figure 3-110 Sending data notification

If the upload is successful, the progress bar turns green, otherwise it turns red, and in both cases, auto closes after 2 seconds.

3.5.7.5.2 Sharing from the *Gallery's map*

The *Gallery's map* displays the pictures that have been locally downloaded on the GCS on the map, based on where the picture was taken. Pictures are automatically clustered, as shown below. To enter selection mode, press *Select* (1).

Once in selection mode, to select a whole cluster, do long press on a cluster. Once selected, the cluster has an orange border (1) and the number of elements selected is updated (2).

In selection mode, it is possible to add or remove individual pictures by simply tapping on them. Individual pictures that are selected also have an orange border as well (3).

To add a POI to the selection of elements to send, simply tap on the point of interested once in *Selection mode*. Points of interest that are selected for TAK sharing have the same orange border.

It is also possible to select all pictures by pressing (7).

To share the selected pictures, press either (4) or open the top *Share* (5) menu and then press *Share to TAK server*, then follow the same procedure as the previous section.

To exit the selection process, press (8). This action clears the selection.

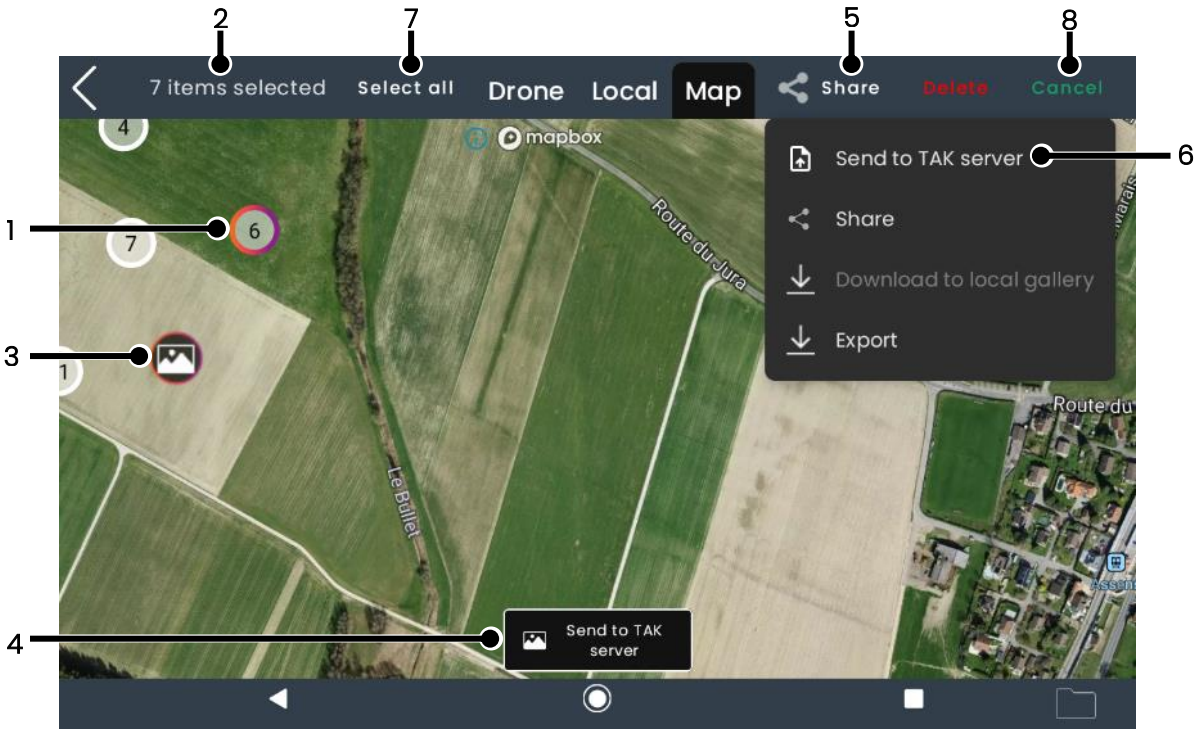


Figure 3-111 Gallery's map screen

It is also possible to enter the selection mode by doing a long press on a single image and the pressing (1) on the contextual menu. The menu also offers access to a quick preview of the image (2). To close the contextual menu, simply tap anywhere on the map.

Figure 3-112 Image preview options on gallery's map screen

3.5.7.5.3 Sharing from the Gallery's image viewer

Pictures can also be shared individually from the image viewer, by opening the share menu (1) then (2).

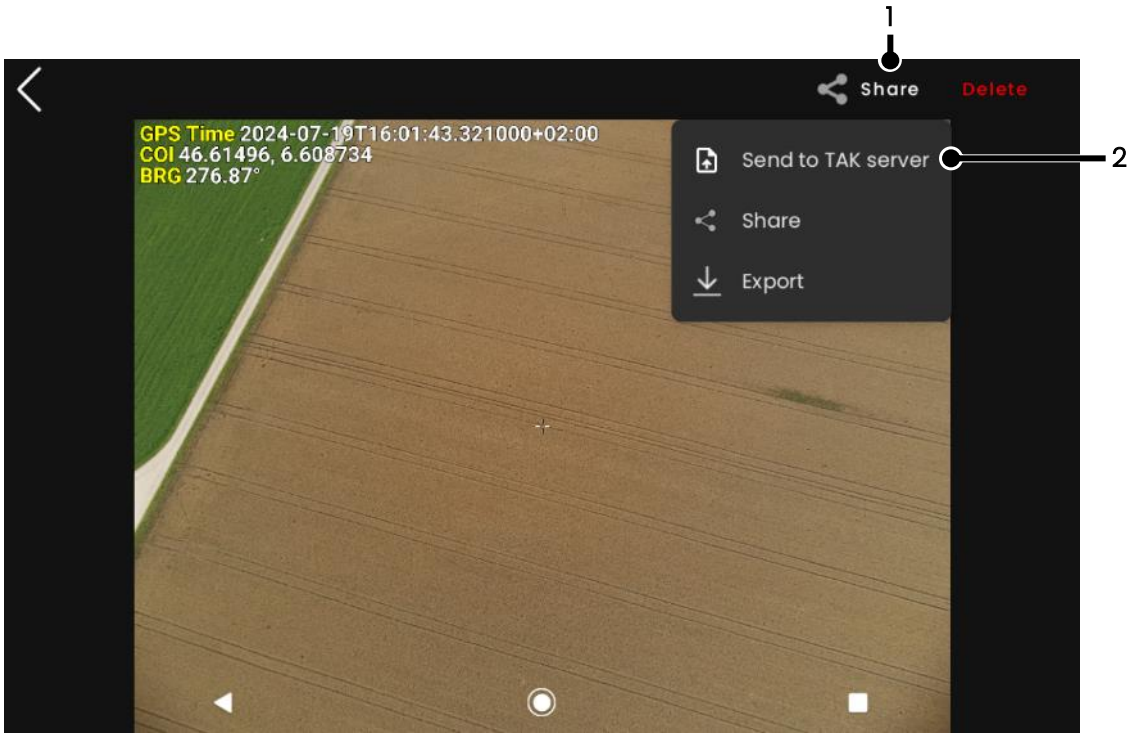


Figure 3-113 Sharing from image viewer screen

When images are shared that way, only the file name can be chosen. The picture that is shared is the original picture and does not have the top left overlay.

3.5.8 Regulation

3.5.8.1 Remote Identification

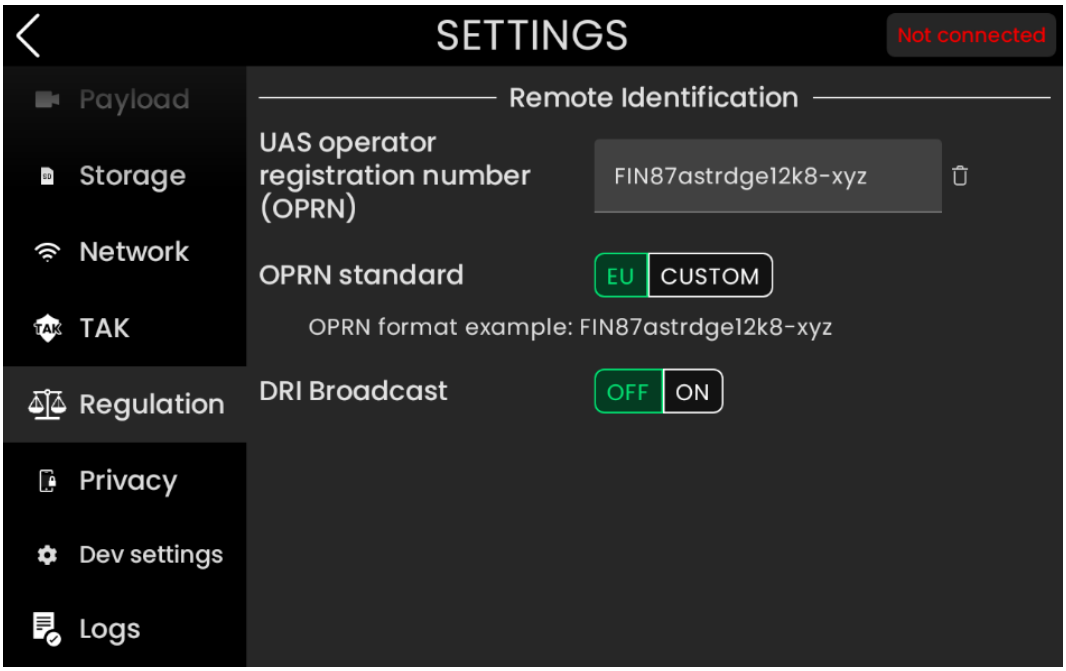
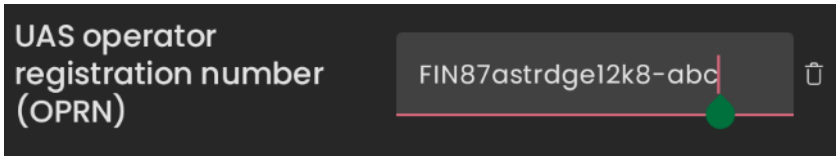


Figure 3-114 Regulation settings screen

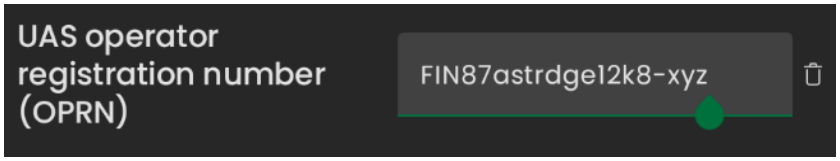
- **UAS operator registration number (OPRN)**: your OPRN provided by your National Aviation Authority.
- **OPRN standard:** choose between *EU* regulations or *Custom*. *EU* follows a strict OPRN pattern while *Custom* accepts everything. It is **your responsibility to properly configure this according to your situation and the local regulation you are subjected to.**
- **DRI Broadcast:** select if the Remote Identification should be broadcast by the drone or not.

The OPRN is checked while you are typing and will be underlined red until it becomes valid. At this moment, the underline turns green.

Invalid OPRN



Valid OPRN



	Note
	• To be able to broadcast, you need to have set a valid OPRN. • You can check the status of the broadcasting in the Drone Information page (ref) under Direct Remote ID section • If the drone is sold to you as C2 compliant, you won't be able to disable the broadcasting

3.5.9 Privacy

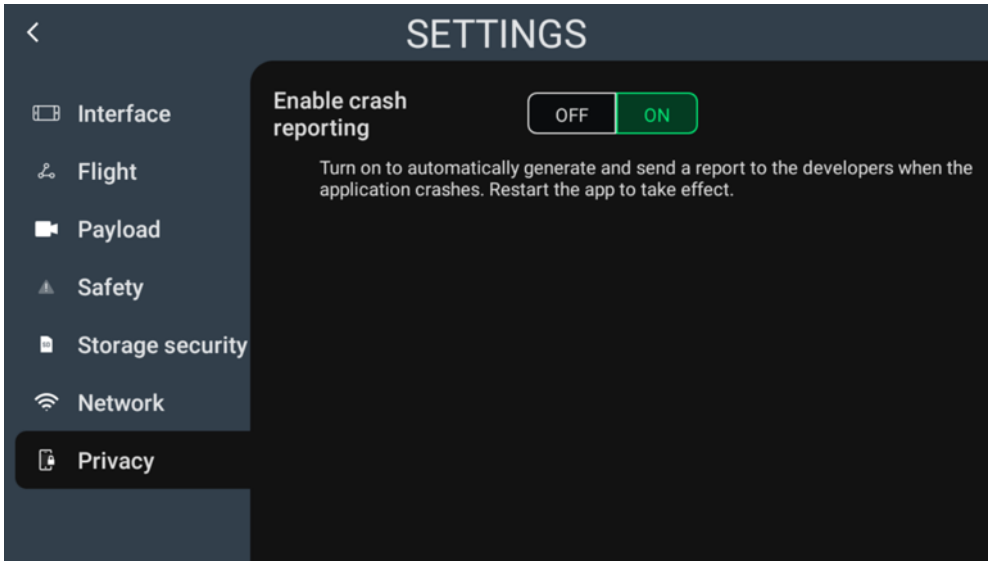


Figure 3-115 Privacy settings screen

- **Crash reporting**: if enabled, a report will be sent to the developers when the application crashes.

3.6 Information Menu

The information menu is accessible from the *Home* screen by pressing (1), (2) or (3), which will respectively open the drone information, logbook, or User information panel.

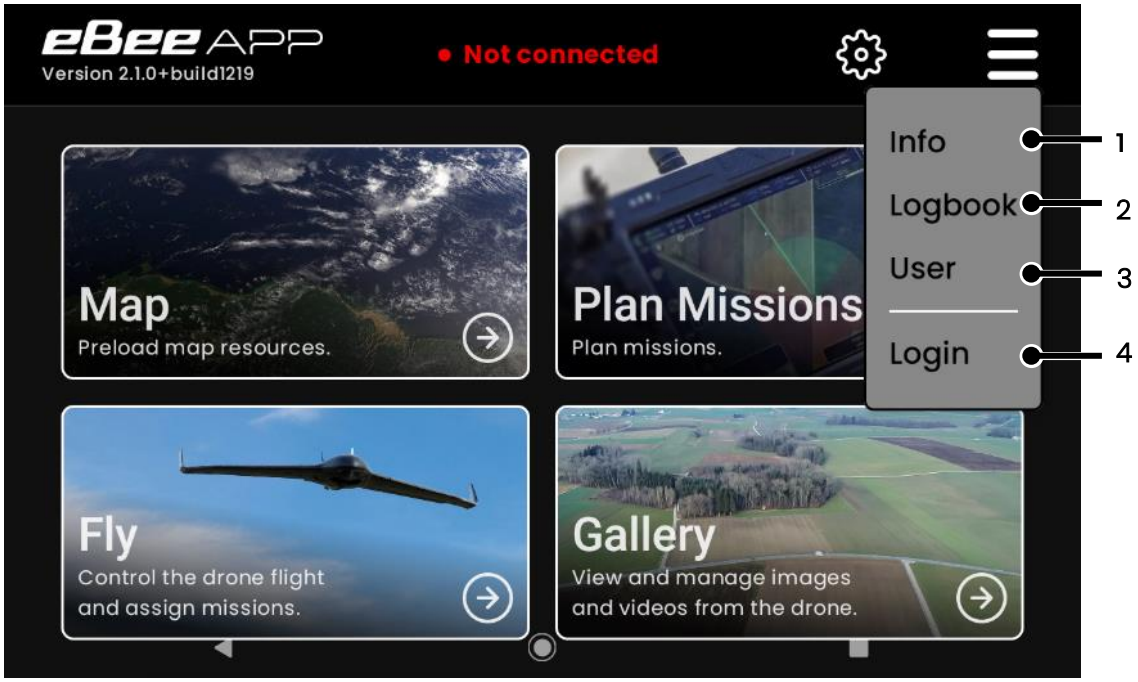


Figure 3-116 Information menu description

3.6.1 General information

The general information panels are grouped in the first three sections **Drone**, **GCS** and **TAK**. The information available is summarized in the table below

Menu	Available information	Comments
Drone section		Required to be connected to a drone
General	firmware version	
	serial number	
	hardware version	
	log name	
	Features	List optional features, see below for more information
Remote ID	Wi-Fi RID status	Tells if it is broadcasting, disabled or if there's an error
	OPRN	
Battery	battery serial number	
	battery cycle count	
GCS section		
	Software version	
TAK section		
	TAK connection status, last transition and reception, bandwidth usage	See section 3.5.7 TAK for more information

3.6.2 Optional features

There is currently one optional feature on the eBee VISION, the ability to setup the Drone Remote ID.

Every time the GCS is connected to the internet, it will connect to drone manufacturer's servers to refresh the list of features for all the drones it has ever been connected to. Once connected to a specific drone, it updates the list of optional features for that drone,

3.6.3 Stats

The *Stats* section displays metrics gathered from the drone while connected to the GCS.
The list is summarized below

Metrics	Comment
Flight	
Flight time	Cumulated flight time since manufacture
Flight counts	Cumulated flight count since manufacture
Peripheral Power Time	
Motor	Cumulated powered time in hours
Servo left	Cumulated powered time in hours. Between 230-250 hours, it's shown in yellow and should be replaced. More than 250 hours, it's shown in red and should be replaced immediately
Servo right	

3.6.4 Logbook

This section displays an entry for each flight that was operated with this GCS. For each entry, the logbook displays:

- The drone's serial number 4 last characters
- The flight ID
- The take-off time
- The landing time
- The duration

It is not possible to export logbook data.

3.6.5 User manual

It is possible to open a PDF version of the user manual by pressing (1), as shown below. The name of the file currently imported is shown in (2)

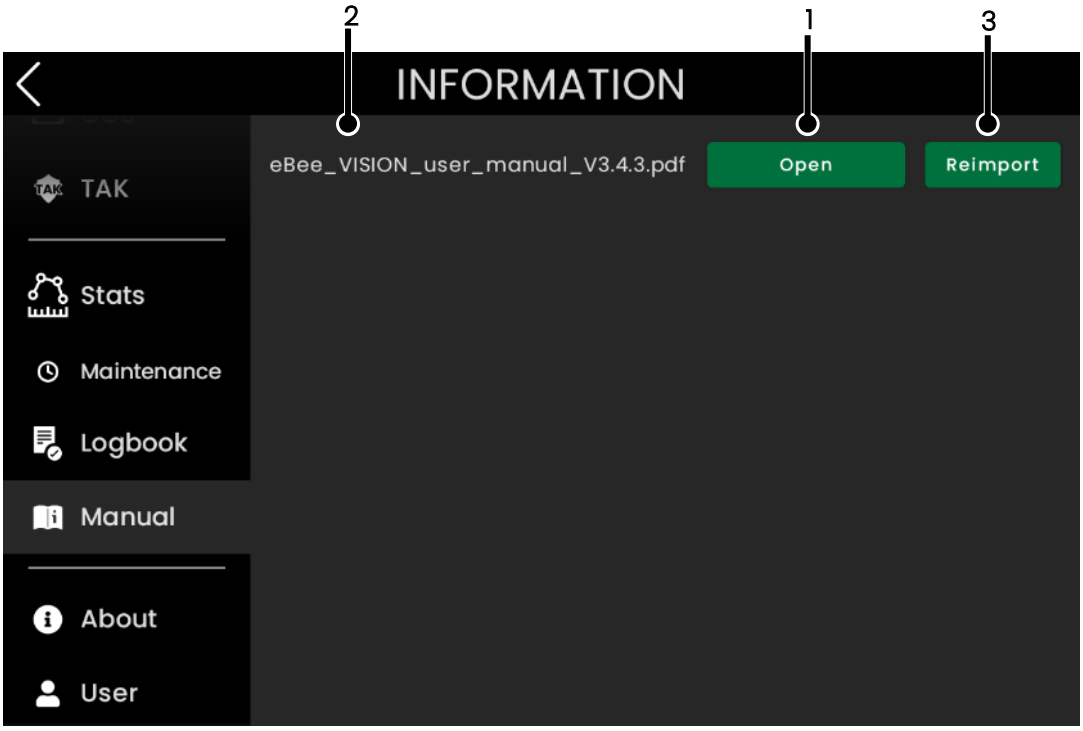


Figure 3-117 User manual screen

If the manual is missing (for instance, after erasing all the application storage), then the name in (2) is empty, and the *Open* button (1) is disabled.
To re-import the manual, first copy the user manual to the GCS using a USB stick, then press (3). This will open the Android file picker. Navigate to the location of the file, and then select the file by tapping it.

ⓘ	Note
• *The application does not do any check regarding the file you import.*	

3.6.6 About

This section lists the open-source libraries that were used for building the application and their licenses.

3.6.7 User

If the GCS is connected to the internet, and one is logged into your senseFly account, this section shows the information related to the associated account.

To log in into your account, from the *Home* screen, press *Login* (4) from Figure 3-116. This opens the default internet browser of the device on account.sensefly.com. Enter your credentials and you should be brought back to the application. To logout, open the same menu and press logout.

4 Operating eBee VISION

4.1 Power ON/OFF the drone

4.1.1 Power ON the drone

- Insert the SD Card if onboard video recording is desired
- Assemble the drone as described at section 2.1 Drone
- Press and hold the ON/OFF button for 2 seconds, until the LED starts blinking blue
- Place the drone on a level surface
- The drone should be placed away from obstacles blocking the view of the sky, to receive a full GNSS radio signal
- In hot weather conditions, if the drone is not being launched immediately, avoid exposing it to direct sunlight until it's ready for take-off, if possible.
- The drone should be placed away from massive metallic masses (e.g. reinforcing steel bars in concrete grounds), to reduce interference with the onboard magnetometer
- The drone LED will turn solid blue once the power-on self-test succeeds (please check for any related information message on the GCS)
- The drone LED will turn solid green once the drone is ready for take-off (which requires the GCS to be connected and the GNSS receiver to finish acquiring its position)

	Note
• The radio link to the GCS is fully initialized about 60 seconds after powering up the drone.	

4.1.2 Power OFF the drone

- Press the ON/OFF button once. Do not hold the button.
- The LED will blink white for a second and then turn off
- You can then proceed to disassembling the drone

	Warning
• If, and only if, pressing the ON/OFF button once does not work, pressing and holding it for ten seconds will force the drone's main electronic board to power down. Some recorded data might be lost when doing so (e.g. the latest taken picture/recorded video) The wings' control surfaces may rotate to 45 degrees as the backup autopilot reacts to a loss of power in the main autopilot.	

