AgEagle

eBee VISION

eBee VISION - User manual

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AgEagle | Route de Genève 38, 1033 Cheseaux-sur-Lausanne, Switzerland

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1 eBee VISION system description

1.1 Drone

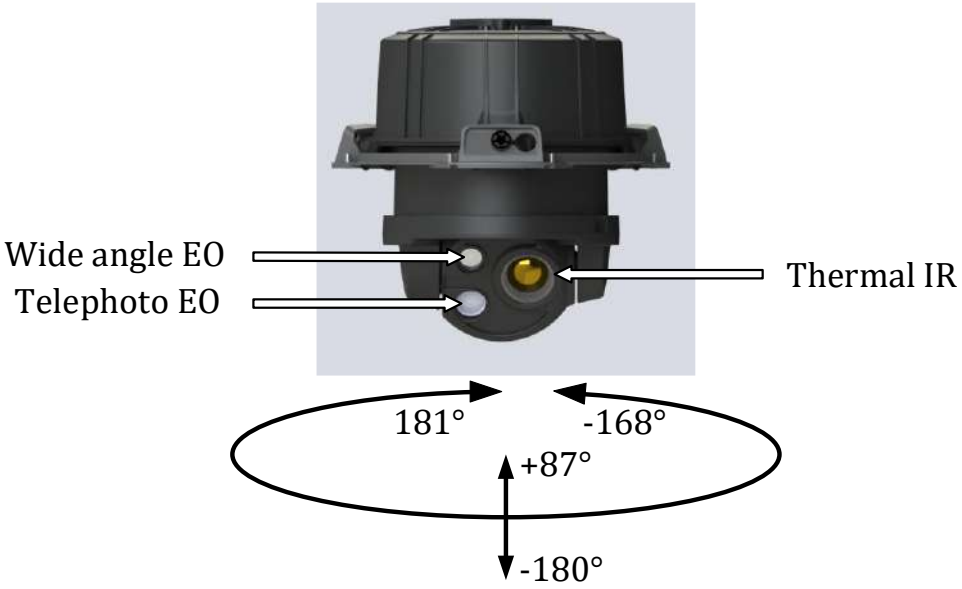
Weight	1.6 kg / 3.5 lbs
Wingspan	120 cm / 47 in
Cruise speed (airspeed)	13.5–20 m/s / 30-45 mph
Endurance	Up to 90 min (detail in 4.2)
Take-off	Hand-launch
Glide ratio	10
Landing	Autonomous Silent Tactical Landing (STL)
Wind resistance	17 m/s / 38 mph
Rain resistance	light rain resistant
Operating temperature	-10 °C to +49 °C / +14 °F to +120 °F
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)

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.

Range	Short: 5 km / 3.1 mi Ultra compact: 15 km / 9.3 mi Extrernal: 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



Wide angle EO / RGB camera	SONY IMX230 1/2.4'' Video: 4K HDR (24 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: 4K HDR (24 fps) Photo: 21 MP Zoom: 4.9x => 32x Focal length: 16mm FOV 21° x 12° F2.4 aperture
Thermal IR	FLIR BOSON 640x512 Focal length: 18mm FOV: 24° x 19° Frequency: 30Hz 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 present, high-resolution data will be recorded in the SD card.
Videos:

- EO: 1080p H.264 proprietary metadata format + subtitles with bearing, coordinate of target, UTC
- EO/IR blending: 720p H264 proprietary metadata format + subtitles with bearing, coordinate of target, UTC

Pictures:

- EO: 16MP (lower if zoomed) images with geotag in exif
- EO/IR blending: 16MP (lower if zoomed) images with geotag in exif
- IR: 0.9MP no geotag

1.4.2 GCS internal memory

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

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

Pictures:

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

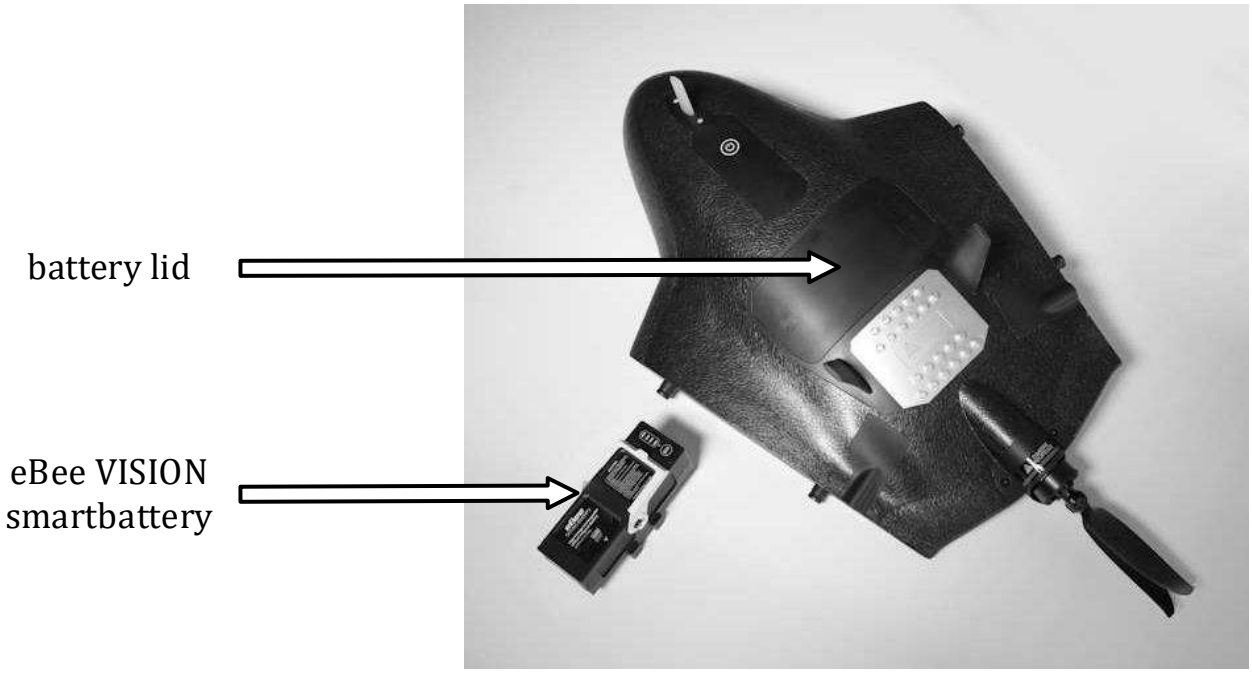
2 System assembly and disassembly

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	



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.	

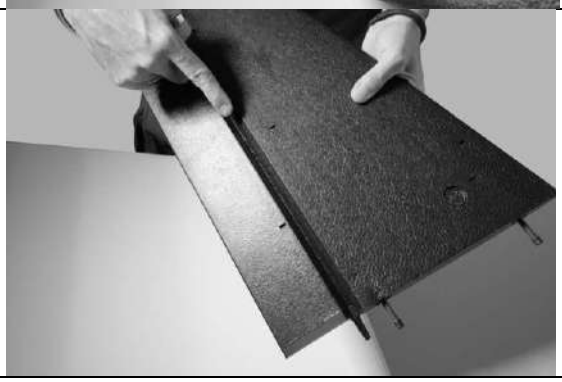
Lift-up the battery handle.	
Place the battery into the battery bay and push it down to connect it.	
Secure the battery by closing down the battery handle.	
insert the tabs of the battery lid in the notches.	
Close the battery lid.	