	Warning
• Removing the battery without first powering down the drone is highly discouraged. Some recorded data might be lost when doing so (e.g. the latest taken picture/recorded video)	

4.2 Flight modes

4.2.1 Take-off

⚠	Warning
• Always keep the propeller area free during the take-off procedure. • Propeller will reach 11000 rpm once launch has been detected, operate with caution.	

eBee VISION take-off procedure is triggered by the shake-shake motion (see section 4.2.1.3 Perform "shake-shake") and composed of the following steps:

- Motor start at low speed
- Payload calibration & control surface deflection
- Motor ramp-up
- Hand launch
- Speed-up
- Initial climb

At the end of the initial climb eBee VISION performs a hold and waits for user instructions. Depending on wind conditions and quality of the hand launch, it will take approximately 100m / 328ft for eBee VISION to finish the initial climb.

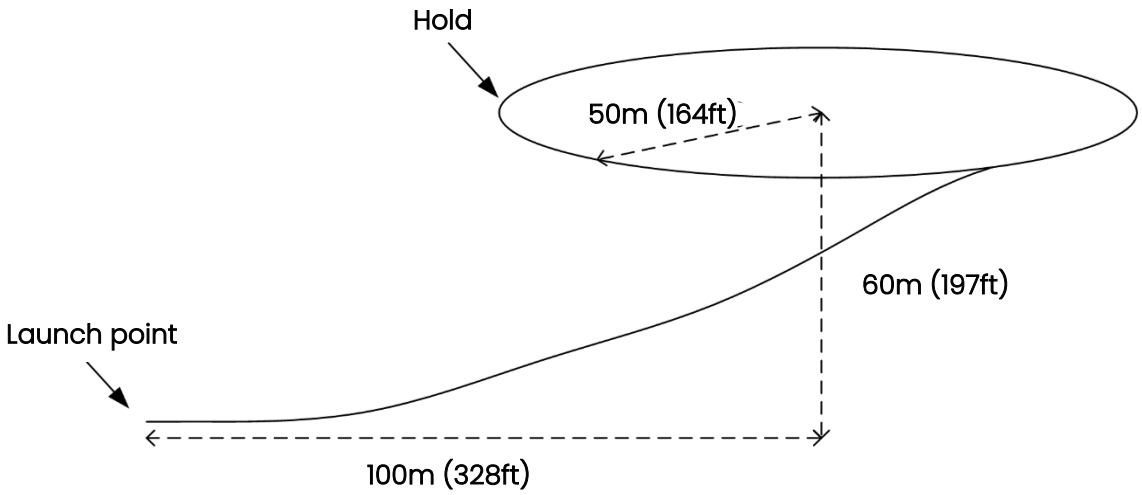


Figure 4-1 Take off flight path

ⓘ	Note
• Climb direction is deduced from hand launch motion.	

⚠	Warning

Make sure that the climb path is free of obstacles. In case eBee VISION detects an imminent impact, it will abort the take-off.

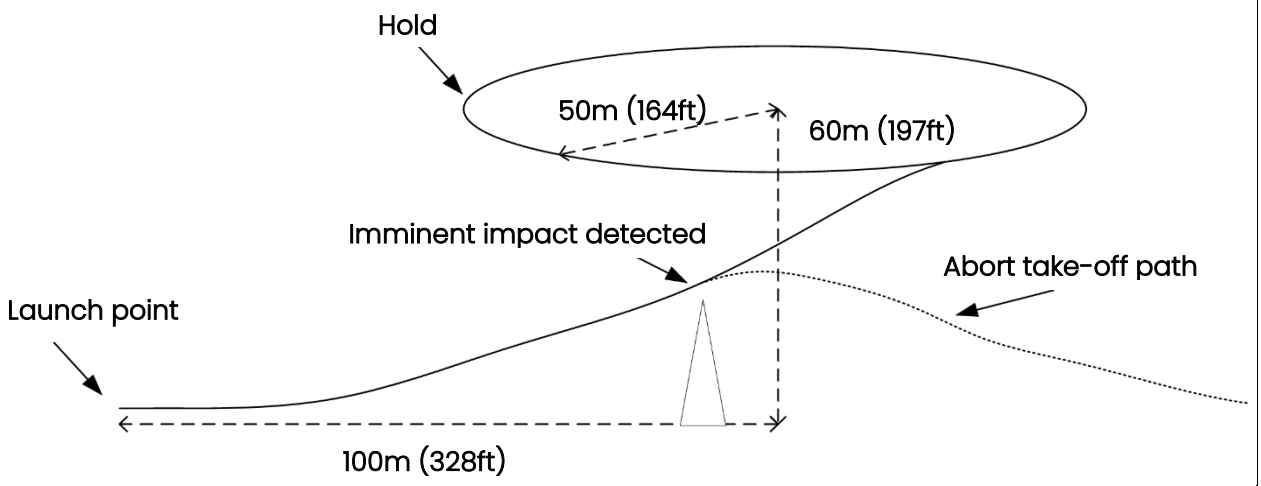


Figure 4-2 Take-off abort procedure

Users can turn off this behavior by disabling the ground sensor. See section 3.5.3.2.5 Ground distance sensor

4.2.1.1 Pre-flight inspection

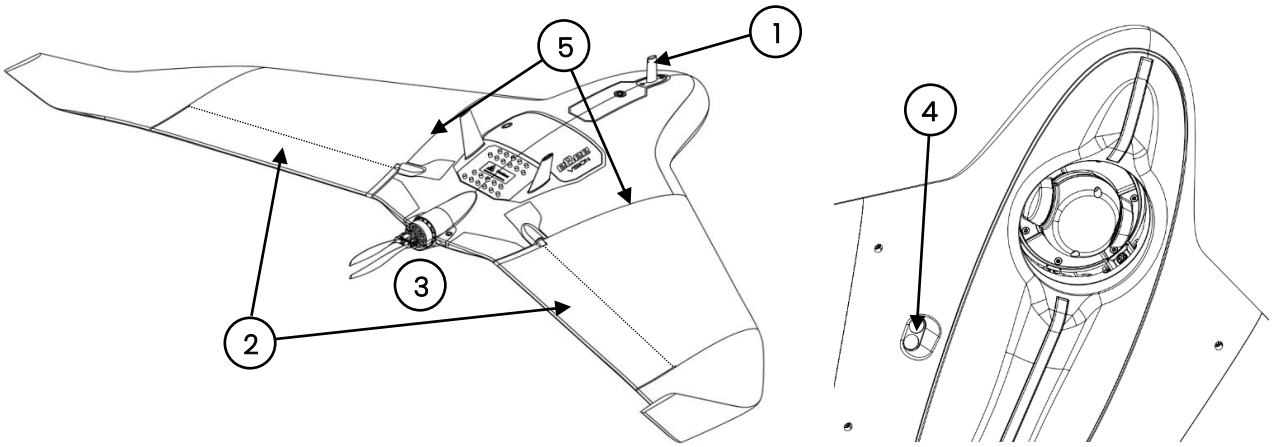


Figure 4-3 Preflight inspection protocol

1. Ensure that the pitot probe is securely fastened and that its holes are free from obstructions. See section 6.1 Replacing pitot tube for replacement instructions.
2. Check that the control surfaces (elevons) can move freely by gently moving them manually.
3. Verify that the propeller is undamaged. See section 6.2 Replacing propeller for replacement instructions.
4. Ensure that the ground sensor is clean. If necessary, clean it with a damp cloth.
5. Check that the wings are clipped all the way and stay flush with the body.

4.2.1.2 Take-off procedure

1. Check the wind direction and position yourself accordingly. Always launch aircraft into the wind.

Figure 4-4 Preflight position

2. Perform "shake-shake", motor will start spinning.
3. Visually check the payload calibration and control surfaces motion.

Figure 4-5 Payload inspection

4. Once the payload is retracted and the motor is at full speed, perform hand launch.

Figure 4-6 Typical hand launch procedure

	Note
• Take-off procedure can be interrupted by making another shake-shake motion. • The payload is retracted during take-off. • The user is not allowed to deploy payload during take-off to prevent damage to the payload.	

4.2.1.3 Perform “shake-shake”

To perform a shake-shake, hold eBee VISION horizontally and move it back and forth 3 times in approximately 3s.
The recommended position for the shake-shake is as it allows to safely check the control surfaces motion and payload calibration.

shake-shake visual control

ⓘ	Note
• Shake-shake can also be used to interrupt the take-off procedure. • Performing a shake-shake does not require strength.	

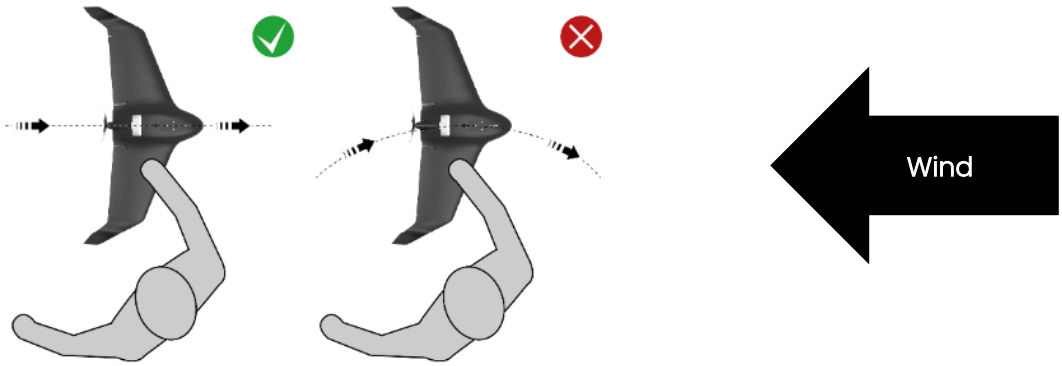
4.2.1.4 Perform hand-launch

There are many ways to perform a successful hand-launch.
The most typical way is to hold the eBee VISION between the body and the middle of the wing.
Position yourself so your back is facing the launch direction.
Launch the eBee VISION in a straight motion slightly upward.

Figure 4-7 Typical hand launch procedure

ⓘ	Note

- The most common mistake is to try to launch with too much strength. eBee VISION does not require a lot of strength to take-off.
- Focus on launching eBee VISION as straight as possible.



For some users it is easier to perform a two-hand launch as it requires less hand strength and reduces the possibility to induce yaw motion during launch.

Shake-shake visual control

Figure 4-8 Two hand launch procedure

It is also possible to launch eBee VISION from the nose:

Figure 4-9 Nose launch procedure

4.2.2 Flight plan

Flight plan mode is used to have eBee VISION follow a determined path.
To entre flight plan mode select a waypoint by pressing the waypoint cycling button and then activate the selected waypoint.

Figure 4-10 Flight plan activation

Each vertical click on the secondary drone control joystick will increase or decrease the altitude of each waypoint of the flight plan 20m / 65ft.

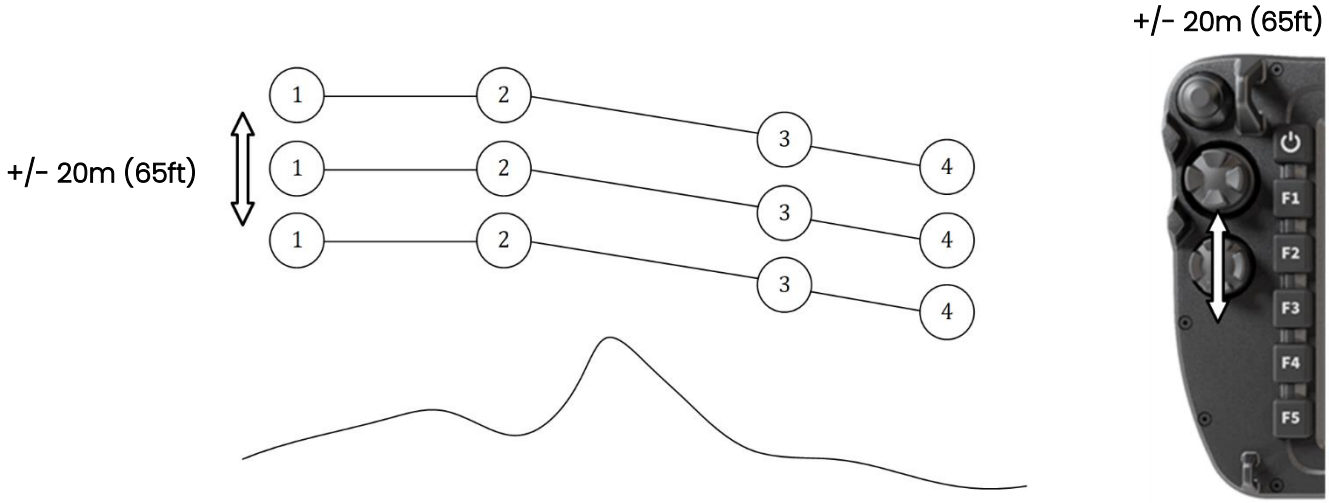


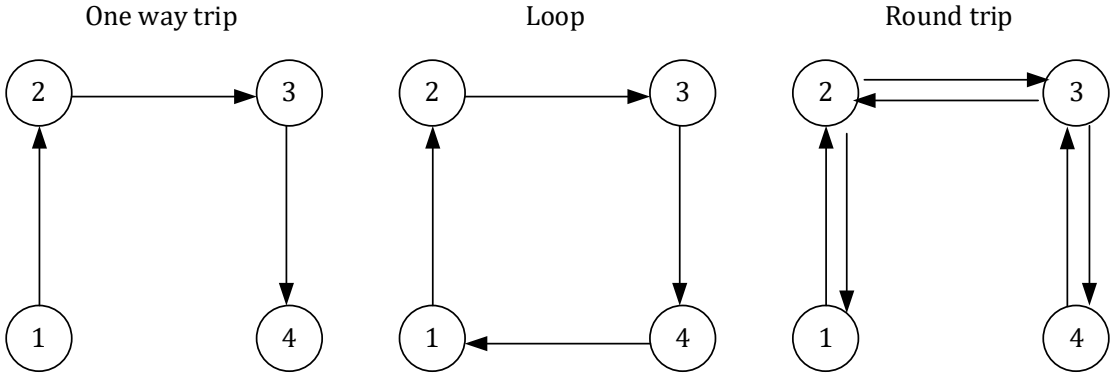
Figure 4-11 Waypoint altitude selection

ⓘ	Note

- After changing the altitude remember to check altitude profile by clicking on the secondary drone control joystick
- Waypoints cannot be pushed below 60m / 197ft above ground.
- Waypoints cannot be pushed above the geofence ceiling if activated

ⓘ	Note

- 3 types of flight plan are available in the flight setting menu.



One way trip: eBee VISION will perform 1-2-3-4 and loiter around waypoint 4 until another mode is triggered.
Loop: eBee VISION will perform 1-2-3-4-1-2- … until another mode is triggered.
Round trip: eBee VISION will perform 1-2-3-4-3-2-1-2- … until another mode is triggered.

4.2.3 Observation

Observation mode is meant to watch a target for a prolonged amount of time.
To enter observation mode press Observation.

Figure 4-12 Triggering observation mode

When Observation is triggered, eBee VISION app will display the observation flight zone on the map. eBee VISION is automatically computing the best trajectory to maintain in sight the current target. The user can then select different POIs or move the line of sight with the gimbal joystick.

There are 3 observations patterns, eBee VISION will automatically decide which one is best fitted based on the observation conditions (wind and distance to target).

4.2.3.1 Close range: circle

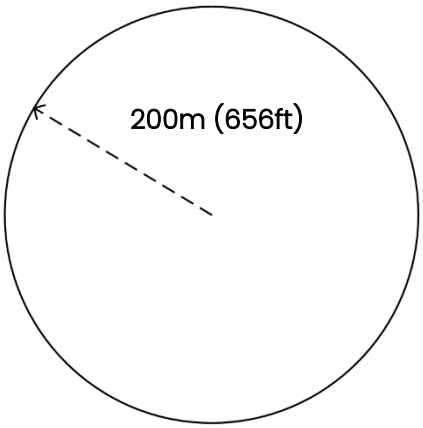


Figure 4-13 Close range circle path

The default radius of the circle is 200m / 656ft. eBee VISION will increase this radius based on current wind conditions.

ⓘ	Note
• For close range observation you may consider scooting mode to get different controls over the eBee VISION trajectory (see section 4.2.4 Scouting)	

4.2.3.2 Long range: 8-shape

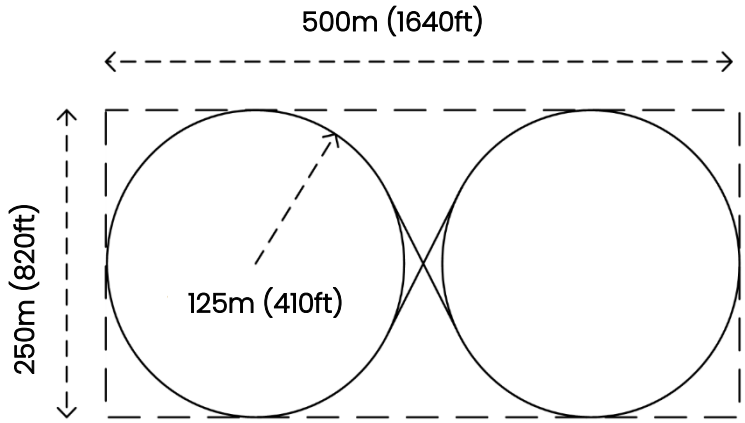


Figure 4-14 Long range 8 shape path

The default 8-shape is approximately 250x500 m^2 / 820x1640 ft^2, its size will vary depending on the wind conditions and distance to target. The 8-shape is designed to keep target in sight without any payload wrapping.

4.2.3.3 Long range: ellipse

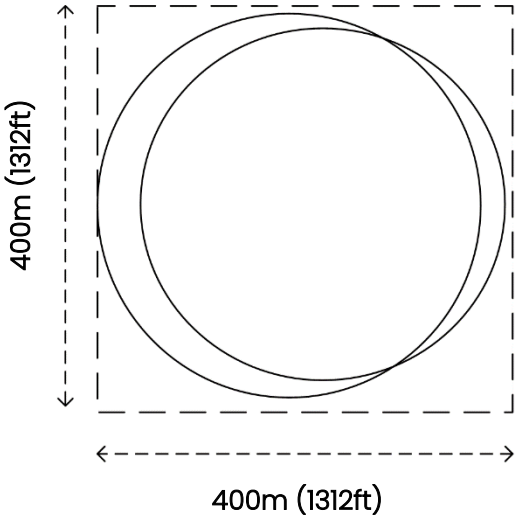


Figure 4-15 Long range ellipse shape

The default ellipse is approximately 400x400 m^2 /1312x1312 ft^2, its size will vary depending on the wind conditions and distance to target. The ellipse is designed to occupy as little area as possible, and that the radius of each circle is adapted to wind conditions so that payload wrapping happens as little as possible.

4.2.3.4 GCS command in observation

Each horizontal click on the secondary drone control joystick will rotate the observation waypoint (and therefore the attached observation flight zone) around the current target with an angle of 45 degrees.

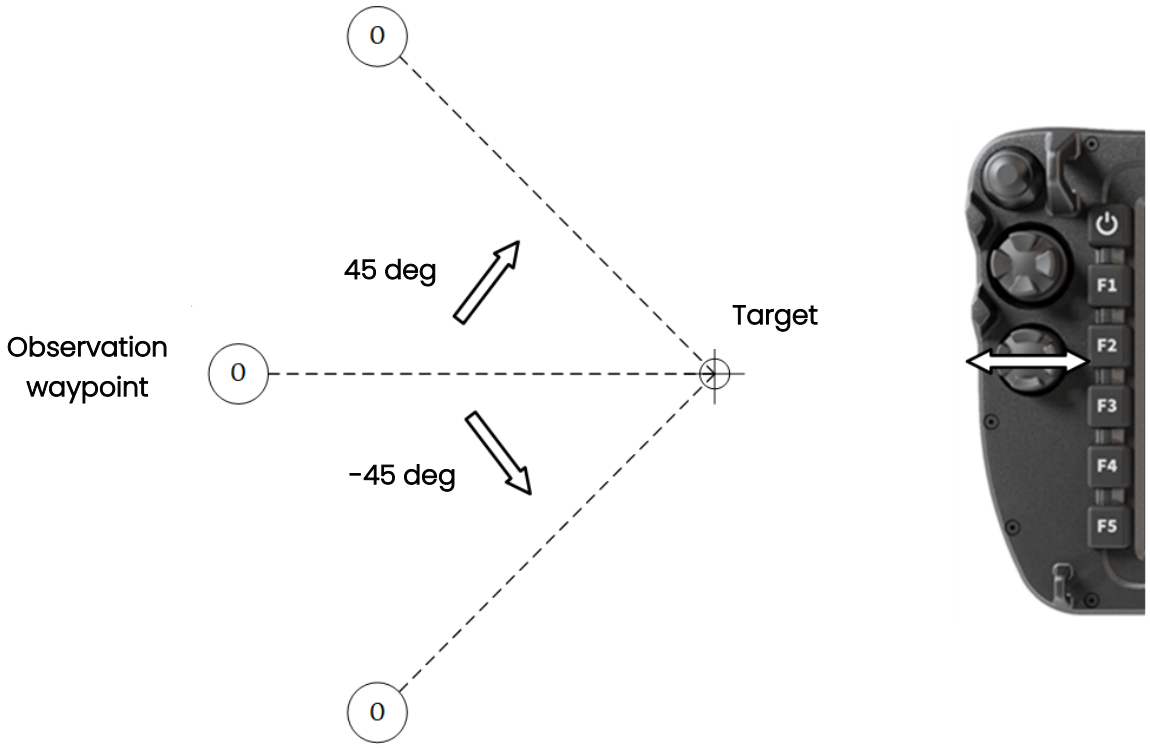


Figure 4-16 Observation waypoint rotation adjustments

ⓘ	Note

- Rotation of the observation waypoint is especially useful to observe different sides of a building from a distance.
- Rotating the observation waypoint will result in a change of the wind conditions and therefore an adaptation of the size of the observation flight zone.
- Depending on the observation distance and wind changing the observation position may take a few minutes.

Each vertical click on the secondary drone control joystick will increase or decrease the observation waypoint's altitude of 20m (65ft.).

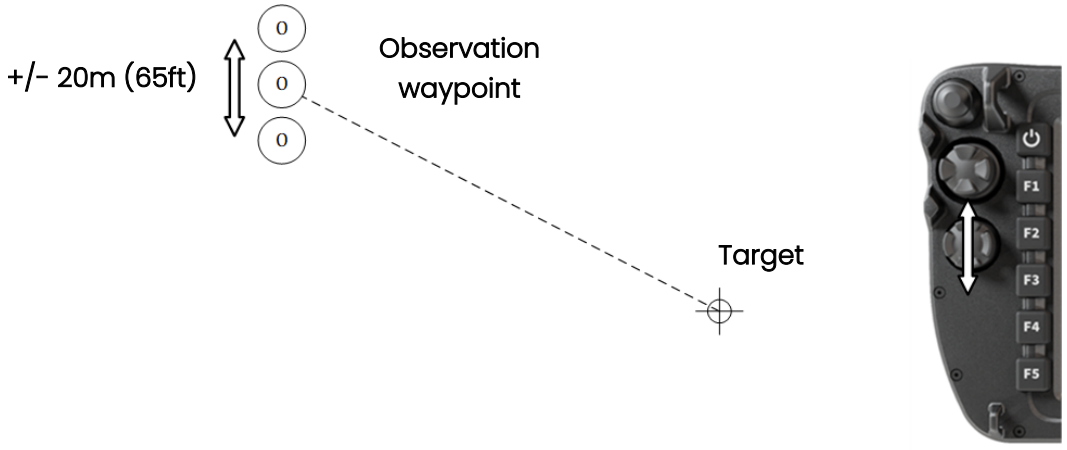


Figure 4-17 Observation waypoint vertical adjustments

ⓘ	Note
• After changing the altitude remember to check altitude profile by clicking on the secondary drone control joystick	

Each push on the distance joystick will increase or decrease the distance between observation waypoint and current target of 50m / 164ft.

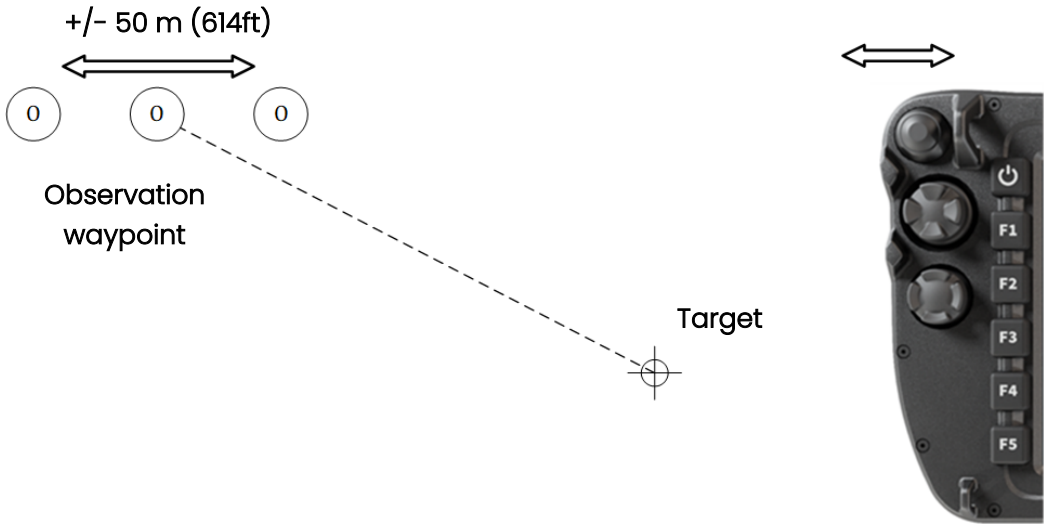
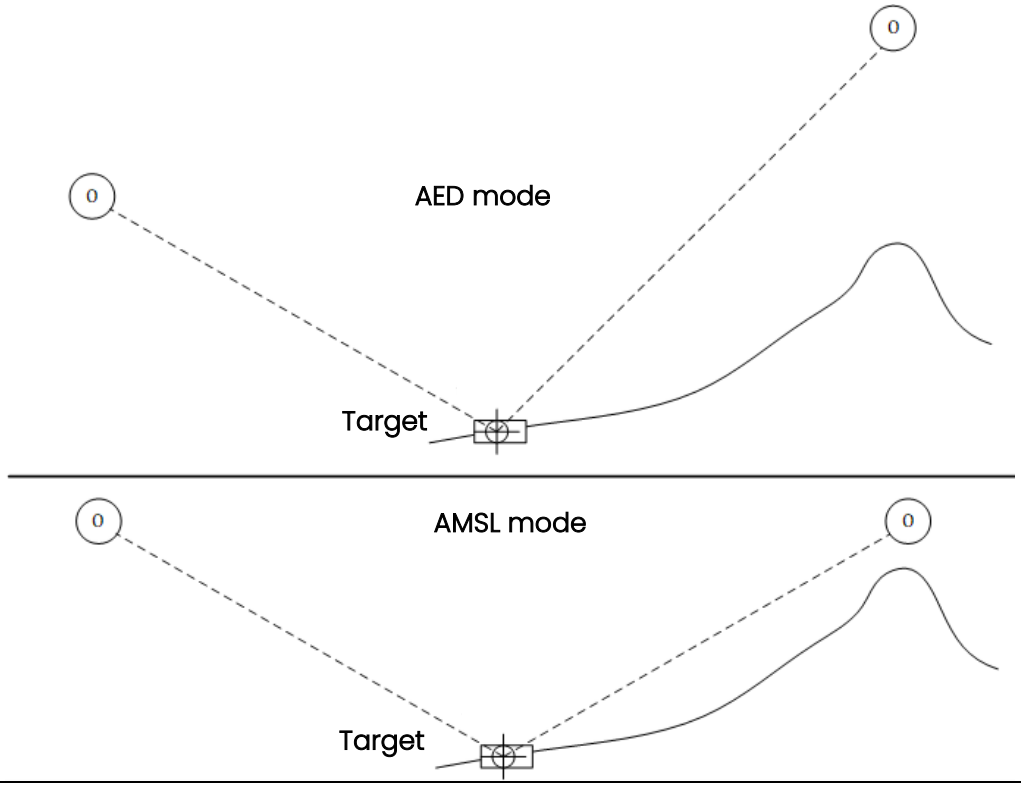


Figure 4-18 Observation waypoint horizontal adjustments

ⓘ	Note

- If zooming is not enough, consider bringing eBee VISION closer to the target.
- Increase the distance between the drone and the target for maximum furtivity.
- Keep in mind that observation mode is affected by altitude mode.



4.2.4 Scouting

Scouting mode is best fitted to explore an area or track a moving target, it also gives very good results for close range observation. To enter scouting mode press scouting.

Figure 4-19 Scouting flight mode button

When Scouting is triggered, eBee VISION will go in the direction of the current target and scouting waypoint is displayed on the map.
Users should use the payload joystick to aim at the desired location and eBee VISION will fly in that direction.

Figure 4-20 Payload aiming adjustments joystick

In case the moving target is too fast, user can use fast mode by pressing the speed button (physical or touch screen).

Figure 4-21 Fast mode toggle button

ⓘ	Note
• Speed button SLOW FAST reflects which speed mode is active. • Keep in mind that going into fast mode will create more noise.	

Each horizontal click on the secondary drone control joystick will switch the rotation direction of the scouting waypoint between clockwise and counterclockwise.

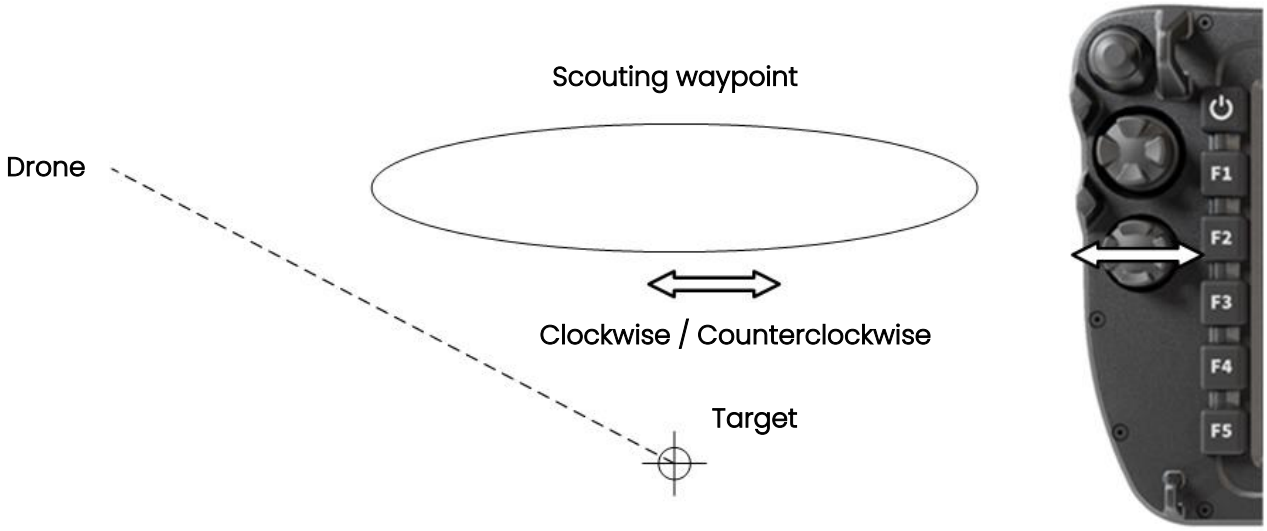


Figure 4-22 Scouting rotation adjustment

Each vertical click on the secondary drone control joystick will increase or decrease the scouting waypoint altitude of 20m / 65ft.

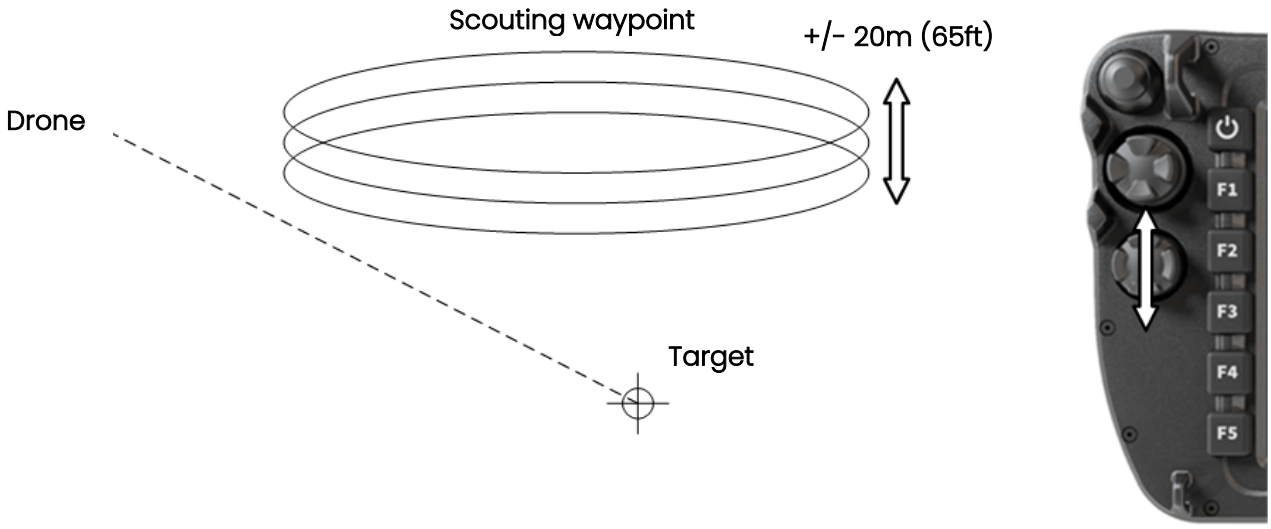


Figure 4-23 Scouting waypoint heigh adjustment

Each push on the distance joystick will increase or decrease the radius of the scouting waypoint by 50m / 164ft.

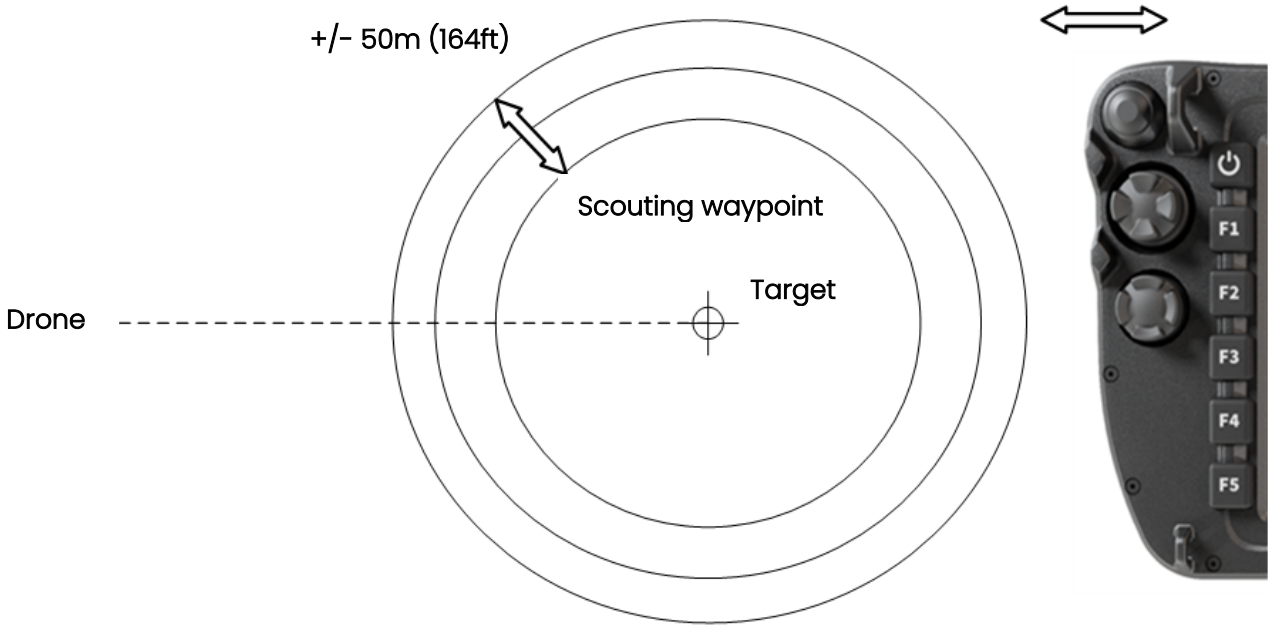
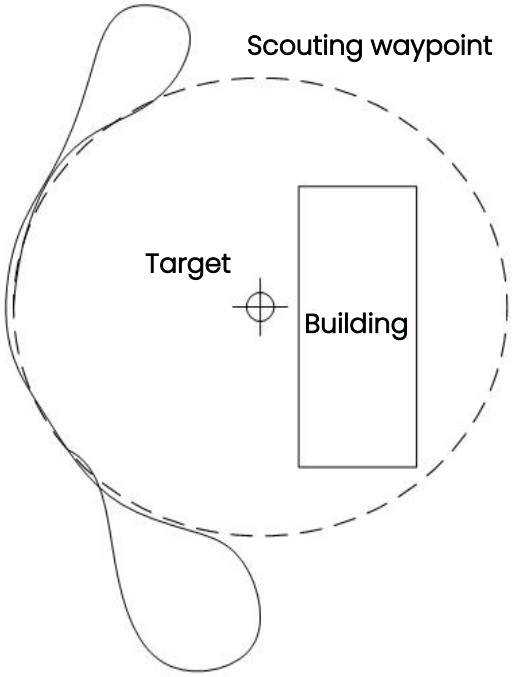
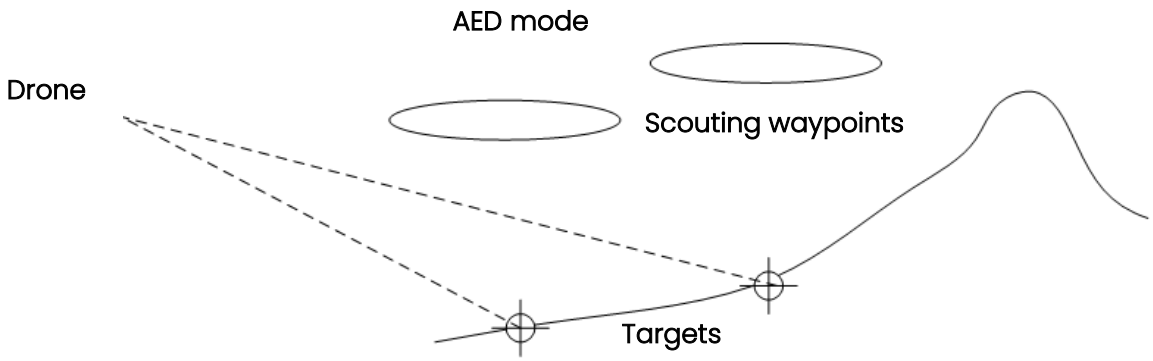


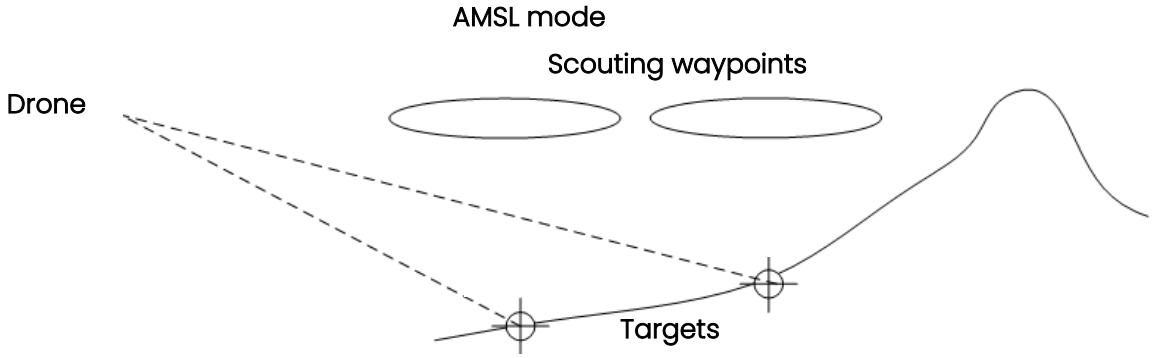
Figure 4-24 Scouting radius adjustment

Note



- Changing rotation direction of scouting may be used to perform arc of circles to avoid blinding due to obstacles like buildings.
- Keep in mind that scouting mode is affected by altitude mode.





4.2.5 Manual

In manual mode, the user takes control of the autopilot. All the flight safety systems are engaged making it extremely easy to pilot eBee VISION. When engaging manual mode, the payload will look in the forward direction to give FPV (first person view) conditions.
The payload state will indicate forward facing in the status bar.
It is not possible to change the orientation of the payload during manual mode to avoid confusion.
Main drone control joystick is used to control eBee VISION:

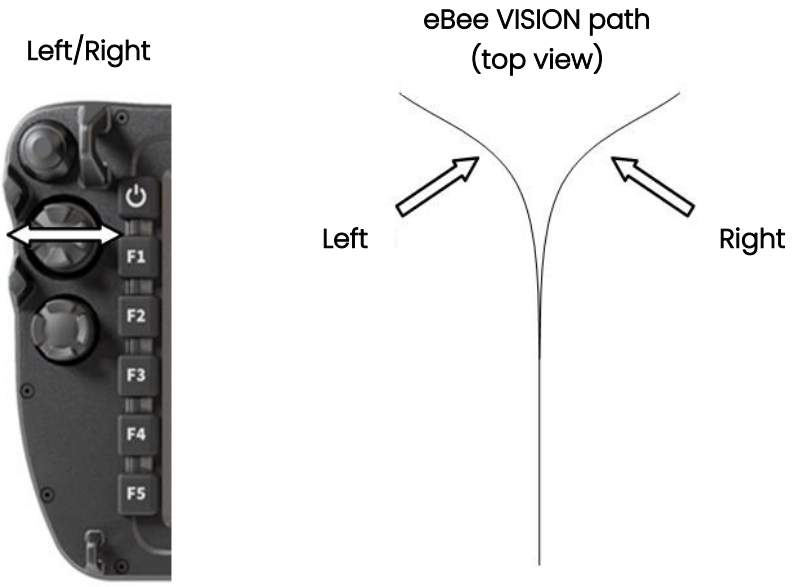


Figure 4-25 eBee VISION heading trajectory control

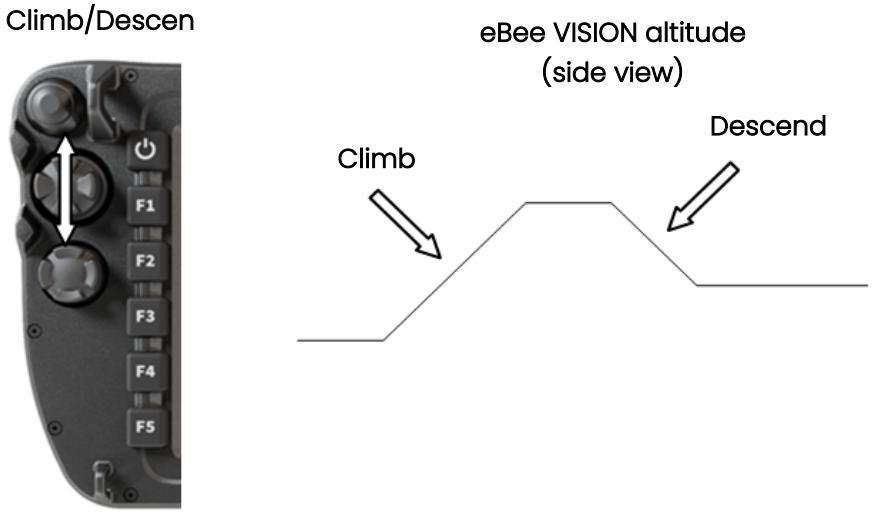


Figure 4-26 eBee VISION altitude trajectory control

ⓘ	Note
User can select the desired reaction on the main drone control joystick in the setting see section 3.5.1 Interface, by default pushing up the joystick is making the eBee VISION climb.	

For fast altitude changes, each click on the secondary drone control joystick will increase or decrease eBee VISION's altitude by 20m / 65ft.