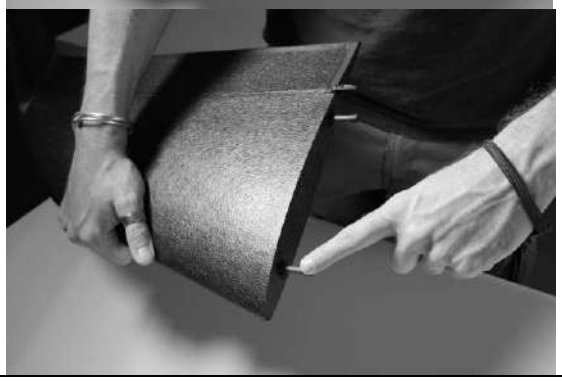
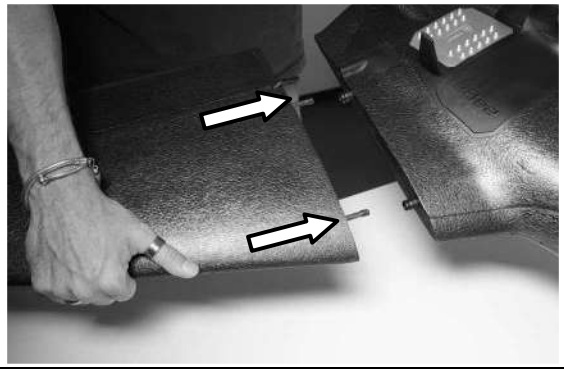
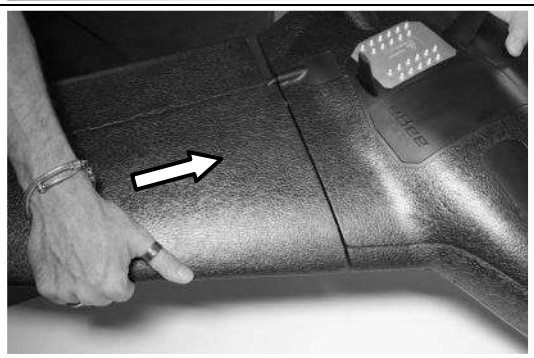
Secure it by clicking on the marked area.	

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.	

ⓘ	Note
• Most of the damage on a wing can be repaired with duct tape.	

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.	

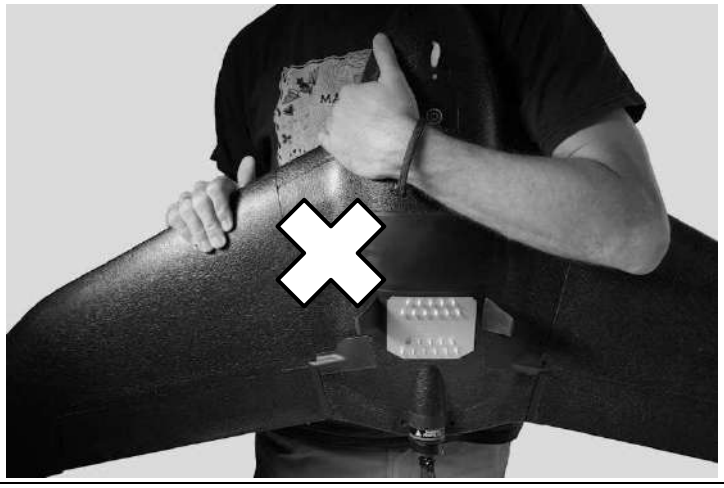
2.1.4 Wings disassembly

Hold eBee VISION against your body and grab the wing close to the winglet.	
Pull to remove the wing.	
Switch hands.	

Pull to remove the wing.	

ⓘ	Note

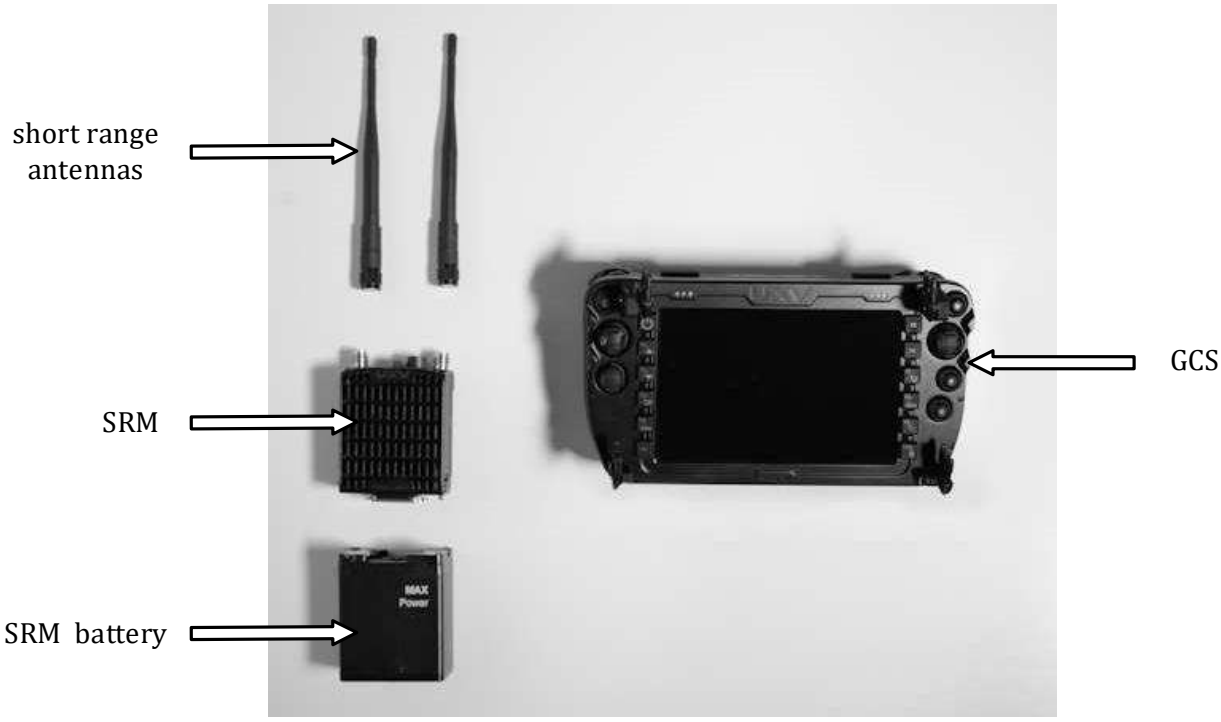
- Using another position can damage the carbon rods over time, especially when holding the wing too close to the body.



2.2 GCS

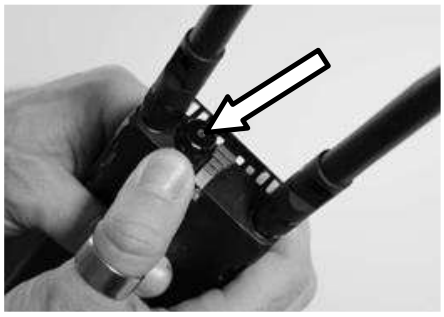
2.2.1 Short range antenna assembly

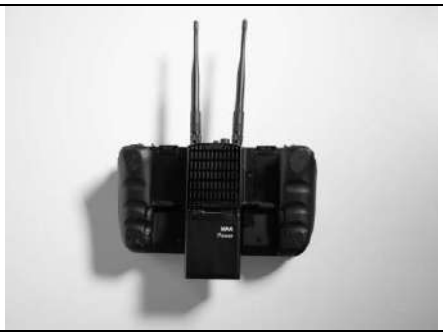
Short range setup is composed by the following elements:



⚠	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.	

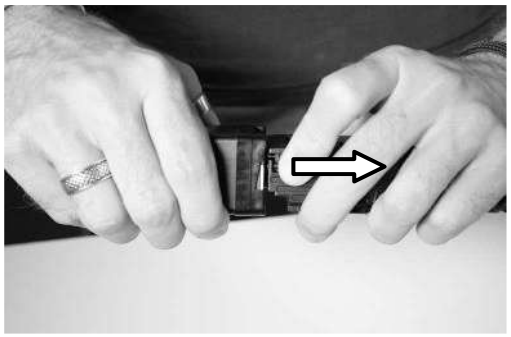
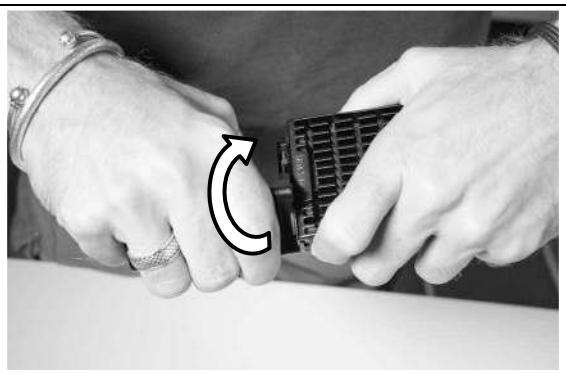
Final setup.	

ⓘ	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.	

2.2.2 Short range setup disassembly

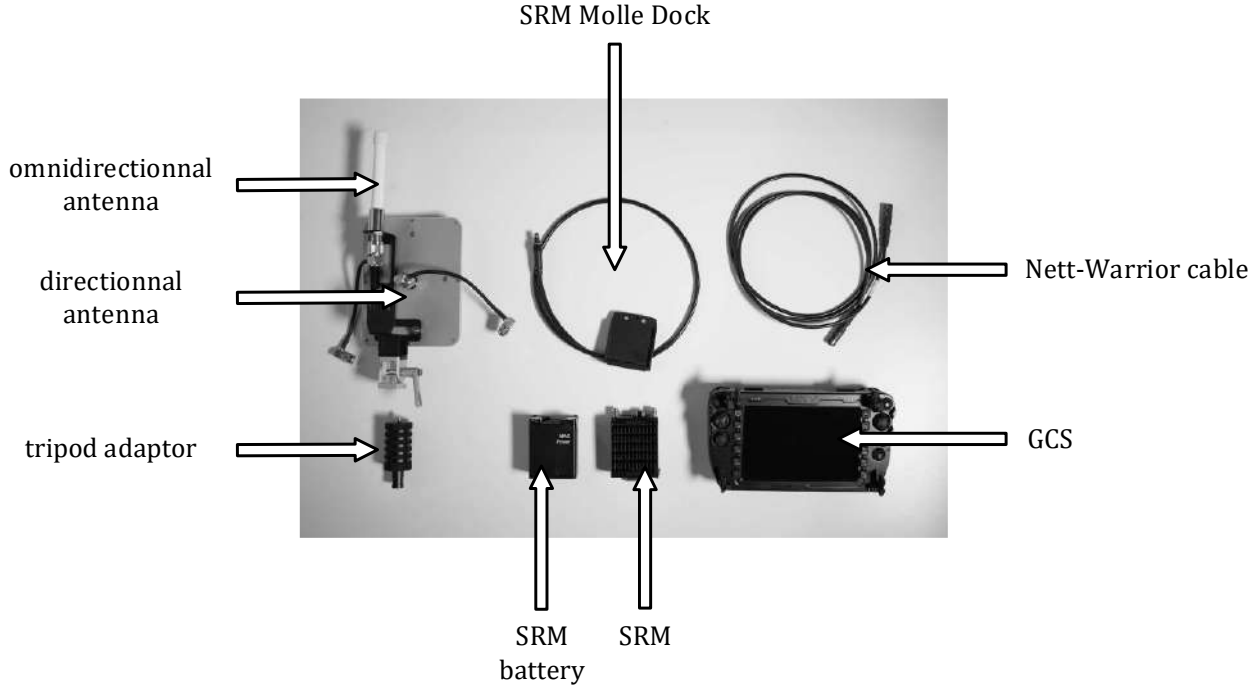
⚠	Warning
• Always turn-off the SRM before removing the antennas to prevent permanent damage.	

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.	

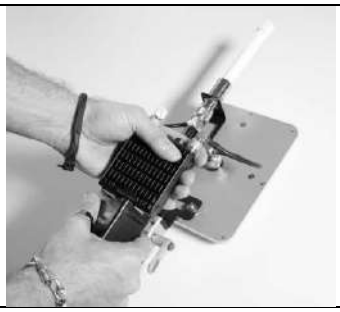
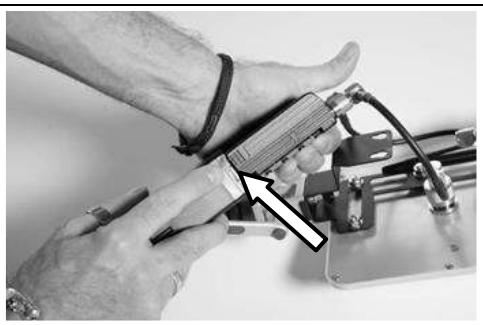
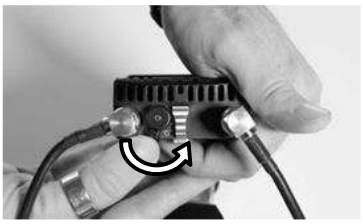
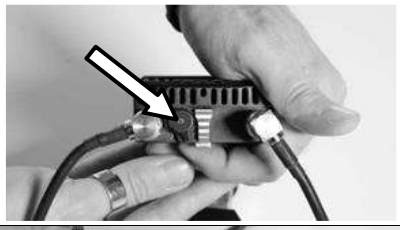
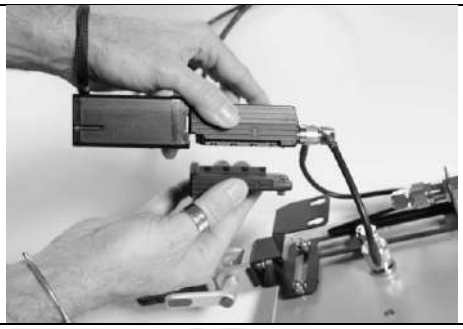
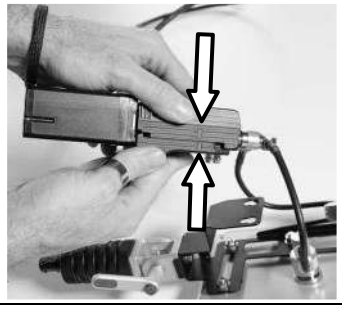
2.2.3 Ultra compact antenna setup assembly