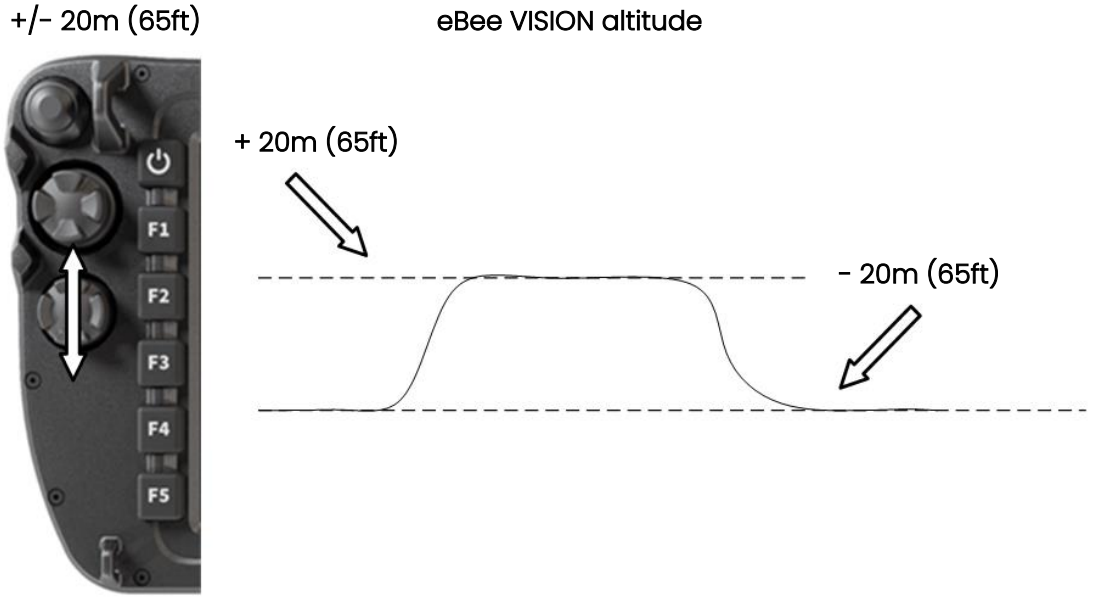
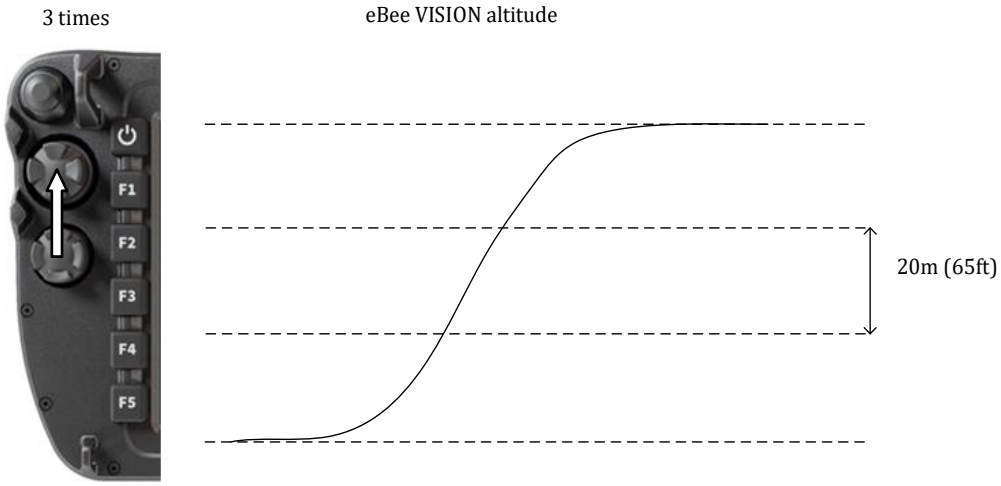


Figure 4-27 27 eBee VISION altitude trajectory incremental adjustment

ⓘ	Note

Pushing the secondary drone control joystick up or down several times will cumulate the altitude steps.



4.2.6 Landing

Landing is initiated by pressing the "Go Land" button (either physical or on the touch screen)

Figure 4-28 Go land button location

The eBee VISION's landing process uses two points: the base waypoint and the landing point.

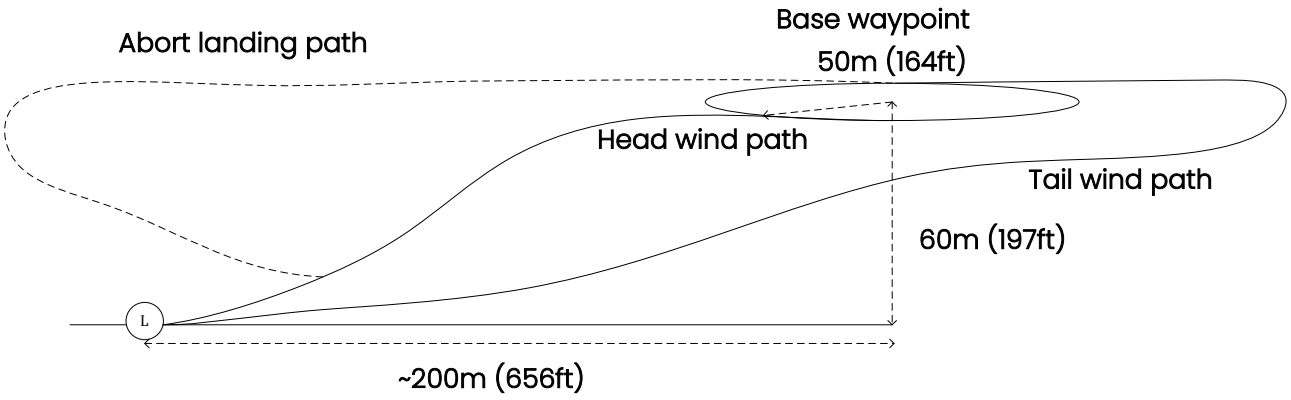


Figure 4-29 eBee VISION landing path

By default, the landing point is positioned at the take-off location. Once the eBee VISION is in flight, the landing point can be moved on the map using the touchscreen. The landing location is represented by the "L" waypoint on the map. When zooming in on the landing location, the display will switch to a detailed view of the landing.

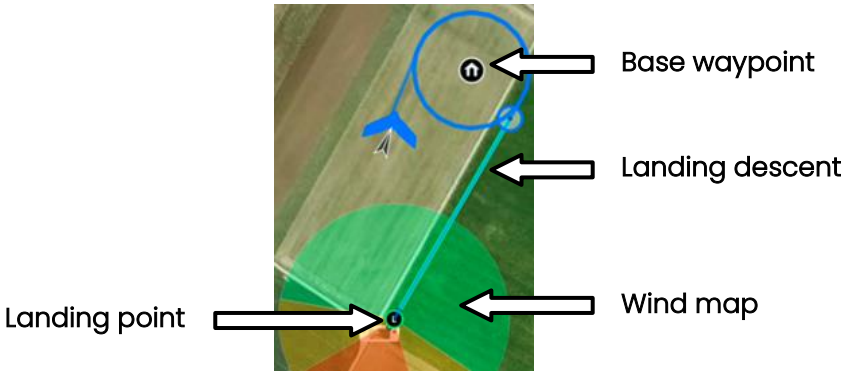


Figure 4-30 Landing path detailed view

The landing process consists of the following steps:

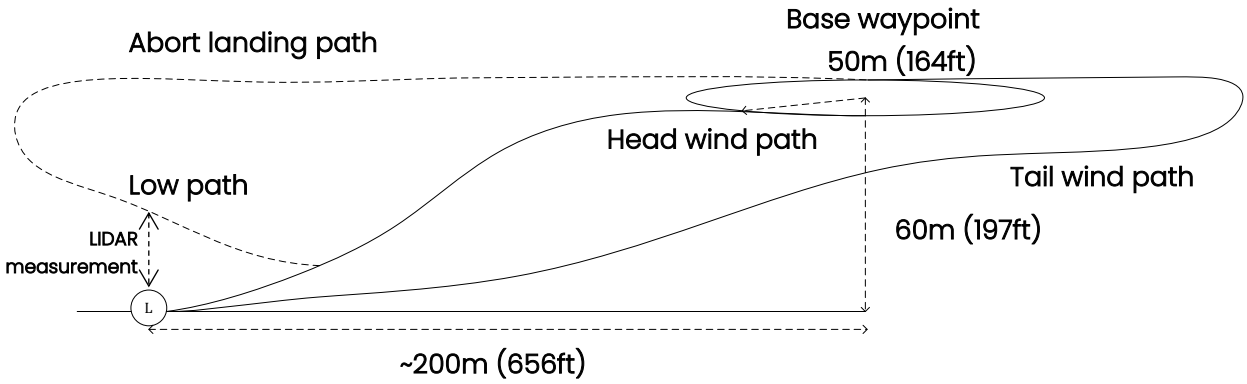
- "Go Land" command is issued.
- The eBee VISION flies in a straight line to the base waypoint.
- The eBee VISION waits for clearance.
- "Clear Landing" command is issued.
- The eBee VISION begins its descent, adjusting for wind conditions.
- The "Abort Landing" command can be used to cancel the landing procedure.
- The eBee VISION lands.

	Note

- Landing clearance gives you time to verify your landing parameters — make good use of it:
  - Check the landing point position and wind condition using the map view.
  - Keep in mind that “Go land” command is influenced by the altitude mode. For more details, see section 3.5.2 Flight

	Note

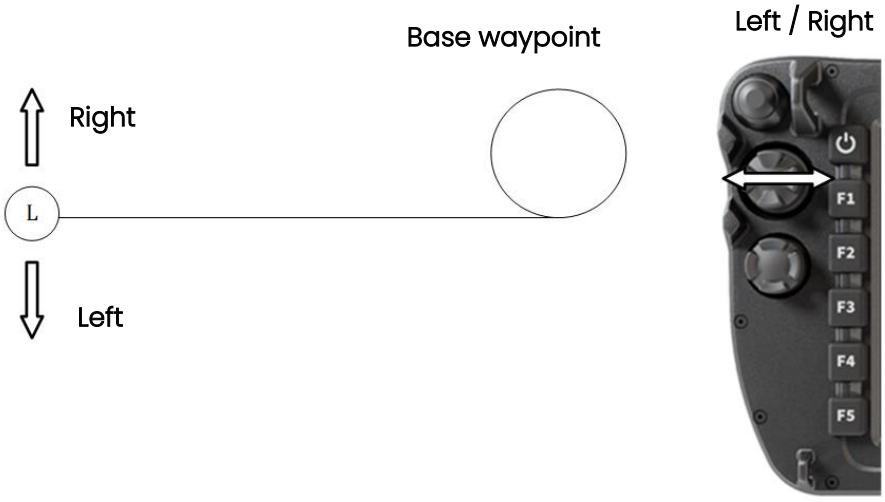
During descent, if the landing point altitude is incorrect, the eBee VISION will perform a low pass. During the low pass, the eBee VISION flies over the landing point to measure it with the ground sensor, climbs again, and returns to the base waypoint to await new clearance.



A low pass is more likely to occur after a long flight due to the accumulation of altitude errors over time. If the landing point location is changed after a low pass, the eBee VISION will perform a second low pass as the landing point altitude may have changed.

ⓘ	Note

During descent, the user can make small adjustments to the landing using the primary drone control joystick.



⚠	Warning

Before clearing landing for eBee VISION:

- Make sure that the landing space is free of obstacles.
- Make sure that eBee VISION will be able to perform a climb in case of abort landing or low pass.

Important: The eBee VISION payload is not designed for landing in sand, dust, or water. Any damage resulting from such landings is not covered under the product warranty. Please ensure that landing surfaces are clear of these materials to maintain the integrity of the drone and its components.

4.2.7 Silent tactical landing

4.2.7.1 Overview

The eBee VISION offers an alternative landing strategy called Silent Tactical Landing (STL). The STL can be used when a fully silent landing is required for discretion, or when the drone lands at an unprepared location where uninvolved people or obstacles could be present. The STL is also the landing strategy applied in case of an emergency that prohibits the use of motor.

The specificities of the STL are

- A descent and touchdown without motor, and
- A low ground speed at impact (below 10 m/s (22 mph)) independent of the wind condition, as the landing direction is always facing the wind.

The low ground speed and absence of motor speed limit the risk of injury to uninvolved people and the risk of damage to the drone in case of an impact with an obstacle. Since the motor cannot be used, the accuracy of the landing is reduced compared to a normal landing.

4.2.7.2 Activation

The STL can be activated in two different ways:

- Automatically by the autopilot, in case of an emergency, such as
  - A motor failure, or
  - A battery issue (empty capacity, high temperature, overcurrent), or
  - A breach of the second geofence limit.
- Manually by the operator at any time.
  To manually trigger an STL, the operator holds both “hold” and “photo” buttons for 2 seconds, as shown on the image below. It is possible to abort a manually triggered STL by repeating the operation.

STL activation: Hold buttons for 2 seconds

Figure 4-31 STL activation

4.2.7.3 Procedure

When the STL is triggered, the eBee VISION automatically designates a ground point directly beneath its current position (or as close as possible if the drone is too low to complete a full circle). It then calculates a downward spiral trajectory to reach that point. The drone shuts off its motor and glides along the computed path until landing is completed. The trajectory is optimized to be compact and ensures the drone finishes in a headwind orientation.

At any point during the STL, the landing point can be adjusted on the map within a limited range indicated by a green circle, which depends on the drone’s altitude and the current wind conditions. When the landing point is adjusted, the drone will first glide to the new position before initiating the downward spiral trajectory. Note that the final landing direction cannot be adjusted, as the drone must land facing into the wind.

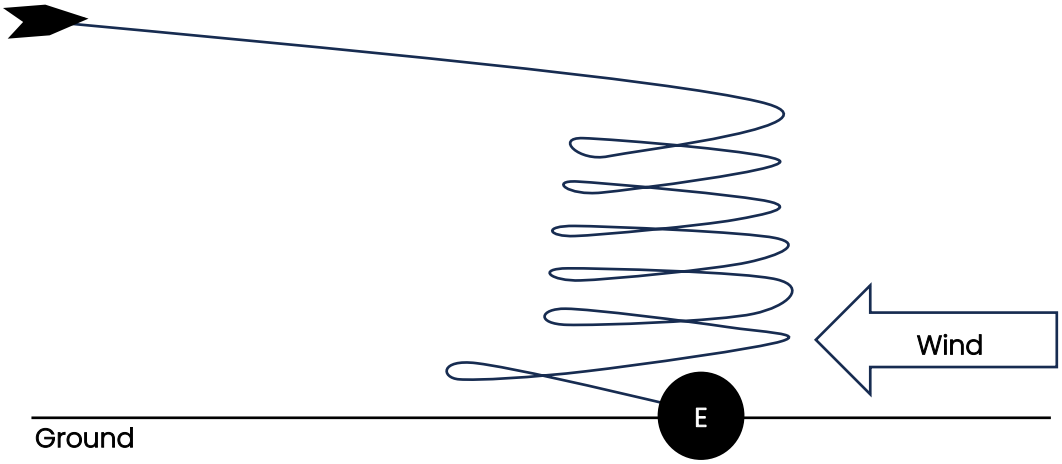


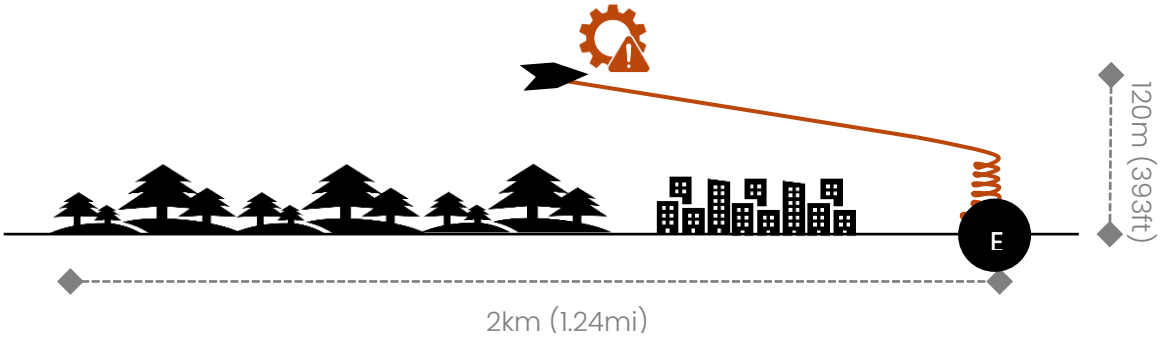
Figure 4-32 Schematic of the STL landing trajectory

Figure 4-33 STL screen

(1) STL landing point (draggable).
(2) Area where the landing point can be moved during an STL.
(3) Drone state indication during an STL, “Emergency landing”.
(4) Landing direction indicator (headwind only).
(5) Landing pad, indicating the expected touchdown area.

ⓘ	Note

Moving the STL landing point in case of an emergency allows the operator to choose a safe landing spot (e.g. land on a field instead of an inhabited area, a forest or a lake) over a large area thanks to the good gliding capability of the eBee VISION.



As an example, if the eBee VISION encounters an engine failure while flying at 120m, the drone will glide for about 1,5 minutes before the drone touches the ground, allowing the operator to choose a landing spot within a range of more than 1 km.

4.2.8 Fast escape

Users can use fast escape by holding the primary drone control joystick in one direction for 2 seconds.

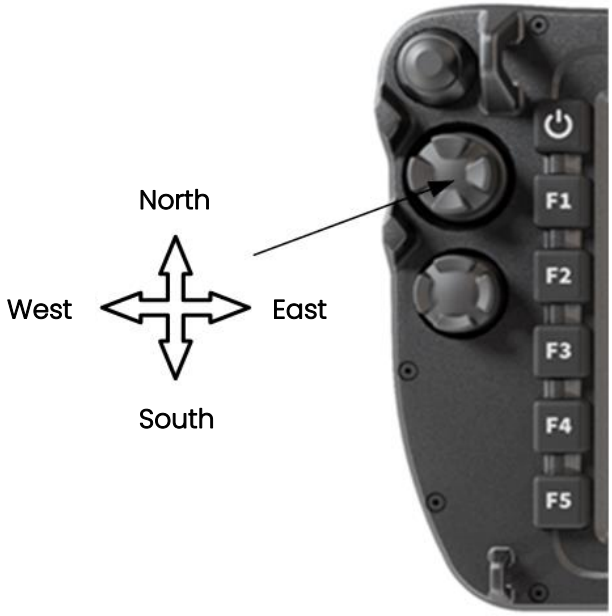


Figure 4-34 Fast escape direction control

In fast escape eBee VISION will go full speed in the direction indicated by the primary drone control joystick until it is released. After fast escape, eBee VISION will enter hold mode to wait for new instructions.

ⓘ	Note
• In the video view use the compass to decide which escape direction is best suited to the current situation. • eBee VISION will stop at the geofence if it is activated. • Keep in mind that fast escape will generate noise.	

4.2.9 Fast climb / descent

In case of possible collision, the user can use fast climb or fast descent by holding the secondary drone control joystick up or down for 2 seconds. eBee VISION will go up or down as fast as possible until the joystick is released and enter hold mode to wait for new instructions.

Figure 4-35 Fast climb/descent altitude control

ⓘ	Note
• eBee VISION will stop at the ceiling of the geofence if it is activated. • eBee VISION will stop at 60m / 197ft above elevation data. • Keep in mind that fast climb or descent will generate noise	

4.2.10 Hold

Users can activate hold mode by pressing the hold button.

Figure 4-36 Hold button location

In hold mode, eBee VISION will perform a 50m / 164ft radius circle at its current position and altitude.

ⓘ	Note
• Secondary drone control joystick can be used to change the hold waypoint altitude • After editing the altitude check altitude profile by pressing the secondary control drone joystick	

4.2.11 GNSS denied

eBee VISION is capable of maintaining stable flight without GNSS reception by using a combination of airspeed, heading and estimated wind velocity. It is therefore possible to continue flying in any flight mode without using the GNSS. Due to lower precision eBee VISION cannot perform a normal landing without GNSS, the STL landing must be used instead.
When operating without any GNSS the accuracy in position decreases over time. An orange circle showing estimated accuracy of the drone's position is displayed on the Map view as soon as the GNSS is not used anymore (see image below).

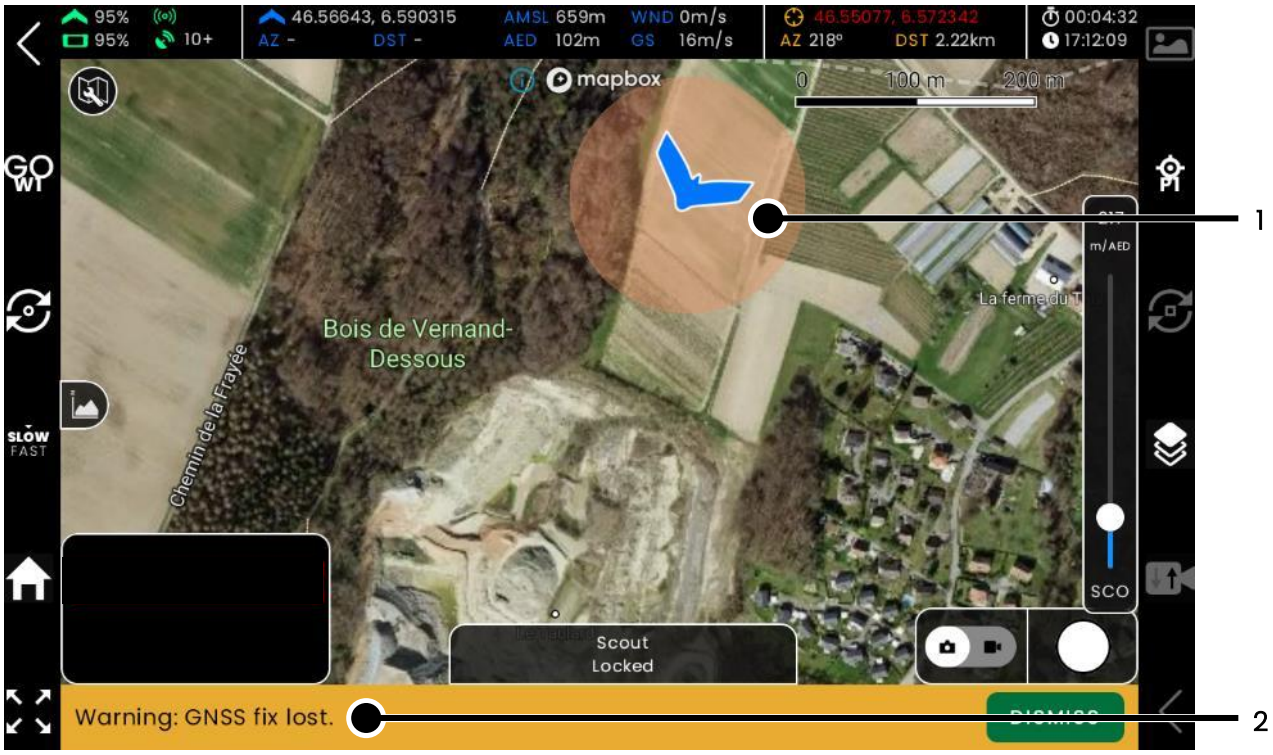


Figure 4-37 GNSS denied notification

(1) Area of uncertainty of the drone position.