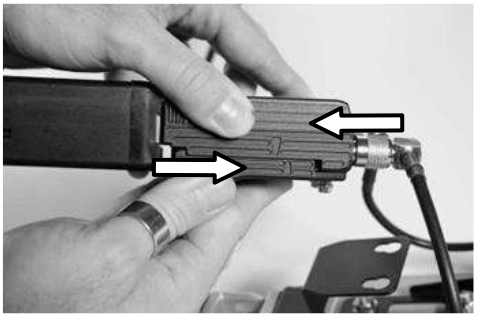
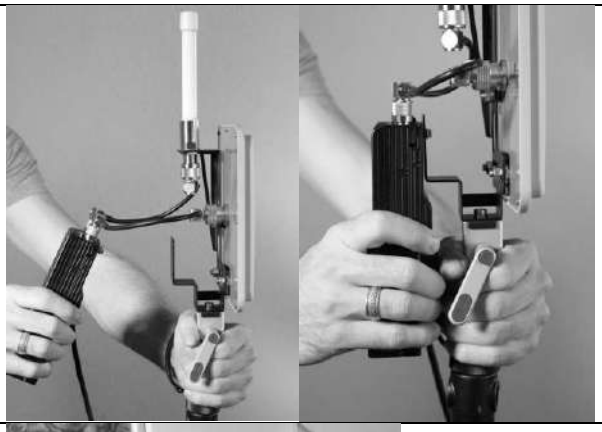
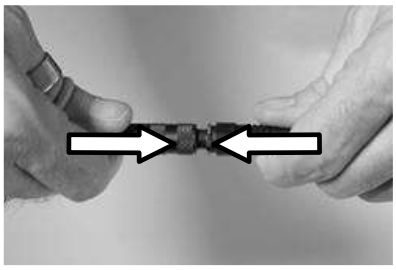
The ultra compact antenna setup is composed of the following elements:

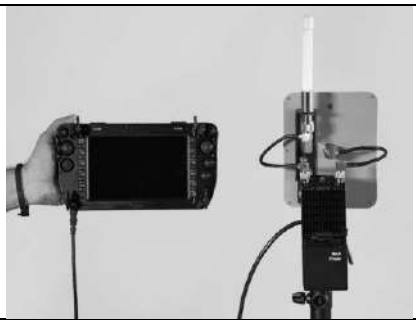


⚠	Warning
• Powering the SRM without antenna can cause permanent damage	

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

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.	

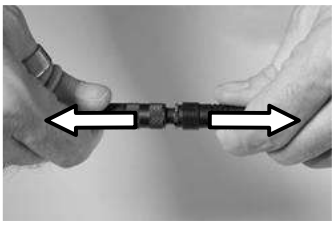
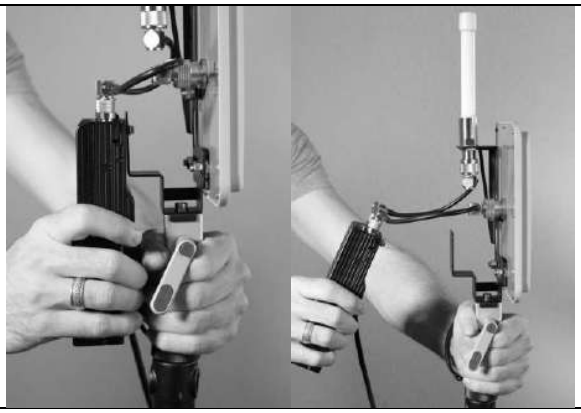
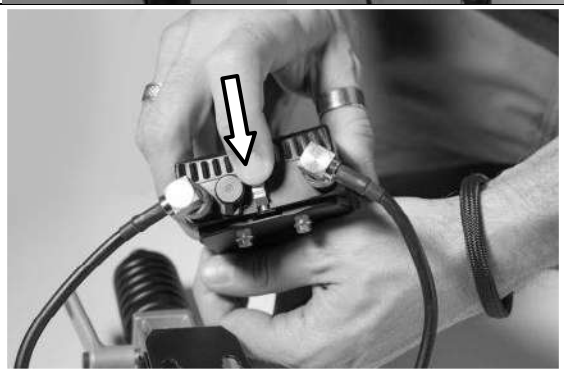
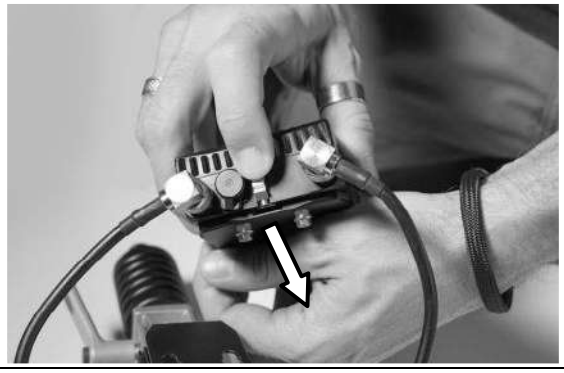
Slide the SRM into the SRM molle dock.	
Attach the SRM molle dock to the antenna holder.	
Fix the antenna mount on the tripod and secure it with the screw.	
Plug the SRM molle dock connector into the nett-warrior cable using the red marking to get the right position.	
Plug the other end of the Nett-Warrior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

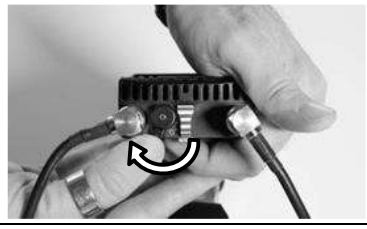
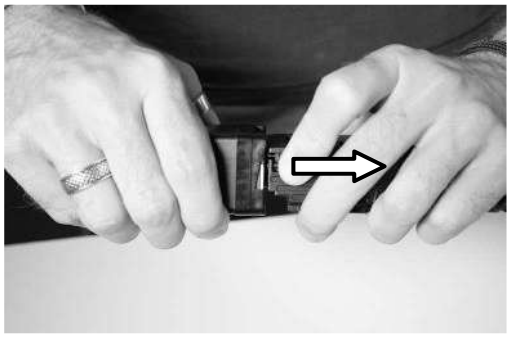
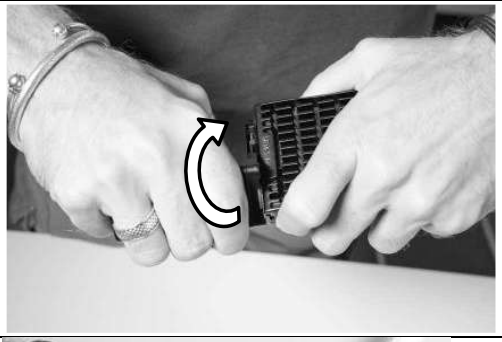
Final setup.	