(2) Warning related to the deactivation or loss of GNSS signal.

4.2.11.1 Activation

The No-GNSS mode is activated in two scenarios:

1. GNSS signal is lost
2. The user deactivates GNSS manually

Activation on GNSS fix loss

In case of GNSS fix loss eBee VISION automatically triggers the safety action defined in the settings. Until recovery of a GNSS fix the safety action cannot be aborted.

Manual activation

GNSS use can be deactivated with the Settings -> Flight -> GNSS for flight option.
When this option is set to DISABLED the autopilot will stop using GNSS measurements as soon as it has gathered sufficient data to ensure safe flight (usually less than one minute after take-off).
On deactivation the user is informed by the GNSS Fix lost warning that GNSS has been deactivated.
Upon deactivation of the GNSS the drone will perform its GNSS lost safety action, therefore the safety action must be set to "None" in order to perform a mission without using the GNSS.

4.2.11.2 Configuration of the safety action

Independently of activation method eBee VISION will execute the Safety Action defined for GNSS Fix Lost.
The user can choose between the following actions:

- Land Now:

  eBee VISION performs an STL.
- Go Land:

  eBee VISION will automatically fly towards the Home point and perform STL once it is reached. The user cannot continue the mission, but he can trigger an STL at any time.

- None:
  eBee VISION will continue its mission, there are no restrictions on performable actions, except that the landing must be an STL. It cannot make a normal landing.

	Note
	• If the option is set before take-off, eBee VISION will use GNSS in the beginning until it has gathered sufficient data to safely deactivate GNSS. • Without GNSS the sensor redundancy is compromised, eBee VISION will therefore be more vulnerable to other sensor failures.

4.2.12 Post-flight precautions

	Warning
	• Wait at least 10 seconds after the drone has come to a complete stop. • Check that the elevons are not moving. • Grab the drone from the front and keep your hands away from the propeller at all times. • Turn off the drone by doing a quick press on the power button.

	Warning
	Special procedure for flights in rain: If the drone has been flown in the rain, it is imperative to position it with the nose facing upward immediately after landing. Maintain this position for a few seconds to allow any residual water to drain and to prevent infiltration into internal components.

4.2.12.1 Inspection of sensitive components

After each flight, carefully inspect the sensitive components of the drone:

- Pitot
- Ground sensor
- Control surfaces
- Propeller
- Payload

Ensure that all moving parts are intact and functioning properly. Also, check for any damage or debris.

4.2.12.2 Drone cleaning

Clean the drone with a soft, damp cloth. Avoid using harsh chemicals or abrasive cleaners that could damage the surfaces or components.
Make sure the drone is completely dry before storing it to prevent moisture buildup or mold.

4.2.12.3 Payload inspection and cleaning

1. See section 4.3.3 Deploy / retract / transit to deploy the payload.
2. Turn the drone upside down to inspect the payload, taking care not to damage the antennas or the pitot tube.
3. Ensure that the cameras of the payload are clear and free from smudges or particles.

4. If necessary, use a soft, lint-free cloth and an appropriate lens cleaning solution for optical surfaces.
5. Return the drone to its upright position.
6. See section 4.3.3 Deploy / retract / transit for instructions on how to retract the payload.

4.3 Payload

4.3.1 Select and activate POI

Like for the waypoint, user can cycle between POIs and activate the desired one to have the payload pointing in its direction.

Figure 4-38 POI related buttons

ⓘ	Note
Activate a POI and combine it with scouting mode to send eBee VISION in the direction of the selected target.	

4.3.2 lock / unlock

During flight plan, the payload can be unlocked to explore the mission space or locked to maintain an object of interest in sight.

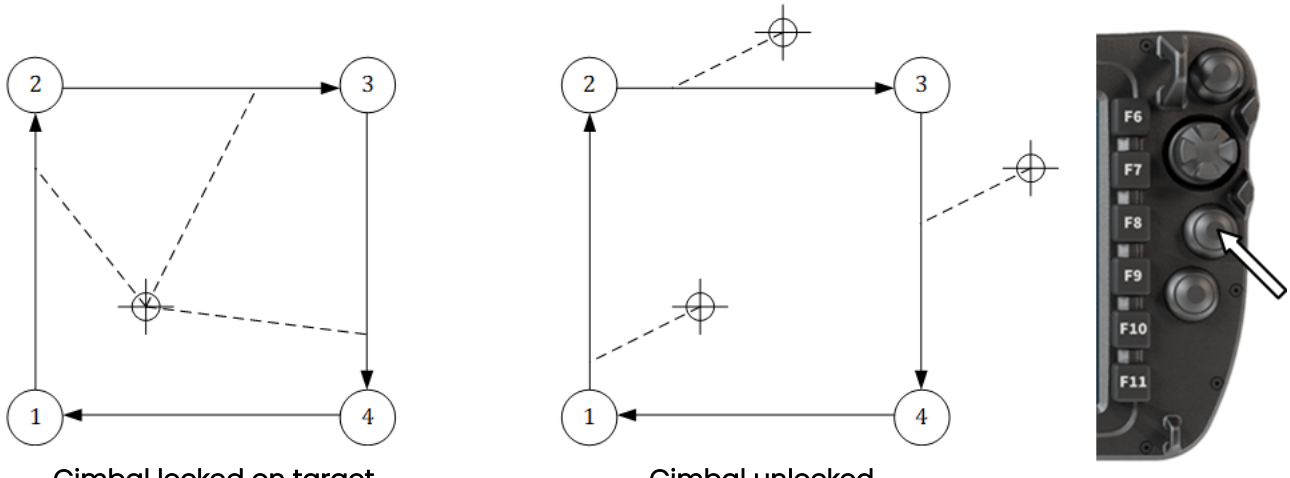


Figure 4-39 Locked / unlocked payload behavior

ⓘ	Note
• payload can be locked on anything, it does not have to be a POI • Payload cannot be unlocked in scooting or observe mode as they are meant to look at a specific target • Payload cannot be unlocked in manual mode to avoid confusion for the pilot.	

4.3.3 Deploy / retract / transit

The payload has 3 positions:

- **Retracted**: the payload is retracted with the camera pointing upwards. This state is automatically activated to protect the gimbal during take-off and landing.
- **Transit**: the payload is retracted with the camera pointing 45° down and forward. Hence mechanically locked in one axis, and controllable in the other. This state is used to reduce drag while keeping some limited visibility around the drone when transiting to a mission zone. Due to single-axis stabilization in this state, the video feed may not appear fully stabilized, particularly during turns.
- **Deployed**: the payload is deployed below the drone to give maximum visibility. This is the standard operating position.

The position of the gimbal can be changed by using the deploy/retract button.

Figure 4-40 Gimbal position control button

4.3.4 Thermal sensor calibration

The thermal sensor requires occasional calibration for optimal image quality. The sensor mounted in the eBee VISION is equipped with a mechanical shutter and thermal calibrations are automatically executed on ground and in flight to provide detailed thermal video stream.
However, the user can initiate a manual thermal calibration by long pressing the thermal calibration icon (1). The calibration process is almost instantaneous (<1s).

Figure 4-41 Thermal sensor calibration button

5 Advanced technical topics

5.1 Coordinate of target accuracy

The circular probable error at 95% (CEP95) of the coordinate of target depends on the observation conditions:

- Distance to target
- Altitude

The following diagram can be used to find the right observation conditions:

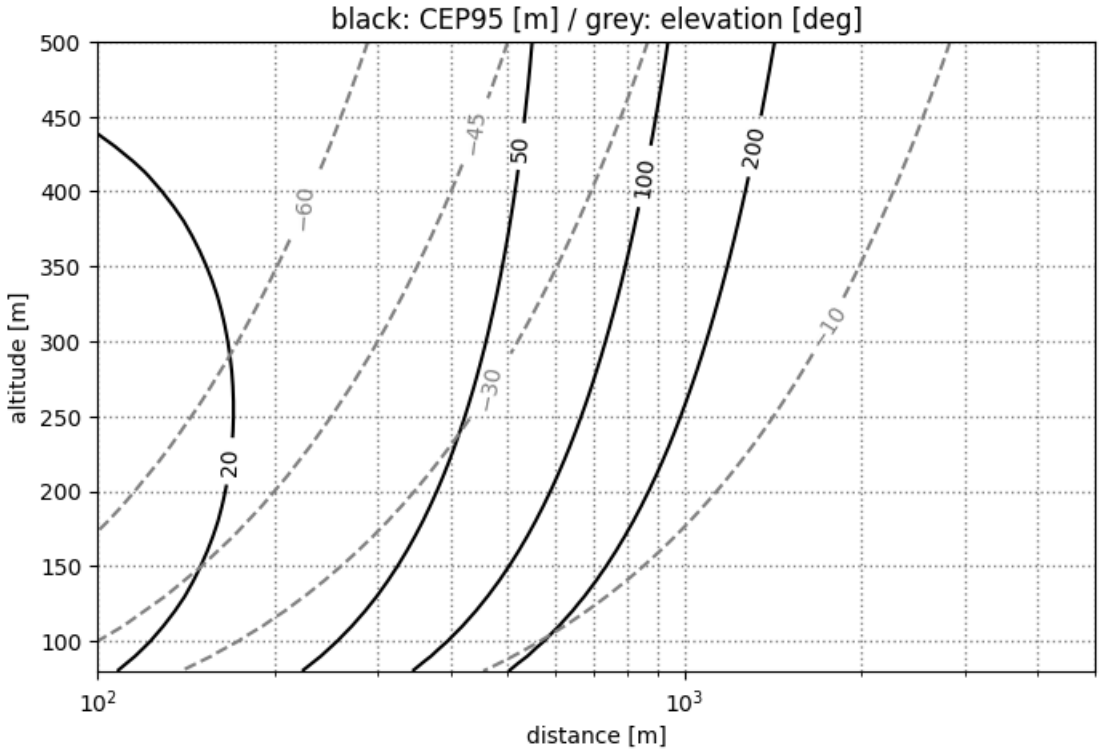


Figure 5-1 Center of target estimation error depending on distance and altitude

The target section of the telemetry ribbon reflects the accuracy of the target coordinate.

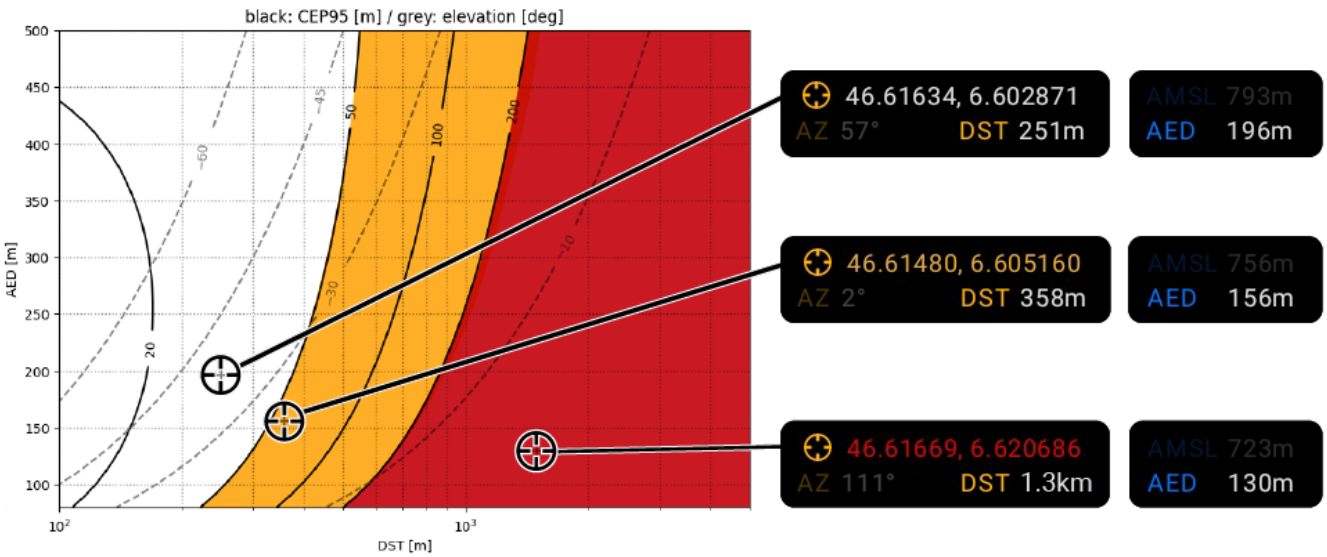


Figure 5-2 Center of target accuracy interpretation from telemetry ribbon

An actual example of eBee VISION's accuracy:

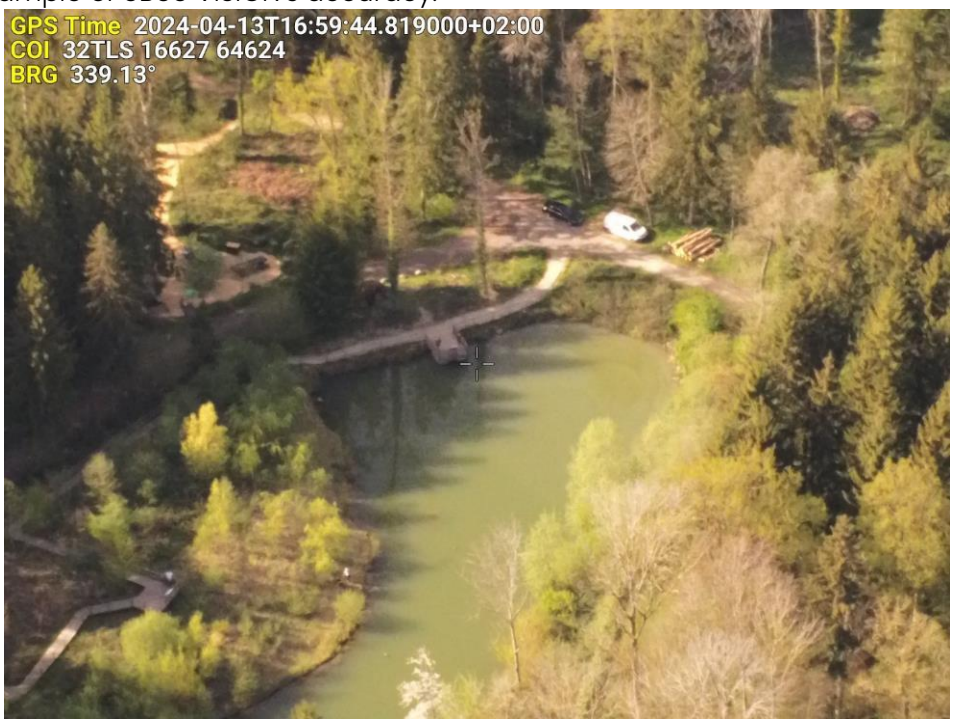


Figure 5-3 Center of target accuracy example image

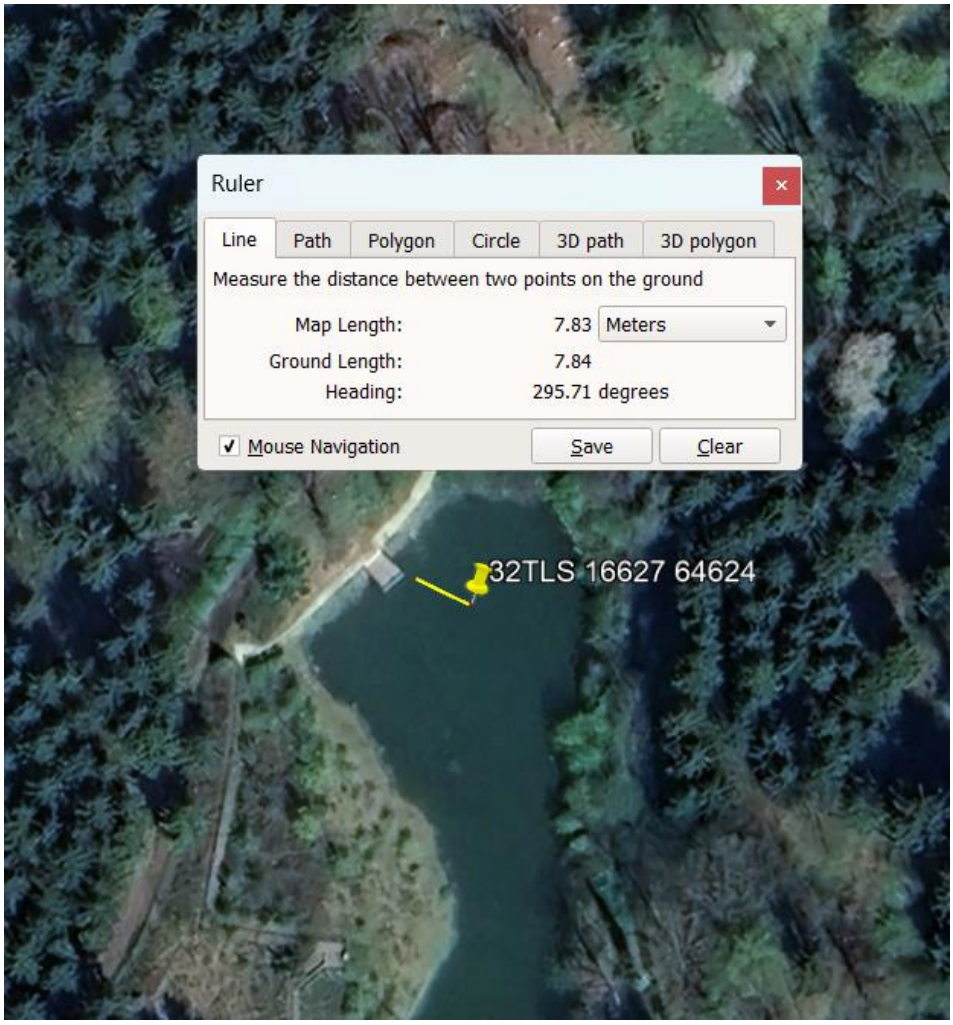


Figure 5-4 Center of target accuracy example

6 Maintenance

6.1 Replacing pitot tube

⚠	Warning
• Do not perform any maintenance of the eBee VISION while it is powered. • Remove the battery before starting any maintenance. See section 2.1.3 Battery disassembly for instructions	

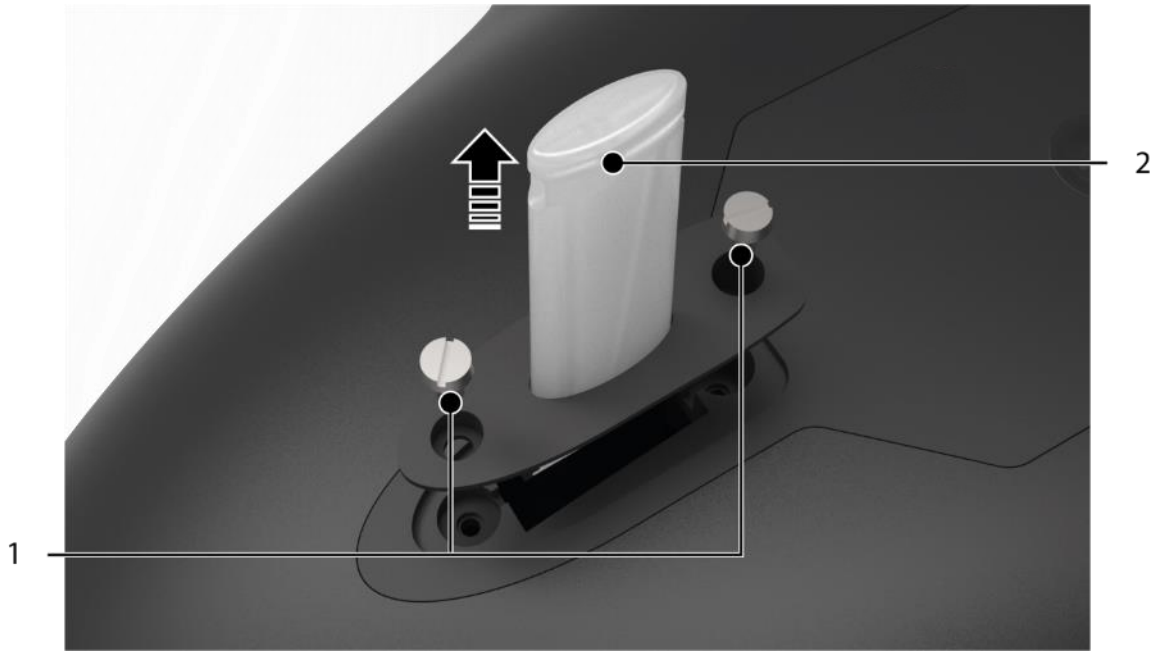


Figure 6-1 Pitot replacement

- Remove the two screws (1) with the help of a flat head screwdriver (n°5) and unplug the pitot tube (2).
- Plug in the new pitot tube and secure it with the two screws. Be careful not to overtighten the nylon screws.

6.2 Replacing propeller

⚠	Warning
• Do not perform any maintenance of the eBee VISION while it is powered. • Remove the battery before starting any maintenance. See section 2.1.3 Battery disassembly for instructions	

6.2.1 Removing the propeller blades

- Carefully position the drone so that you have clear access to the propeller assembly.
- Using a Torx 8 screwdriver, carefully loosen the screws securing the propeller blades to the hub, then gently pull the shafts out to release the propeller blades.

6.2.2 Mounting the propeller blades

ⓘ	Note
• Before replacing the propeller blades, inspect the hub and surrounding components for any signs of wear or damage. Clean the area if necessary to ensure a smooth reassembly.	

- Place the O-ring as shown in the diagram below, ensuring the correct orientation of the propeller blades. Note that both propeller blades are identical, but their orientation is crucial for proper operation.