ⓘ	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.	

2.2.4 Ultra compact antenna setup disassembly

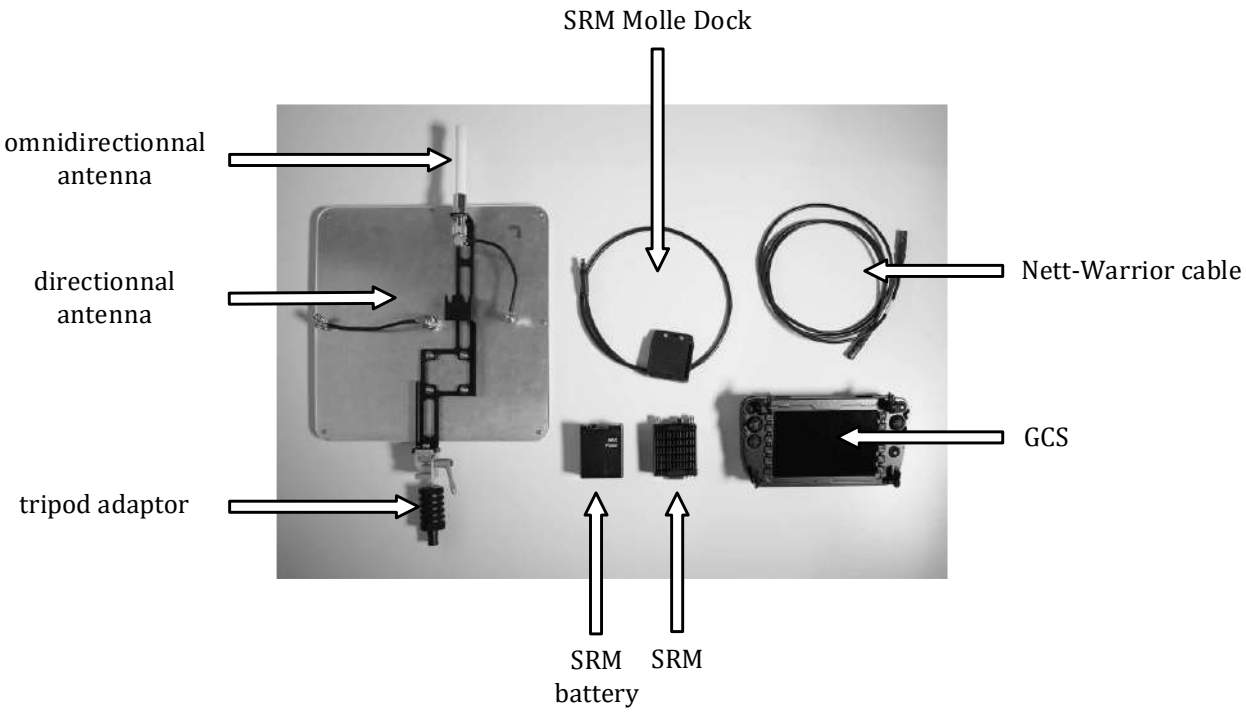
⚠	Warning
• Always turn-off the SRM before removing the antennas to prevent permanent damage.	

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.	

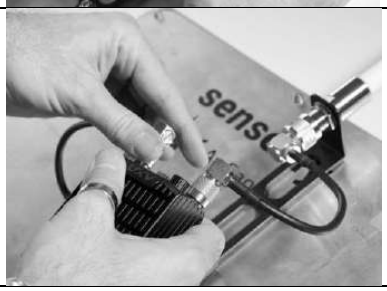
Turn-off the SRM.	
Pull the pin to unlock the SRM battery.	
Twist the SRM battery to disconnect it.	
Unscrew antenna.	
Unscrew second antenna.	
Unscrew the tripod adaptor.	

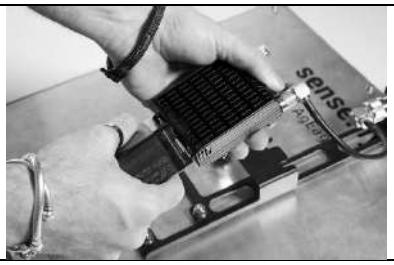
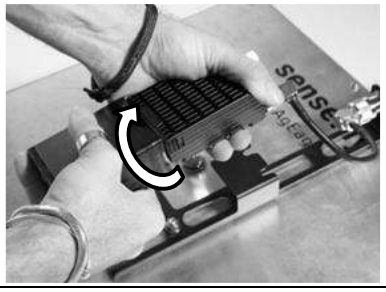
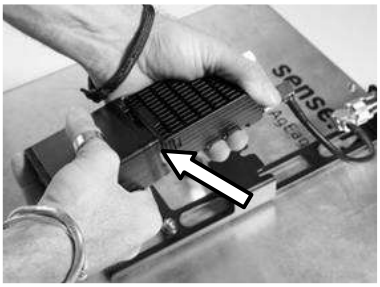
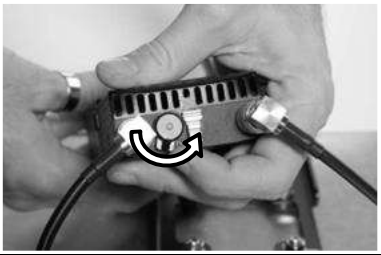
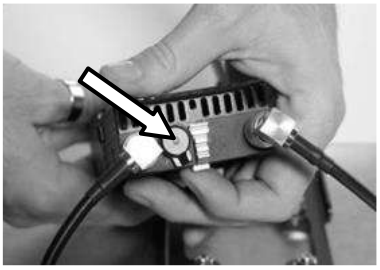
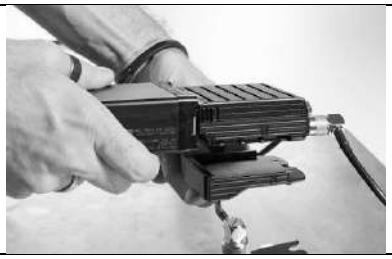
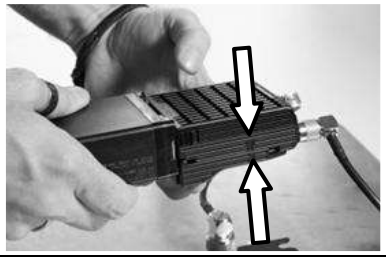
2.2.5 External antenna setup assembly

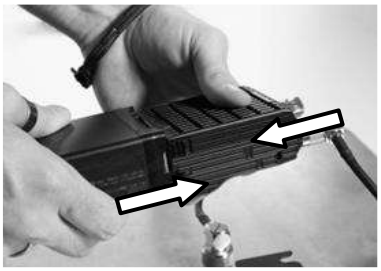
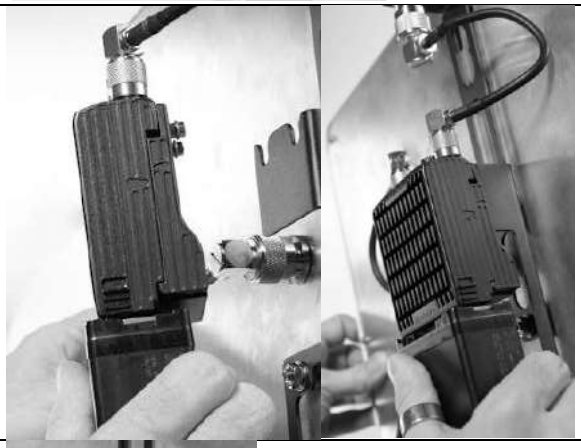
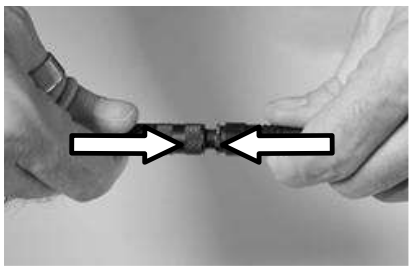
The external antenna setup is composed of the following elements:

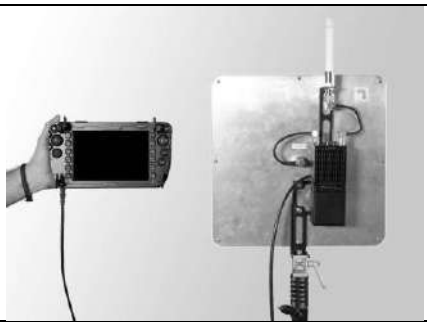


⚠	Warning
• Powering the SRM without antenna can cause permanent damage	

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

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.	

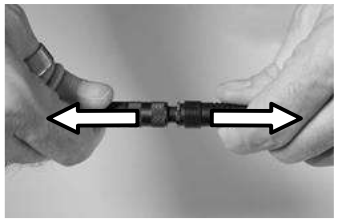
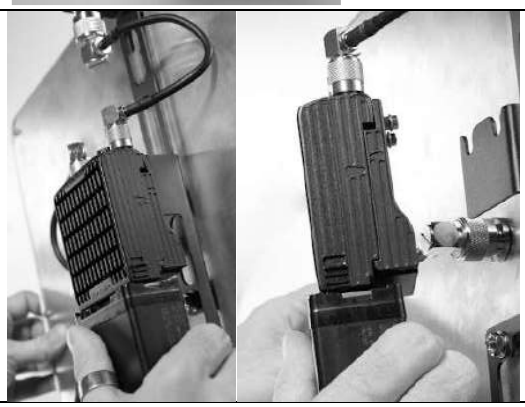
Slide the SRM into the SRM molle dock.	
Attach the SRM molle dock to the antenna holder.	
Fix the antenna mount on the tripod and secure it with the screw.	
Plug the SRM molle dock connector into the nett-warrior cable using the red marking to get the right position.	
Plug the other end of the Nett-Warrior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

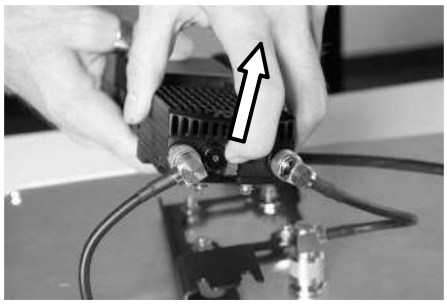
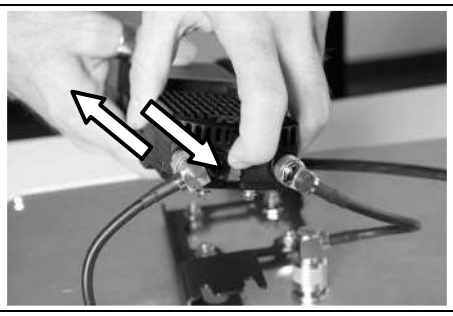
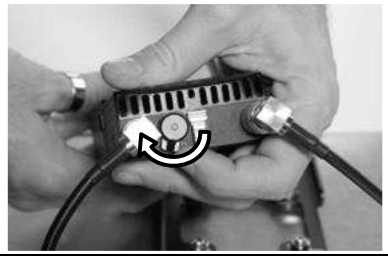
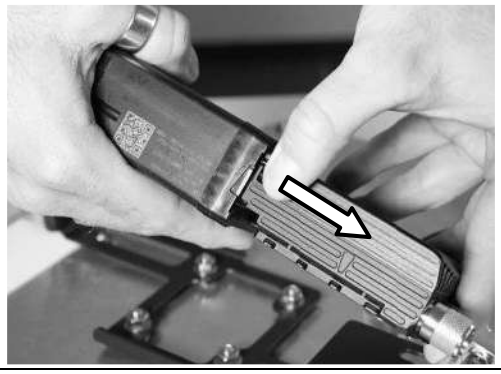
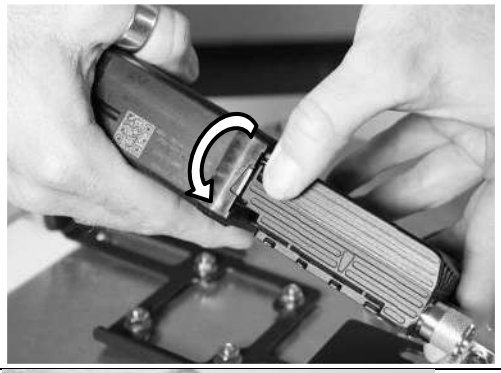
Final setup.	

ⓘ	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 External 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.	

Unscrew omnidirectional antenna.	
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

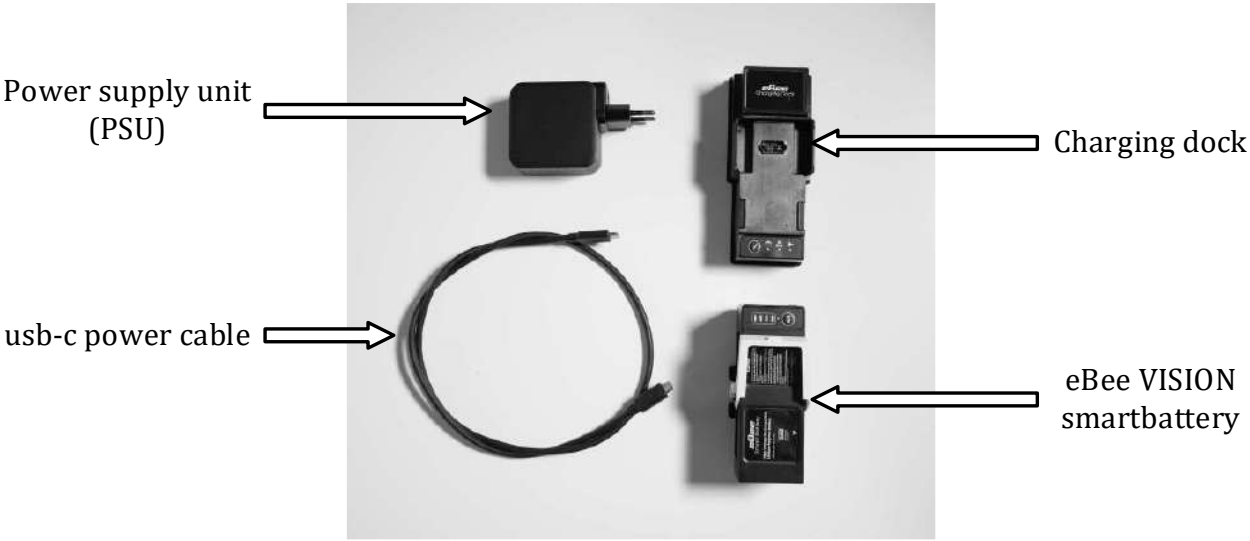
Drone battery is a Li-Po 15.4V , 4550mAh.