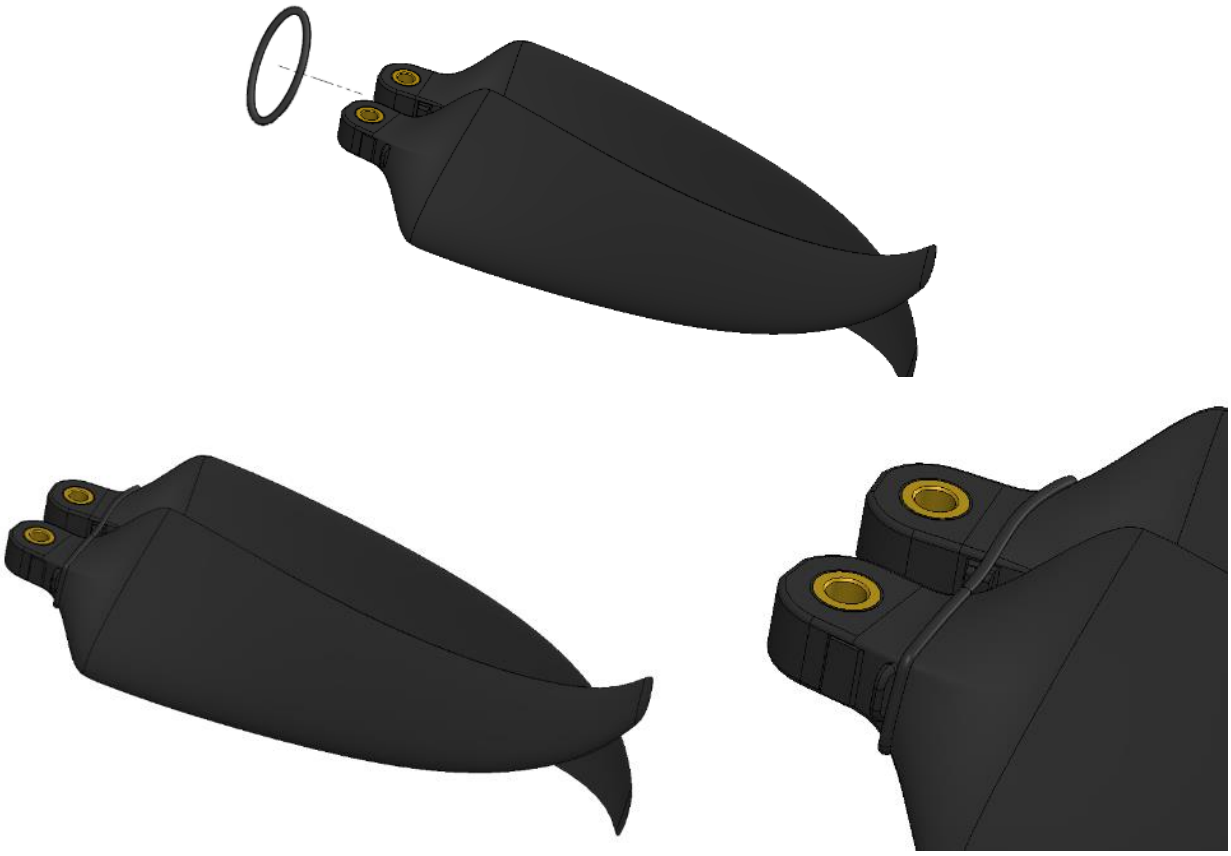


Figure 6-2 Propeller O-ring placement

- Insert the O-ring and propeller blade subassembly into the hub, ensuring that the blades are oriented correctly. Insert the shafts and tighten them using a Torx 8 screwdriver. The recommended maximum torque is 0.8 Nm. Applying a higher torque may damage the hub.

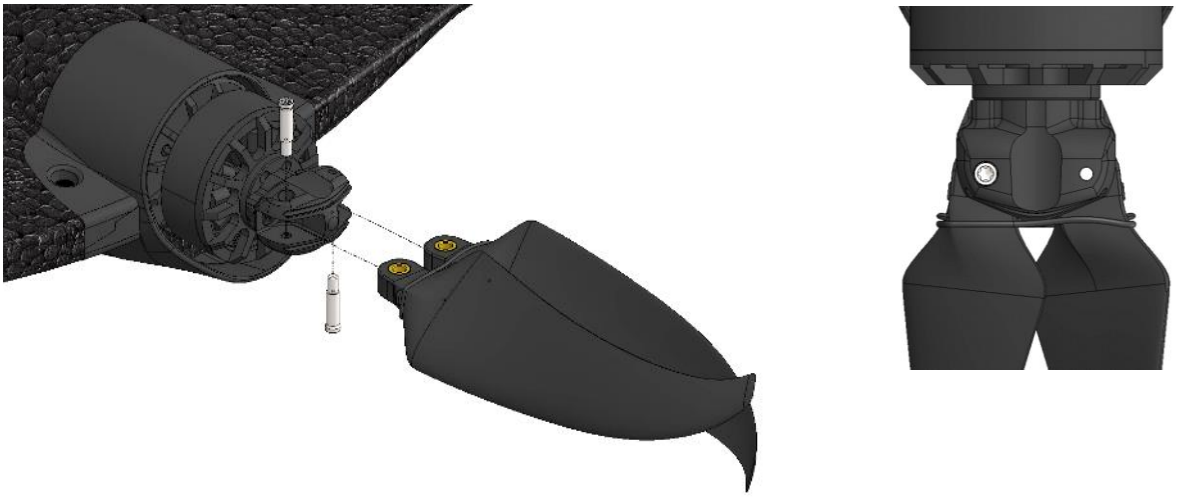


Figure 6-3 Propeller blades placement in the hub

- Manually test the propeller deployment to ensure it operates correctly. Verify that there is no jamming or resistance during movement. Check that the blades fold immediately and come back aligned longitudinally when released.

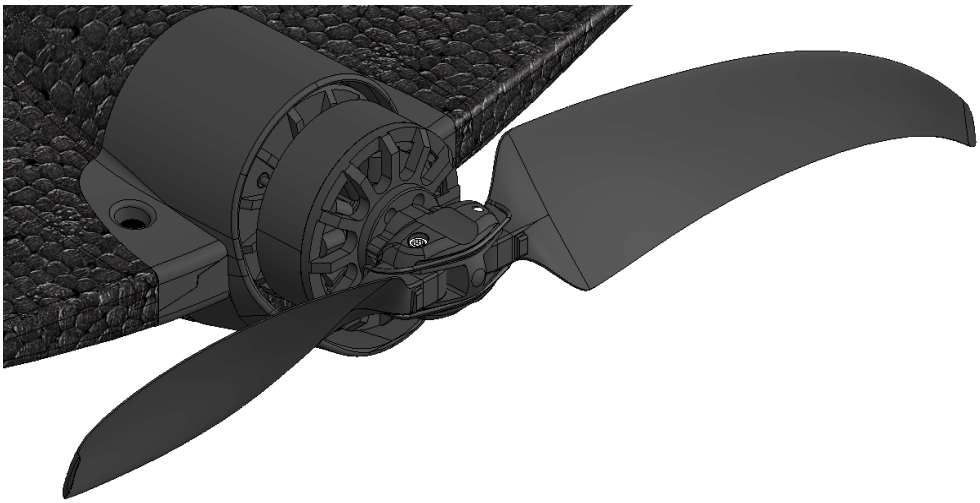


Figure 6-4 Propeller opening check

6.3 Payload assembly / disassembly

⚠	Warning
• Do not perform any maintenance on the eBee VISION while it is powered on. • Remove the battery before starting any maintenance. See section 2.1.3 Battery disassembly for instructions	

6.3.1 Open the drone

- Remove the upper motor half-cowling that is held by 2 screws using a Torx T-10 screwdriver (1), then the four lower screws.
- Grasp the motor with one hand and pull the lower half-cowling (2) with the other to open the drone.

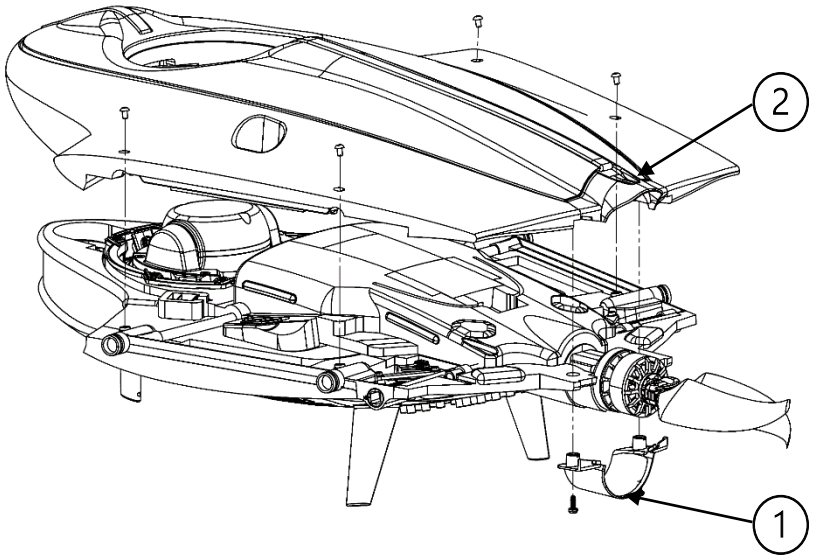


Figure 6-5 Lower body disassembly

6.3.2 Remove the payload

- Using a Torx T-10 screwdriver, unscrew the eight M3 screws (1) securing the payload to the drone.
- Carefully detach the payload (2) from the drone once all screws are removed.

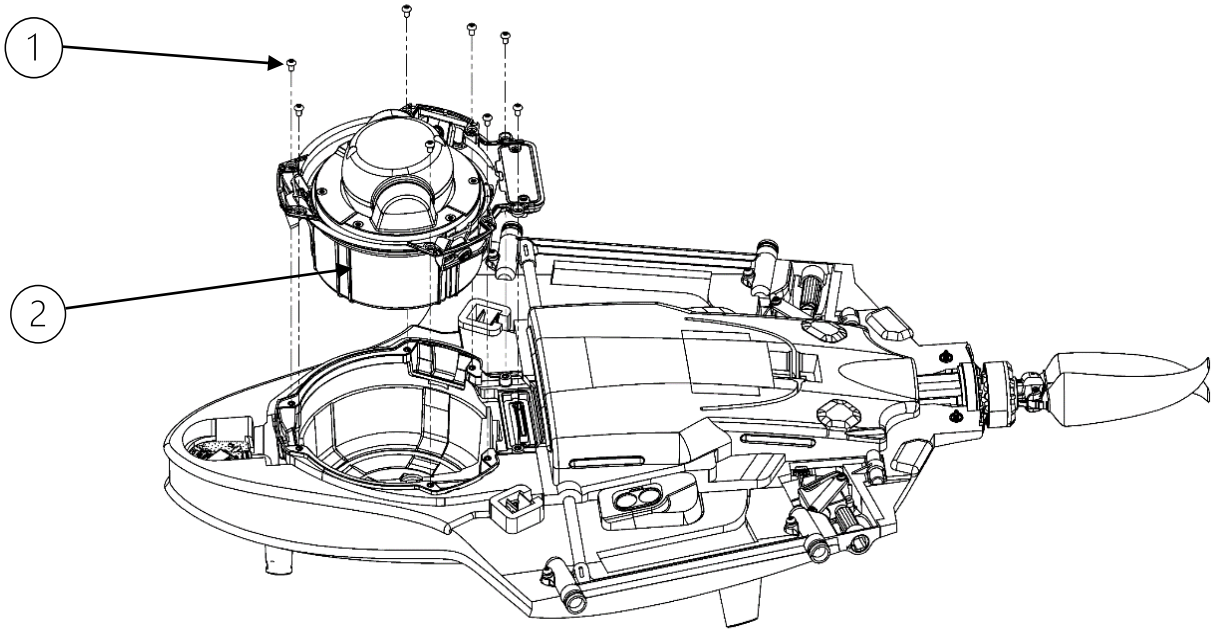


Figure 6-6 Payload removal

6.3.3 Install a payload

- Position the payload in place. Be careful when you plug the connectors together.
- Secure the payload by screwing in the eight M3 screws. Make sure all screws are tightened evenly. Apply a maximum torque of 0.7 Nm to avoid damaging the payload.

6.3.4 Reassembling the lower body

- Start by inserting the nose section of the drone into position. Ensure that it is properly aligned with the upper body.
- Once the nose is in place, press down on the underside (belly) of the drone to securely clip the lower body (1) into position. Make sure all clips are engaged, and the body is fully secured.
- With the lower body (1) clipped in, insert the four main screws and tighten them. The recommended maximum torque is 0.7 Nm to avoid damaging the drone.
- Finally, position the motor's upper half-cowling (2) and secure it by tightening the two screws. Ensure that the cowling is properly aligned and that the screws are tightened securely.

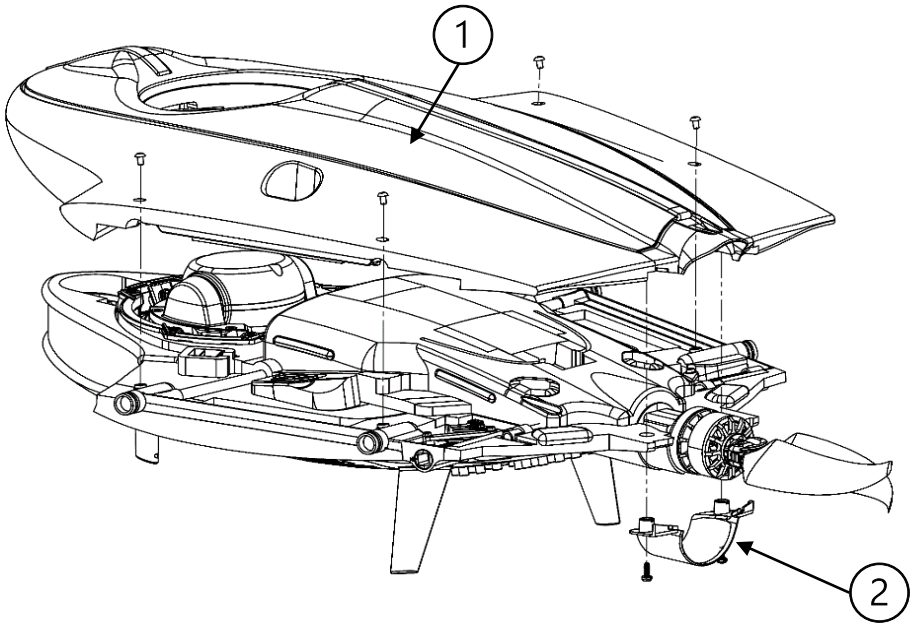


Figure 6-7 Lower body reassembly

6.4 Servo motor replacement

⚠	Warning
• Never try to manually change the trim of eBee VISION. • A wrong trim position will prevent the eBee VISION from flying. • Do not perform any maintenance on the eBee VISION while it is powered on. • Remove the battery before starting any maintenance. See section 2.1.3 Battery disassembly for instructions	

ⓘ	Note
• When performing the servo reset in the eBee VISION app, it is a requirement that both servos be reset at the same time.	

6.4.1 Open the drone

- Remove the upper motor half-cowling (1), then the four lower screws.
- Grasp the motor with one hand and pull the lower half-cowling (2) with the other to open the drone.

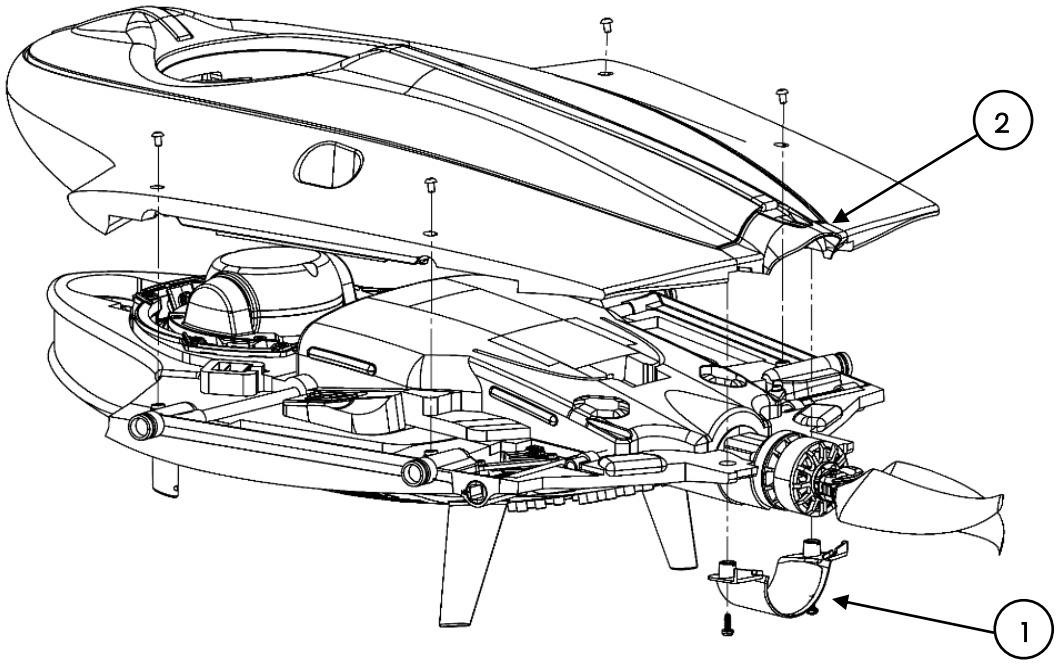


Figure 6-8 Lower body disassembly

6.4.2 Remove the Servo Motor

- Unplug the connector
- Using a Torx T-8 screwdriver, unscrew the two M3 screws (1) securing the servo to the drone.
- Remove the retaining clamp from the servo that needs to be replaced.
- Pull the servo upwards by sliding its shaft out of its housing.

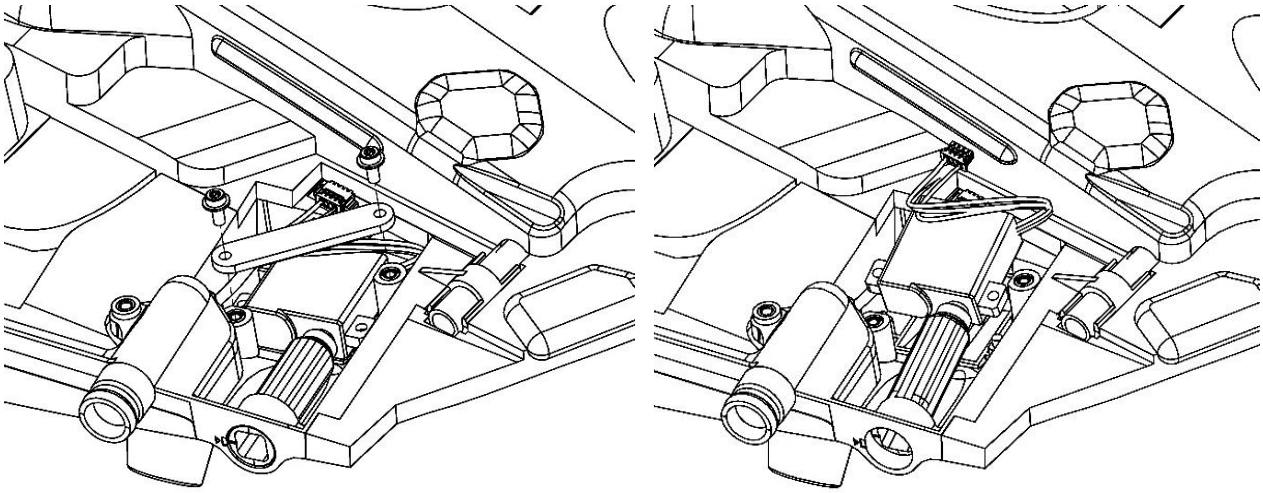
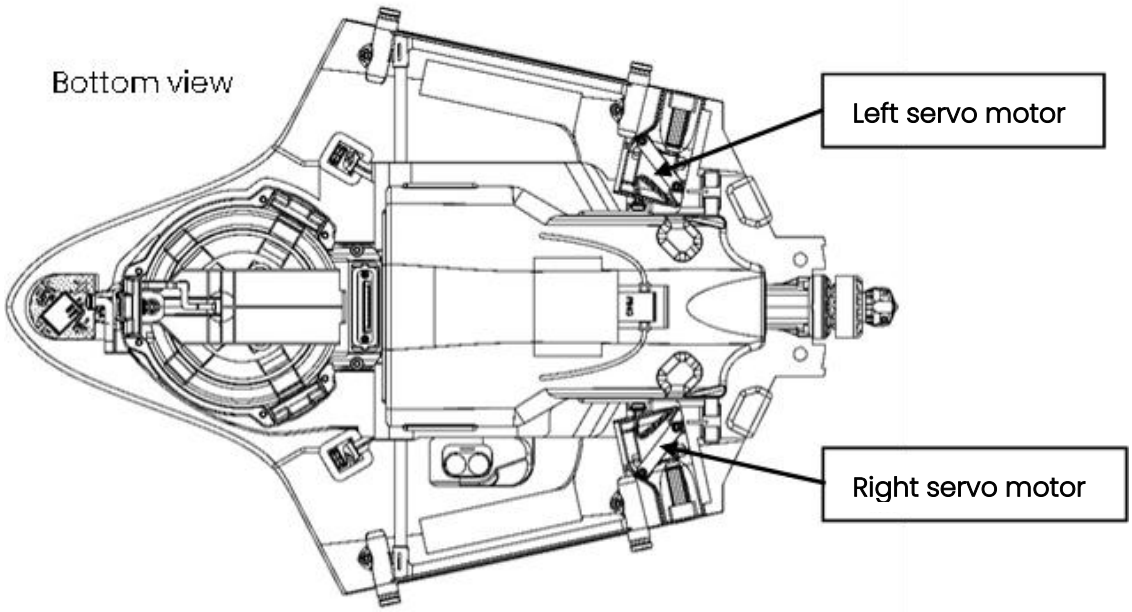


Figure 6-9 Servo disassembly

6.4.3 Install the New Servo Motors:

ⓘ	Note

- Be careful to identify the left and right servo motors.



- Take note of the serial numbers of the new servo motors as well as the side where each motor will be installed.
- Follow the reverse steps to reassemble the new servo motors. The recommended torque is 0.3Nm with Loctite® 243. Using a higher torque can damage the drone.

6.4.4 Update Servo Motor Records:

- After replacing the physical servo motors, reinstall the battery, connect the drone, and navigate from the Home Screen to the top right menu > 'Info' > 'Maintenance'

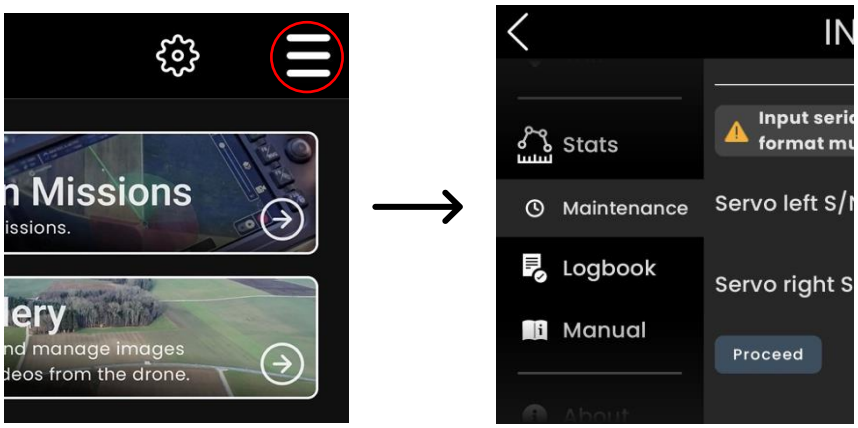
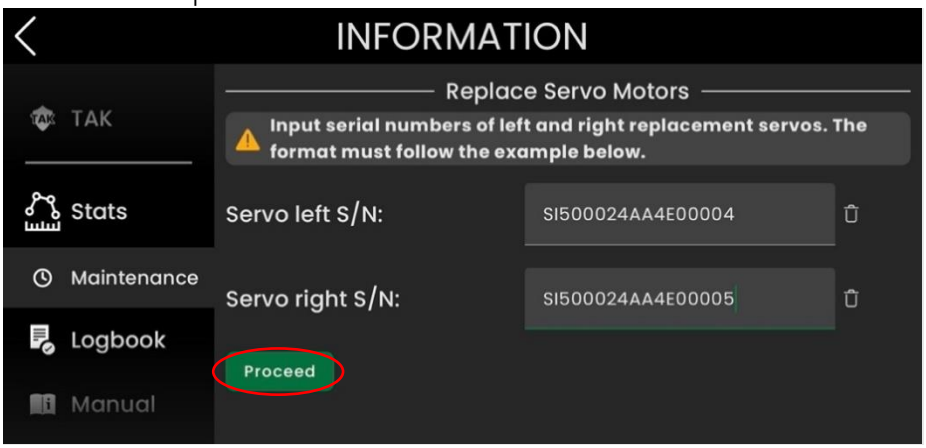


Figure 6-10 Servo maintenance screen

- Enter in the serial numbers for each respective servo motor in the format shown. Tap "Proceed" and confirm the prompt to update the drone.

ⓘ	Note

- The format must match the structure shown.
- The serial number must be 17 characters long.
  - An example of a valid serial number is *SI500024AA4E00002*



6.4.5 Confirm the Update:

- A prompt will appear to confirm a successful update. Navigate to 'Stats' on the left-hand pane and verify that the powered time for both servo motors is 0 hours.

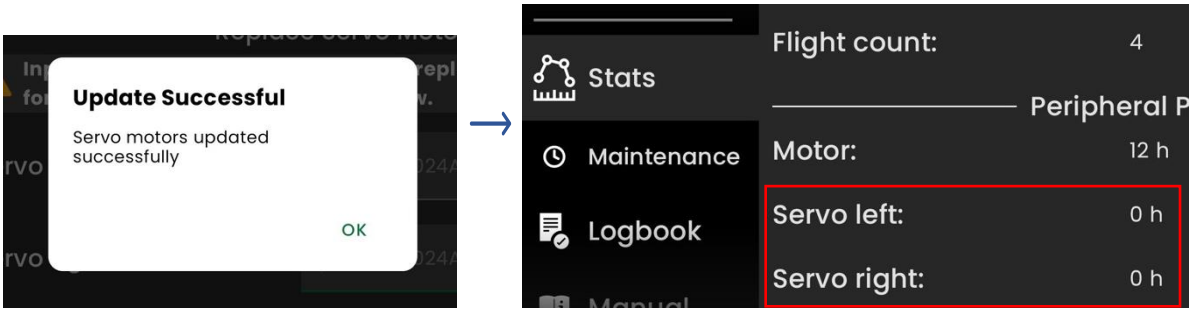


Figure 6-11 Servo statistics update

6.4.6 Final Verification:

- Power on the drone without the wings and check that the servo shaft line is within the acceptable range (refer to the arrow in the picture below). It is not an issue if the servo shaft line is not perfectly centered within the range; it will self-align after the first flight.

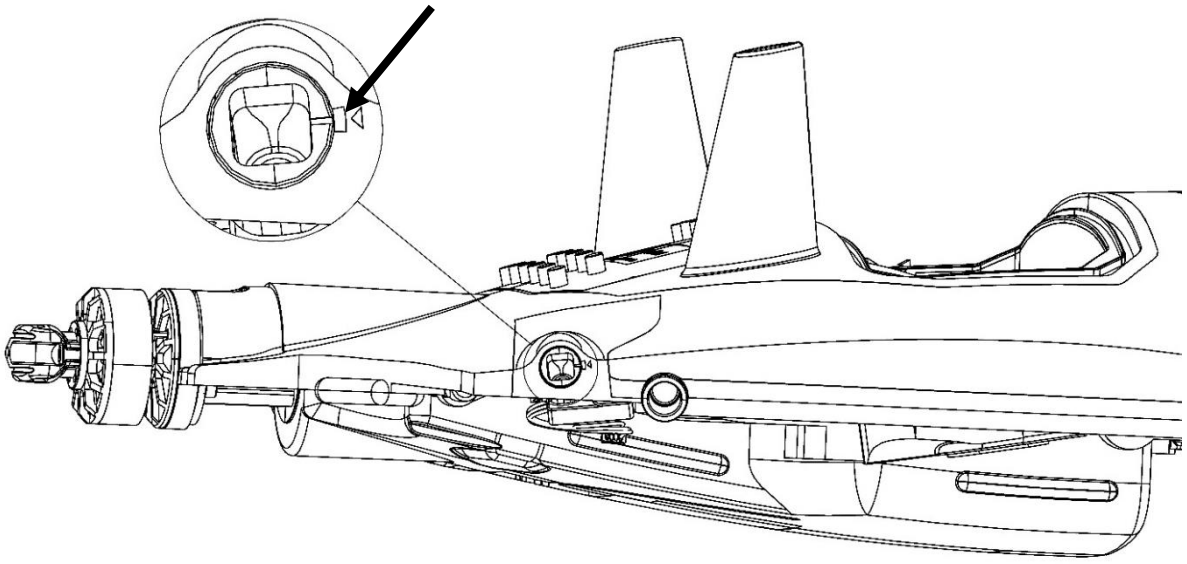


Figure 6-12 Servo trim check

6.4.7 Reassembling the Lower Body

- Start by inserting the nose section of the drone into position. Ensure that it is properly aligned with the upper body.
- Once the nose is in place, press down on the underside (belly) of the drone to securely clip the lower body (1) into position. Make sure all clips are engaged, and the body is fully secured.
- With the lower body (1) clipped in, insert the four main screws and tighten them. The recommended maximum torque is 0.7 Nm to avoid damaging the drone.
- Finally, position the motor's upper half-cowling (2) and secure it by tightening the two screws. Ensure that the cowling is properly aligned and that the screws are tightened securely.

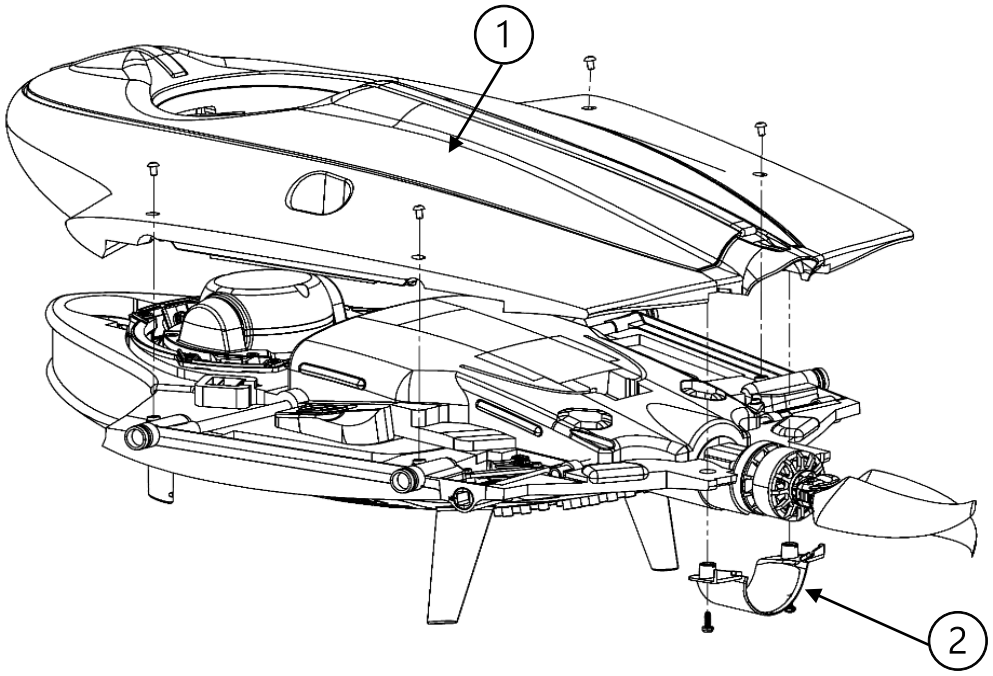


Figure 6-13 Lower body reassembly

6.5 Handling shark antennas

6.5.1 How to pack your drone in the backpack

Figure 6-14 Shark antenna insertion

⚠	Warning
• Please handle the shark antennas with care when storing the drone. • Always store the drone flat in the backpack.	

6.5.2 How to straighten a shark antenna?

Here is an example of a bent antenna:

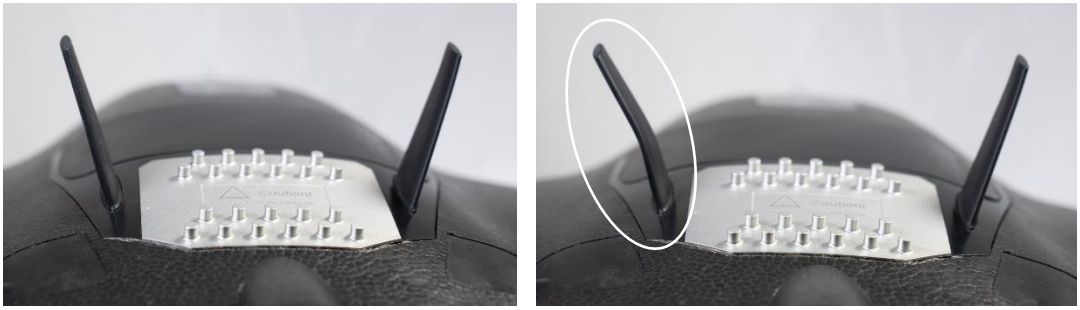
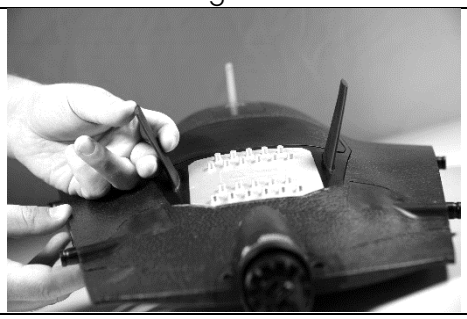


Figure 6-15 Bent shark antenna example

⚠	Warning
• Do not handle the Shark antennas unnecessarily.	

In case of a bent antenna, please use the method shown below to straighten the antenna:

Take the bent shark antenna with your fingers	

Bend it in the opposite way	
Check that the antenna is well aligned	

7 Software and firmware update

7.1 Software versioning

It is the user responsibility to ensure that the GCS application version and the drone firmware version are the same.
The version of each of those release follows the semantic versioning rule (X.Y.Z), which can be used to anticipate the nature of the changes:

- X: Major change in the drone behavior and safety procedures.
- Y: New feature added to the software. The existing features and behaviors are not affected by that release.
- Z: Bug fix on a specific feature. No behavior modification is expected on other features.

7.2 GCS software update

Download the Android APK application file (ebee-vision-app-X.Y.Z.apk) using the link provided in the release notes. Copy the APK file on a removable device that can be read by the GCS. Plug the removable device to the GCS and open the “My files” app (1):

Click on the APK name to start the update.

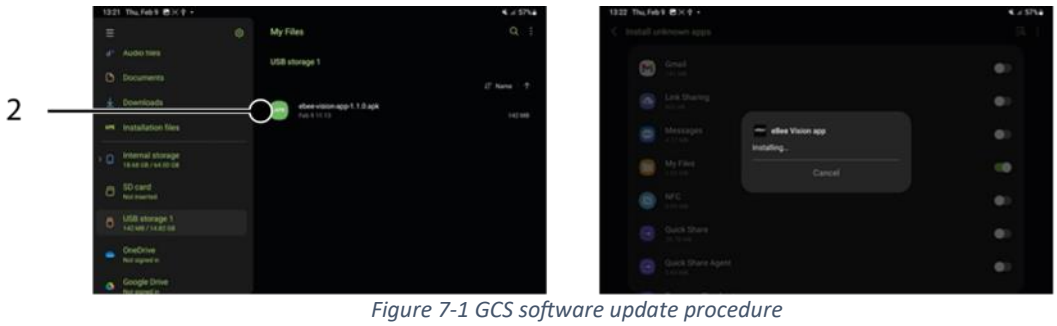


Figure 7-1 GCS software update procedure

7.3 eBee VISION drone’s firmware update

Download the drone firmware file (eBee_VISION_update.tar.gz) using the link provided in the release notes. Copy the file at the root of the drone SD card. Properly unmount the SD card from your computer and insert it in the drone. Then insert the battery and power on the drone without connecting to it with the GCS.

⚠	Warning
• Do not pull out the battery of the drone while an update is in progress	

The drone's LED will blink yellow during the update process. The whole process should take approximately 5 minutes. At the end of the process, the LED will blink for a short amount of time green if the update succeeded or red if it failed.

If the update takes more than 15 minutes, it means a problem has occurred. Try to shut down the drone with its power button, and if it is not reacting, remove the battery. You can now retry the update from the beginning. If the drone doesn't boot anymore, please contact support.

	Note
•	The update file put on the SD card is removed automatically by the drone during the update process.

7.4 Battery and motor update

When the drone boots with a new firmware, it will check if the battery or the motor need an update. If it is the case, the drone will perform these updates.

	Warning
•	Do not pull out the battery of the drone while an update is in progress

Below is the pattern depending on the update being made:

1. Update of the battery: the drone's LED blinks yellow and the battery's LEDS will draw a scan pattern (light moving to the left, then to the right and so on).
2. Update of the motor: the drone's LED blinks yellow.

The update of the battery's firmware takes approximately 3 minutes and the motor's one around 30 seconds. Once finished, the drone's LED should stop blinking yellow and the battery's LEDS should remain still. Do not pull out the battery of the drone while an update is in progress.

	Note
•	If the update takes more than 15 minutes, it means a problem has occurred. Try to shut down the drone with its power button, and if it is not reacting, remove the battery. You can now reboot the drone.

7.5 Modems firmware update

If the modems need an update, a pop-up dialog will appear shortly after the GCS has been connected to the drone.

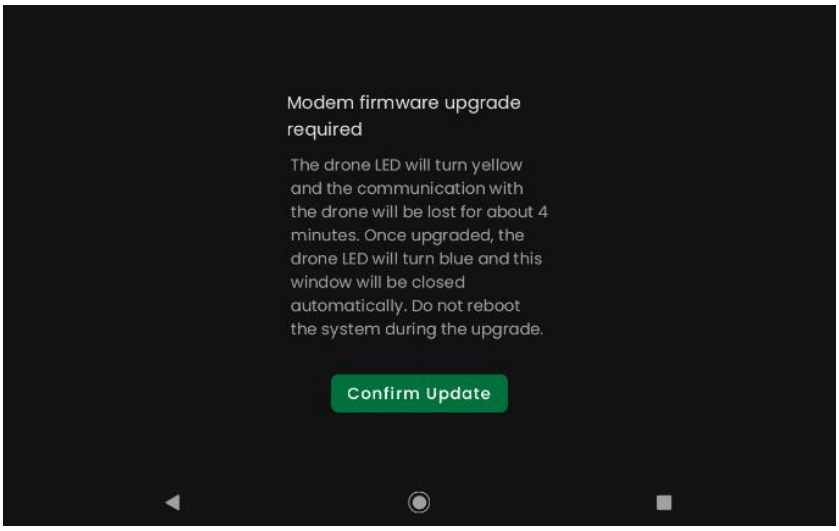


Figure 7-2 Confirm modem update notification

Once you press *Confirm Update*, the update of both the GCS's modem and the drone's modem will begin. The process takes approximately 5-6 minutes. The drone's LED will blink yellow during the process.

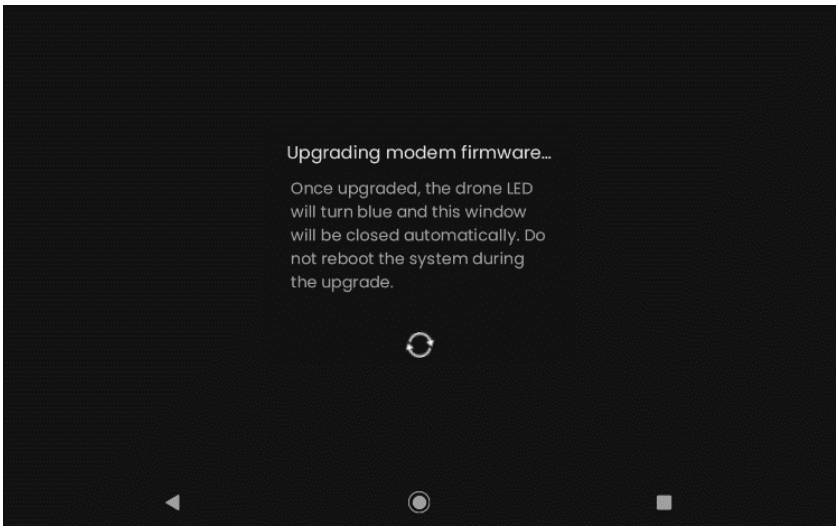


Figure 7-3 Modem update in progress notification

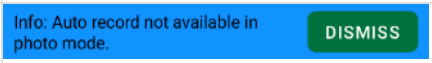
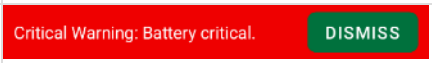
The connection between the drone and the GCS will also be lost at some point and should be retrieved at the end. When finished, the drone's LED will stop blinking yellow and the application will come back to the home screen.

ⓘ	Note
• If the drone's LED never turns yellow, it is safe to force-restart the app and retry. • If the update takes more than 15 minutes, it means a problem has occurred. Try to shut down the drone with its power button, and if it is not reacting, remove the battery. You can now reboot the drone. Also force-restart the app and retry. • If the app is stuck on the updating screen for more than 5 minutes after the drone's LED stopped blinking yellow, you can force-restart the app.	

8 Troubleshooting

8.1 Pilot notifications

Various information, warnings, and critical warnings can be displayed during the eBee VISION drone operation. These notifications will be displayed as a ribbon at the bottom of the GCS screen, in both the video and map view.

Type	Description	Display state
Self-test issues	A "Self-test" issue appears during the initialization of the drone in case of a sensor hardware issue. Example: ***GNSS issue.***	
Take-off veto	A "Take-off Veto" appears when the autopilot is performing pre-flight checks, in case of an event that prevents the drone from taking-off. Example: ***Gimbal initialising***	
Information	An "Information" appears when an event occurs that does not require a direct action from the user. Example: ***Auto record not available in photo mode.***	
Warning	A "Warning" appears when an event occurs that triggers an automatic response from a drone, or requires the user's attention and action, but does not compromise the drone's ability to continue flying. Example: ***Low endurance.***	
Critical Warning	A "Critical Warning" appears when an event occurs that prevents the continuation of normal flight. This is the most serious type of error. In most cases, when a critical warning occurs, the flight is aborted, and the drone initiates an emergency action which immediately directs it to the ground. Example: ***Critical battery***	

8.1.1 Self-test issue

Notification Message	Cause	User Actions
IMU issue GNSS issue Barometer issue Lidar issue Pitot issue Magnetometer issue	The sensor has encountered a hardware problem during its initialization.	1. Reboot the drone. If the issue persists, contact support.

8.1.2 Take-off veto

Notification Message	Cause	User Actions
Autopilot initializing, please wait	Autopilot is being initialized.	1. Wait a few minutes for initialization to finish. 2. Keep the drone in an open area to ensure a good GNSS reception. 3. Keep the drone immobile to allow calibration of autopilot. 4. If longer than a few minutes, reboot the drone.
Gimbal initializing, please keep immobile	Gimbal is being initialized.	1. Wait a few seconds for initialization to finish. 2. Keep the gimbal immobile. 3. If longer than a few seconds, reboot the drone.
Battery too low. Please charge battery	Battery state of charge (SOC) is too low for take-off (<20%).	1. Use a charged battery.
Internal communication error with power chain	A communication error occurred in the propulsion chain (battery, autopilot or motor).	1. Reboot the drone. If the issue persists, contact support.
Take-off blocked by current warning	A warning is active and prevents the drone from being ready-for-take-off.	1. Resolve the warning. 2. If needed, reboot the drone. If the issue persists, contact support.
No battery communication	The drone cannot communicate with the battery.	1. Reboot the drone. 2. If the issue persists, try another battery. 3. If the issue persists, contact support.

8.1.3 Information

Notification Message	Cause	User Actions
Auto record not available in photo mode	“Auto record from take-off” is set in the settings and current picture mode is set Photo. Auto record won’t be triggered at take-off.	1. Ignore the information, or 2. Change from picture mode to video mode, or 3. Change settings to disable auto-recording at take-off.
GCS battery is below 20%	GCS battery low and the GCS may shutdown during the flight.	1. Connect the GCS to an external power supply.

8.1.4 Warnings

Notification Message	Pre-Conditions	User Actions
Ground sensor fault	The ground sensor is defective.	On-ground: 1. Check that the ground sensor is not covered. 2. Move the drone up and down to allow self-test of the ground sensor. 3. If needed, reboot the drone, if the issue persists, contact support. In-flight: 1. Expect decreased landing precision. 2. Restriction: Ground avoidance not possible.
Defective barometer	The barometer is defective.	On-ground: 1. Reboot the drone, if the issue persists, contact support. In-flight: 1. Restriction: Flight without GNSS not possible.
Defective magnetometer	The magnetometer is defective.	On-ground: 1. Reboot the drone, if the issue persists, contact support. In-flight: 1. Restriction: Flight without GNSS not possible.
Magnetic perturbations, please move to clear area	The magnetometer detects perturbations.	On-ground: 1. Move the drone away from metallic objects. 2. Rotate the drone in every direction to allow for magnetic calibration. 3. If needed, reboot the drone, if the issue persists, contact support. In-flight: 1. Fly away from the perturbed area. 2. Restriction: Flight without GNSS not possible until the end of the perturbation.
Gimbal communication error	No communication received from the gimbal.	1. Reboot the drone, if the issue persists, contact support.
Gimbal IMU failure	Gimbal sensor issue at initialization.	1. Reboot the drone, if the issue persists, contact support.
Gimbal calibration failure, make sure not to touch the gimbal	The gimbal failed to calibrate.	1. Make sure that the gimbal is free to move. 2. Try again a shake-shake to trigger a new calibration. 3. If needed, reboot the drone. If the issue persists, contact support.
Gimbal motion blocked	The gimbal is blocked.	1. Wait about a minute for three automatic unblocking attempts. 2. Make sure that the gimbal is free to move.

		3. If needed, reboot the drone. If the issue persists, contact support.
Gimbal not controllable, expect landing with deployed gimbal	The gimbal cannot be controlled because it detected a problem.	On ground: 1. Ensure that the gimbal is free to move, reboot the drone, if the issue persists, contact support. In flight: 1. Expect a landing with gimbal deployed. Find a smooth landing place.
Ground modem communication error, please check configuration	The GCS failed to initiate configuration link with the ground modem.	1. Ignore the issue (it might be impossible to switch to long range network), or 2. Restart the app. 3. If needed, reboot the ground modem and GCS, if the issue persists, contact support.
GCS internal error. Please power off the GCS, wait 2 minutes and power on the GCS	The GCS has encountered an internal error.	1. Power off the GCS, 2. Wait 2 minutes, 3. Power on the GCS. 4. If the issue persists, contact support.
GCS battery is below 10%. Please consider charging it	The GCS battery is below 10% SOC.	1. Charge the GCS. 2. Connect the GCS to an external battery.
Missing elevation data	The application does not have elevation data for landing or mission points.	1. Go to the Map screen and preload the area around the current drone position and mission waypoints.
Wi-Fi enabled. Consider disabling it	The Wi-Fi is enabled on the GCS.	1. Disable the Wi-Fi on the GCS to save energy and limit interferences.
Drone storage is getting low, consider removing medias from it	The storage media on the drone is getting full.	1. Empty the drone storage media.
GCS disk free is not enough for 1h of video. Please consider deleting files	The GCS disk is getting full.	1. Delete files from the GCS.
The planned mission may intersect with the ground	The planned mission trajectory is very close to or below the ground (based on the GCS elevation data).	1. Adapt your mission to avoid ground intersection.
The planned mission is too	The planned mission contains waypoints too far from each	1. Reduce the mission size.

long for computing ground proximity	other to be able to compute the ground proximity alert.	
The planned mission may breach the geofence	The flight plan is too close to or outside of the geofence limit.	1. Move the flight plan waypoints away from the geofence limits. The notification disappears when the distance is high enough.
RTH cannot climb enough to avoid terrain because of the geofence	The automatic RTH trajectory requires to fly higher than the ceiling of the geofence.	1. Increase the ceiling of the geofence. The notification disappears when the altitude is high enough.
Current trajectory may breach geofence	The drone is flying towards a waypoint that will bring it too close to or outside of the geofence limit.	1. Move the current waypoint away from the geofence limits, or 2. Expect the drone to start a hold near the geofence limit.
Drone too close to geofence	The drone is currently too close to the geofence limit.	**Automatic response:** The drone will hold near the geofence limit.
Drone outside of geofence	The drone is flying outside of the geofence volume.	**Automatic response:** Drone will fly back into the geofence and hold.
Landing not possible, landing trajectory may breach geofence	The position of the landing pattern is too close to or outside of the geofence limit.	1. Move the landing or the home away from the geofence limit. The notification disappears when the distance is high enough.
Drone too close to a no-fly zone	The drone is too close to or inside an exclusion zone.	1. Fly away from the exclusion zone.
Vibrations detected, check propeller	The drone has detected strong accelerations possibly caused by vibrations.	**On ground:** 1. Check the integrity of the propeller. **In flight:** 1. Go Home and land, if warning persists, perform an STL.
Airspeed sensor obstructed	Drone airspeed sensor is obstructed or defective.	**Automatic response:** Depending on the safety setting, the drone will go land or continue the mission. **User action:** 1. Expect possible flight instability if the wind conditions changes. 2. Restriction: Flight without GNSS not possible.
Strong wind detected	Wind estimation stronger than 17m/s (38 mph).	**Automatic response:** Depending on the safety setting, the drone will go land or continue the mission. **User action:** 1. If needed, consider flying at a lower altitude where the wind is often slower. 2. Consider an STL if the drone fails to come back (wind above 22.5 m/s (50 mph)) 3.

Low endurance	Drone endurance is just enough to return to the landing point and land.	**Automatic response:** Depending on the safety setting, the drone will go land or continue the mission. **User action:** 1. If needed, move the landing point closer to the drone position, or 2. Expect an STL landing before arriving at the landing point.
User action aborted due to communication link lost	Communication from GCS to drone has been lost for more than 10 seconds while flying in a mode with direct control by the GCS (ex: manual, scouting, fast escape, etc.)	**Automatic response:** Drone will hold. **User action:** 1. If the communication link is recovered, the flight can continue.
Communication link lost	Communication from GCS to drone has been lost.	**Automatic response:** Drone will go home after the duration defined in the safety setting and land automatically. **User action:** 1. If the communication link is recovered, the flight can continue.
Ground proximity detected (if flying in clouds de-activate ground sensor)	The drone has detected that it is less than 20 m (66 ft) above the ground. It is possible that the detection was caused by clouds or fog.	**Automatic response:** The drone climbs to 60 m (197 ft) above ground or higher if needed to quit ground proximity and hold. **User action:** 1. If flying in clouds or fog, the ground sensor can be de-activated in the safety settings to avoid false detections.
Drone spinning, attempting flight recovery	The drone has entered an uncontrolled falling state (spin).	**Automatic Response:** Drone performs a recovery action, then holds. **User action:** 1. Wait for the attempted recovery action to finish. 2. Land the drone and check the drone integrity.
Battery temperature rising quickly	The battery temperature is continuously rising and might get too hot if the mission is continued.	**Automatic response:** Drone will go home and must be landed.
GNSS fix lost	GNSS fix has been lost.	**Automatic response:** Depending on the safety setting, the drone will either continue the mission, or directly perform an STL, or fly towards estimated home position and initiate STL when reached (see section 4.2.11 GNSS denied).

Missing elevation data for computing RTH	The RTH trajectory goes through an area without elevation data.	1. Preload elevation data in the area between the drone and the landing point, or 2. Switch the RTH altitude referential to AMSL and set an altitude with sufficient margin from the ground.
Battery too low for low pass, landing precision decreased	The battery is too low (SOC<8%) to allow a low pass.	1. Expect a landing with decreased precision.
Low pass deactivated; landing precision decreased	The low pass has been deactivated in the settings.	1. Activate the low pass in settings, or 2. Expect a landing with decreased precision.
Landing without ground sensor, precision will be decreased	The landing will occur without measuring ground distance.	1. Activate the ground sensor if de-activated, or 2. Expect a landing with decreased precision.
The planned landing direction is outside of recommended range (based on wind)	The landing direction is too much in the crosswind or back-wind direction.	1. Change the landing direction to improve the precision and ground speed of the landing. 2. Use the color code displayed around the landing point when changing the landing direction (see section 4.2.6 Landing).

8.1.5 Critical warning

Notification Message	Cause	User Actions
Drone far outside of geofence	Drone is far outside its geofence, i.e. more than 200 m (650 ft) away from the geofence limit.	**Automatic response:** Drone will initiate an STL. **User action:** 1. Remove or modify the geofence and abort the STL, or 2. Choose an appropriate STL landing point inside the geofence and abort the STL once the drone is inside the geofence.
Battery level critical	Your drone's battery is almost empty (SOC<5%). This error is always preceded by a low endurance warning.	**Automatic response:** Drone will initiate an STL. **User action:** 1. The STL cannot be aborted. Choose an appropriate STL landing point.
Battery high temperature	Battery temperature is too high.	
Battery over current	The battery has measured over-current.	
Battery internal error	The battery had an internal error.	

Battery health warning	The battery lost a lot of its capacity.	
Motor failure	Propulsion motor has a critical failure.	
Motor high temperature	Motor temperature is too high.	
Imminent ground impact	Drone will impact the ground within 1 sec.	**Automatic response:** Drone will cut motor and reach the ground smoothly. **No user action possible.**
IMU failure	IMU has failed, the drone cannot be controlled anymore.	**Automatic response:** Drone will cut motor, with elevators up to limit the speed of the drone until reaching the ground. **No user action possible.**
Multiple sensors failure	Several critical sensors have failed, the drone cannot be controlled anymore.	
Autopilot internal error	Communication failure with critical autopilot component.	

8.2 In-flight emergency actions

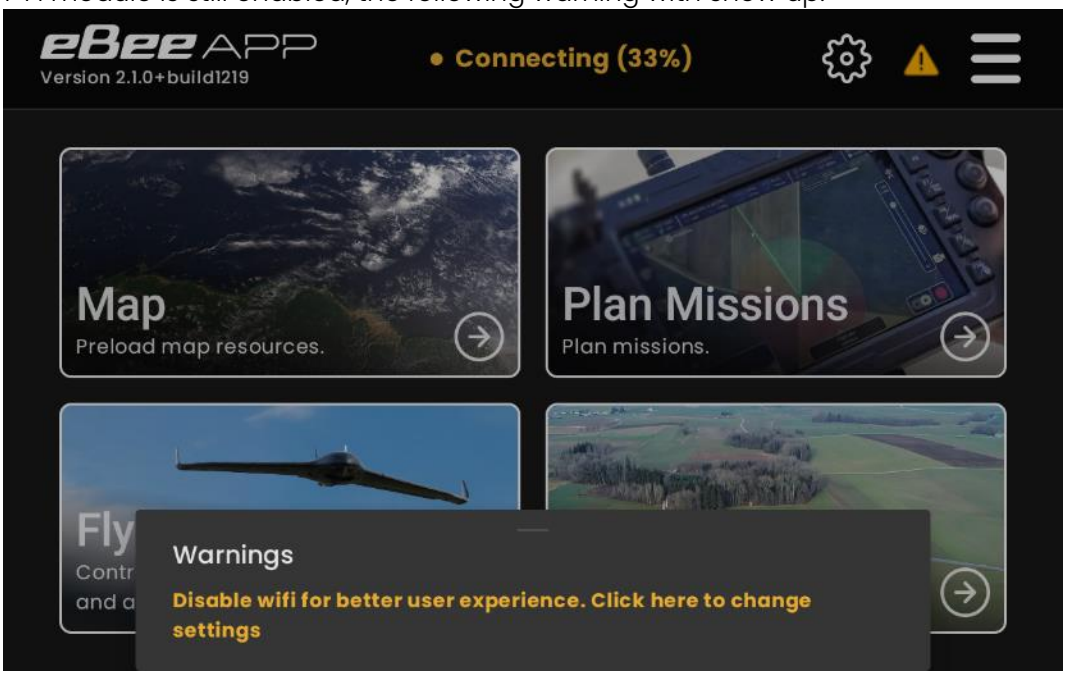
Situation	Action
Unstable flight	• Go land / STL
Air traffic	• Hold / fast descent / fast climb / fast escape
Altitude / location unreliable	• Go land / STL
Unexpected ground proximity detected	• Check drone altitude • Check flight parameters • Disable ground sensor for flight and landing in clouds or fog

8.3 Understanding the connection status

Connection status	Description
● Not connected	Nothing is connected
● Modem detected	The GCS's modem is detected, and GCS is communicating with it
● RF link set	The radio link between the modems of the GCS and the drone is established. Both modems are communicating together
● Connecting (66%)	GCS is connecting to the drone itself
● Connected	GCS is connected to the drone and communicating with it

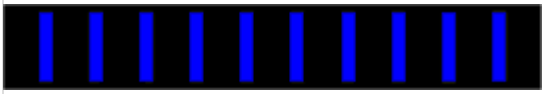
⚠ Warning

While the Wi-Fi connection can be used to connect the GCS to the Internet to preload map resources, it is necessary to disable it prior to connecting to the drone, as the Wi-Fi connection may interfere with the drone radio link.
If the Wi-Fi module is still enabled, the following warning with show up:



A click on the message will open the WI-FI settings to let you disable it.

8.4 Understanding the drone's LED

Drone's LED	Description
 Pulsing Blue	Initialization
 Constant Blue	Preflight checks running
 Constant Green	Ready for take-off
 Constant Red	Preflight check issue
 Blinking Yellow	Update in progress on the drone
 Blinking white twice	Drone shutting down
 Off	Drone Off

8.5 Understanding the battery's LED

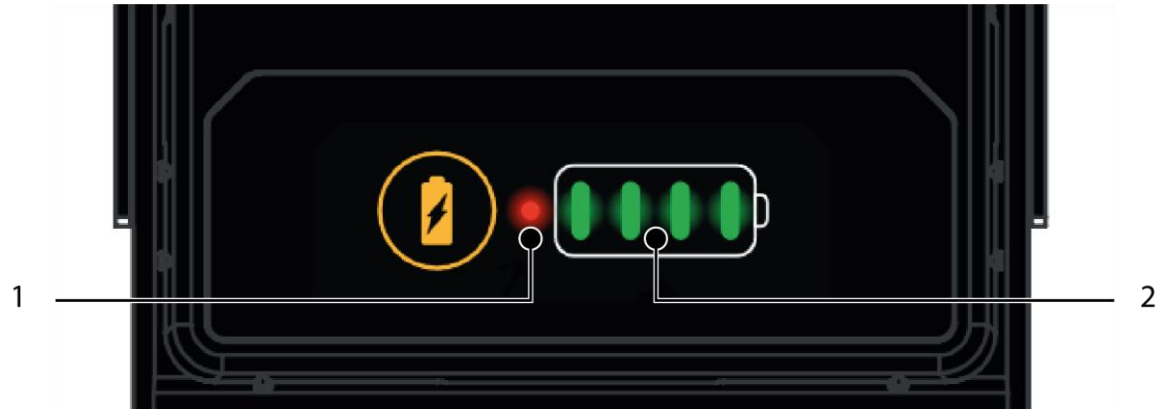


Figure 8-1 Battery LEDs description

(1) The red LED indicates an issue.

(2) Each green LEDs represent 25% of the charge.

8.5.1 Battery issues and Troubleshooting

The battery has onboard electronics continuously monitoring battery parameters. If it has encountered serious events potentially damaging to the battery, it raises an error (red LED) and prevents the user from using the battery. Most of these errors can be recovered by the user himself.

If the red LED is ON (whatever green LED is lit on) when pressing the battery button:

1 – Plug the battery on a charger and wait for 30s:

a- If the charger beeps once, the red LED is OFF, and the dock charging green LED is ON, the battery will begin charging. The error will be cleared, and the battery can be used normally

b- If the charger beeps 5 times or exhibits any other behavior not described in above section: the error cannot be cleared by charging, and the battery will not charge.

2 – If the error has not been cleared by the charger, plug the battery into a drone and try to switch ON the drone. If the drone can be switched on, it means the error was not critical, and the drone software may clear it. If the drone remains OFF and the battery still shows a red LED when pressing its button, then the battery cannot be recovered, please contact AgEagle customer support.

ⓘ	Note
• Some battery issues are auto recoverable. For example, if the cell temperature is below -20°C or above +75°C, the battery cannot be used, and the red LED will remain lit when the button is pressed as long as the battery temperature is out of range. The error will automatically be cleared once the battery temperature returns to its specified range.	

9 Legal

Read the whole user manual carefully before using an AgEagle product.

AgEagle products (the "Product(s)") are intended for professional use only.

Always comply with Civil Aviation regulations and other applicable laws, act responsibly and follow the instructions in your AgEagle User Manuals.

9.1 Regulations

All use of the product including, but not limited to, the use conforms to the applicable law of the country in which the product is operated, is under the client's sole responsibility.
The client should inform himself by reading this user manual before using the product.

9.2 Compliance with export control regulations.

Products may be subject to export control regulations. In which case:

- The Product must not be used to design, develop, manufacture or use any military equipment or any nuclear, chemical or biological weapons, nor missiles classified under the U.S. Munitions List, the Common Military List of the European Union and the Wassenaar Arrangement Munitions List.

- The Product must not be exported, re-exported, sold or transferred, either directly or indirectly, to any military end-user (defined as a national armed organization) or to anyone else if the Client is aware that the Product will be subsequently exported or transferred to a military end-user.

- The Client must comply with the dual use regulations if such regulations apply.

- The Client must declare that he/she is not a "Person subject to Sanctions" and must not export, re-export, sell or transfer the Product, either directly or indirectly, to any "Persons subject to Sanctions". A "Person subject to Sanctions" means a person, a company or entity appearing on the list of specially designated persons established by the Security Council of the United Nations, the United States of America and the European Union.

- The Product must not be exported, re-exported, sold or transferred, either directly or indirectly to any "Country subject to Sanctions". A "Country subject to Sanctions" means a country subjected to international economic sanctions adopted and applied by the Security Council of the United Nations, the United States of America and the European Union.

9.2.1 FCC compliance statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection

against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment under the following conditions:

1. This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) and user's/nearby person's body at all times.
2. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
AgEagle company is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

9.2.2 ISED Canada compliance statement

This equipment complies with RSS102's radiation exposure limits set forth for an uncontrolled environment under the following conditions:

1. This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) and user's/nearby person's body at all times.
2. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

9.3 Limited warranty

SenseFly SA (the "Supplier") warrants that the delivered Product will be free from defects in workmanship and materials for a period of twelve (12) months from the date of shipping by SenseFly SA to the original Client. During the Warranty Period, should the covered Product, in the Supplier's sole opinion, malfunction due to any defect in material and/or workmanship, the Client's

sole remedy and the Supplier's sole liability shall be, at Supplier's option, to either repair or replace the malfunctioning Product with a similar product at no charge, or if repair or replacement is not possible, issue a credit note; provided that the malfunctioning product is returned, with proof of purchase in the form of the Client's original copy of the sales receipt, within the applicable Warranty Period.

Warranty does not apply, without limitation, in case:

- The delivered items are not stored, maintained or used according to their specifications,
- The delivered items are damaged due to carelessness, misuse, negligence, or wrong use by the user,
- For defects due to normal wear and tear including, but not limited to, normal degradation, misuse, moisture or liquids, dust, proximity or exposure to heat, accidents, excessive strain, abuse, neglect, misapplication, non-authorized repairs or modifications, damage due to rain, water or humidity, or other causes for which SenseFly SA is not answerable,
- The delivered items are damaged during shipping. The warranty is void if the Product has been tampered with or opened.

Battery cells are excluded from warranty after first use.

The warranty shall be subject to the condition that the Client submits the Product, every 200 hours of Product flight, to the Supplier or to a Supplier-Authorized Service Centre for a service in accordance with maintenance schedules and service instructions. A service may be performed in advance provided however that the next service is performed within the above-mentioned time interval. It is the Client's own responsibility to monitor the number and duration of flights and decide when the maintenance check must be performed.
Any cost in relation with scheduled maintenance and service instructions, other than the return shipping costs, shall be borne by the Client only. The Product is always shipped at Client's sole risk, even in case of free delivery. The Supplier is responsible for loss or damage to the Product only when the Product is in the Supplier's premises.
The Client shall make available to the Supplier, at the Supplier's request, all data regarding maintenance parameters. The Client further agrees and acknowledges that the Supplier is entitled, at any time, to access, analyze and use all data available on the Client's Account regarding the maintenance parameters. If such data are not available for a reason over which the Supplier has no control or responsibility, including but not limited to an external service provider issue, network fault or power failure, the Supplier is under no obligation to provide the Limited Warranty coverage until such data is made available.
It is the Client's responsibility to check that the Product is compliant with applicable requirements under local laws and regulations. Before using the Product, the Client shall make any and all necessary checks to ensure that any additional provisions required by international or local authorities are taken into consideration and carried out.

There are no express or implied warranties, representations, or conditions other than those stated in this Limited Warranty. This Limited Warranty is made in lieu of all other warranties, representations, or conditions, whether expressed or implied, including without limitation, merchantability or fitness for a specific purpose.
The remedy set forth herein shall be the sole, exclusive remedy by SenseFly SA with respect to the Product.

9.4 Limitation of liability

Under no circumstances will the supplier be liable for any direct, indirect, special, incidental or consequential damages (even if the supplier is notified of the possibility of such damages) including, but not limited to, any crash or damages caused by the client or a third party while operating or using the product(s) (including simultaneous flights of products using a single instance of the software, encryption mode) and any damages caused by failure of the autopilot, electronics or software (even if caused by a malfunction of the product, autopilot, electronics or software), any loss of revenue, loss of profit, or loss of data whether based upon any alleged breach of warranty, representation or condition, contract, or any other conduct including negligence (intentional or otherwise), giving rise to such claim. The client shall not operate the product(s) in areas or under circumstances where a failure could cause damages or/and harm to people, property or/and animals.

9.5 Intellectual property rights

SenseFly SA Products and software are protected by intellectual property rights. SenseFly SA is the proprietor and legal and beneficial owner and/or the authorized licensee of any intellectual property rights within the Products, and SenseFly SA is entitled to the benefit of all applications made for the grant of SenseFly SA Intellectual Property Rights. SenseFly SA, eBee and related logos are registered trademarks of SenseFly SA. You may not use or register, in whole or in part, registered trademarks without express authorization from their respective owner.

9.6 Copyrights

SenseFly SA reserves the right to make changes to the terms, specifications and product descriptions contained in this document at any time without notice.

9.7 Technical support

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Website: http://www.ageagle.com

SenseFly SA and our resellers provide you with full professional product support. To submit a support ticket, please use our support website https://ageagle.com/support/.