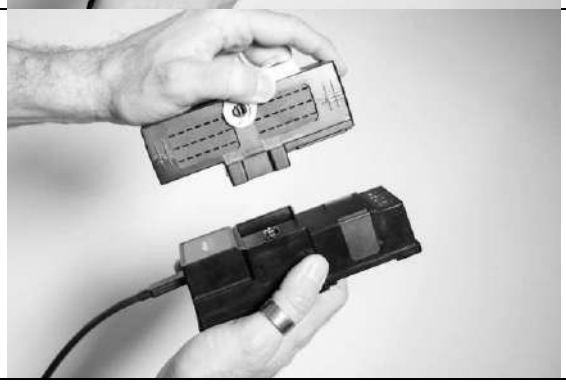
2.3.1.2 Drone battery charging

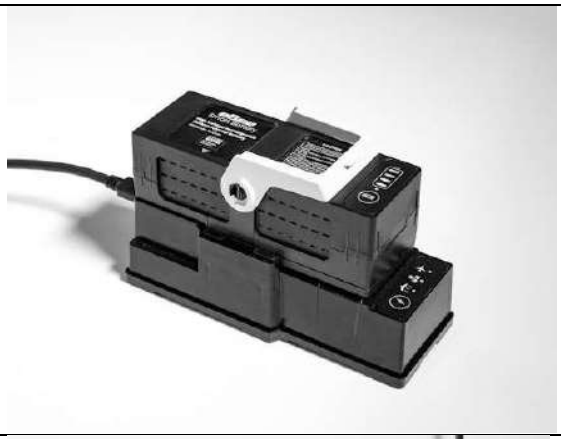
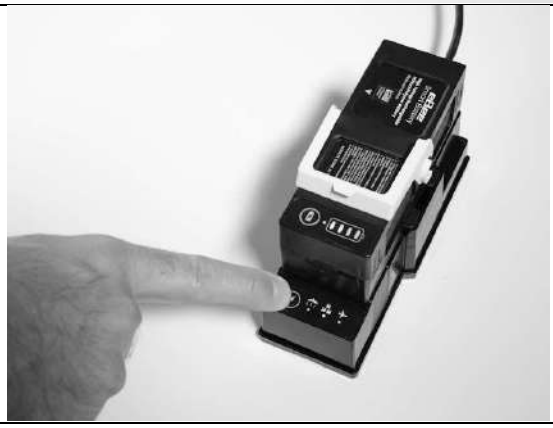
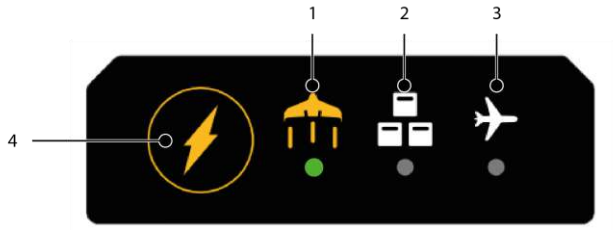
⚠	Warning

- 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:



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. • 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

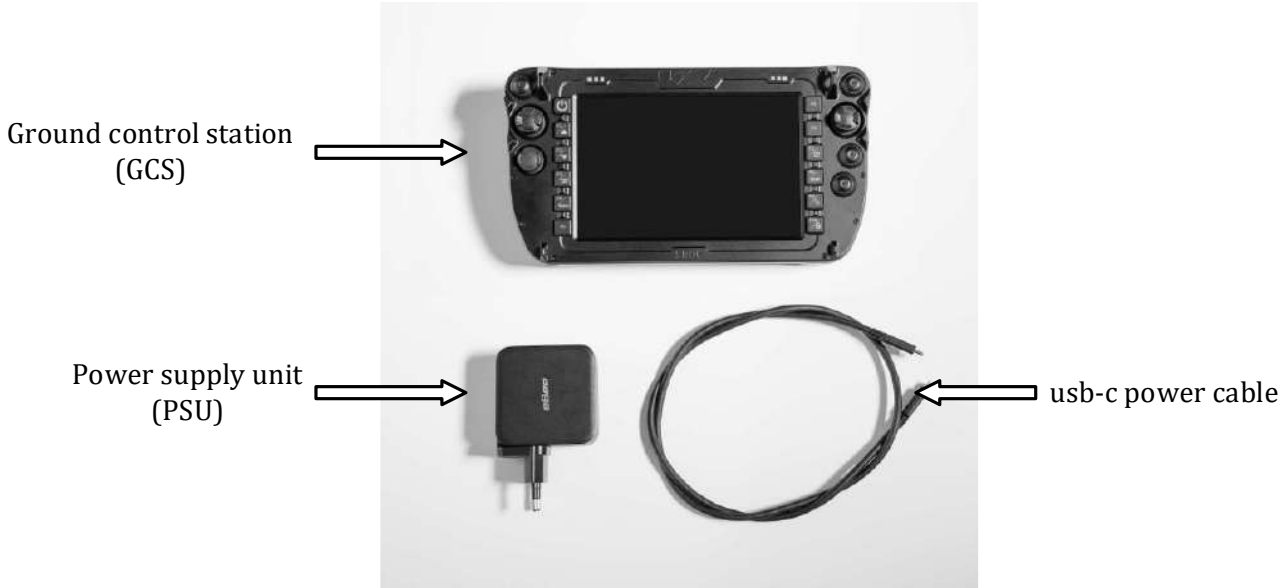
2.3.2 GCS battery

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:



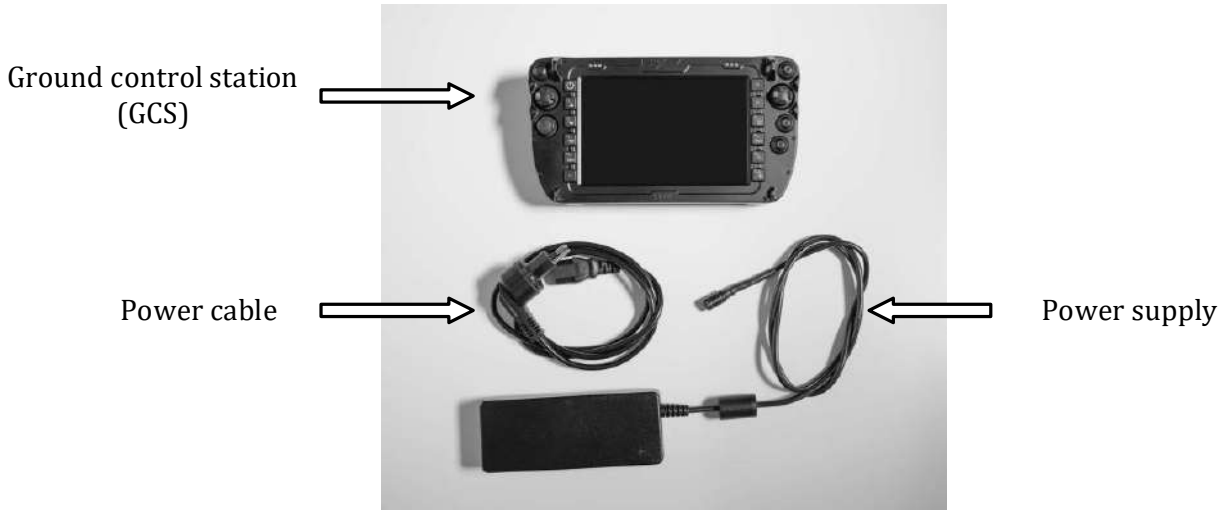
Plug the USB-C cable in the PSU.	

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 powerbank 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:



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 powerbank to recharge on the field.	

2.3.3 SRM battery

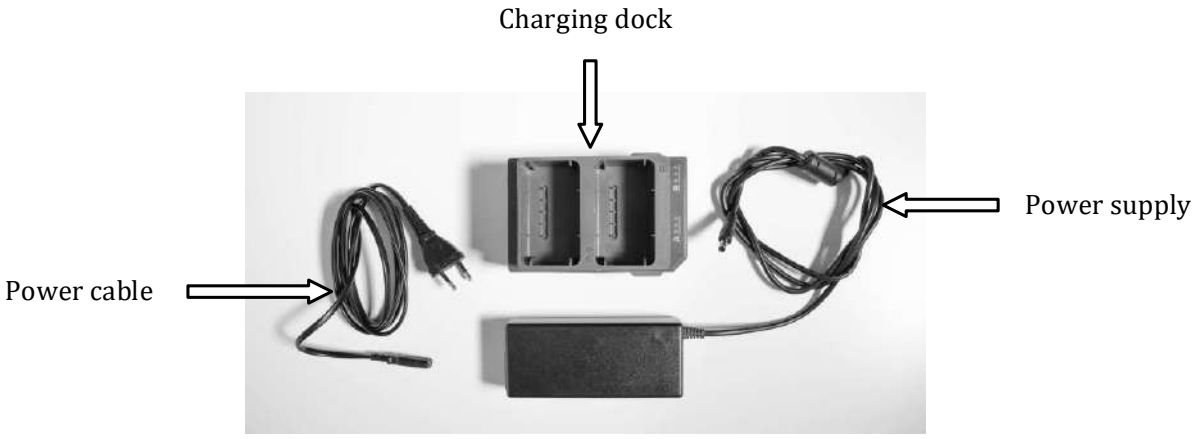
⚠	Warning
• Always use the SRM battery within its operating range (-30 °C to +60 °C / -22 °F to +140 °F) • Using the SRM battery outside those conditions will affect its safety and lifespan and may cause spontaneous combustion or permanent damage. • Do not use SRM battery in strong electrostatic (such 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).	

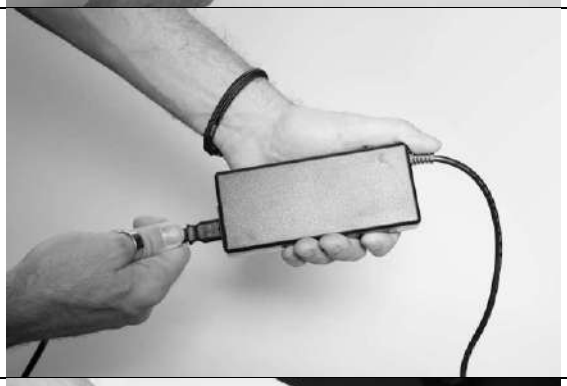
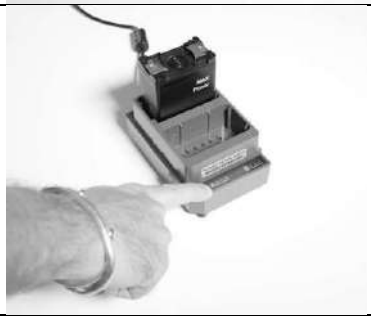
2.3.3.1 SRM battery properties

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:



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

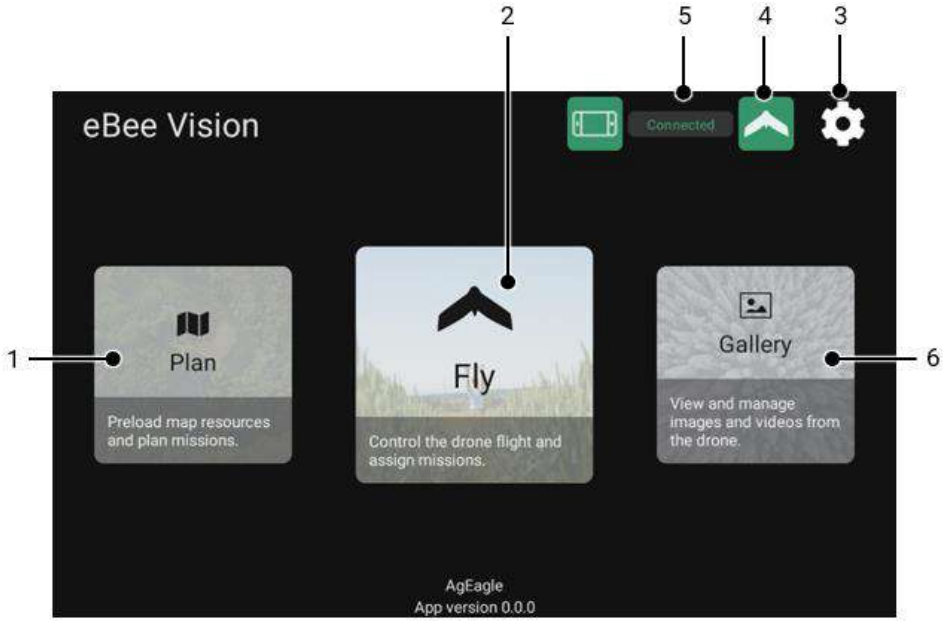
Battery must be stored at a temperature in range (+10 °C to +49 °C / +50 °F to +120 °F).
Battery must be stored in a dry, ventilated environment.

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 Operating eBee VISION

3.1 Home screen



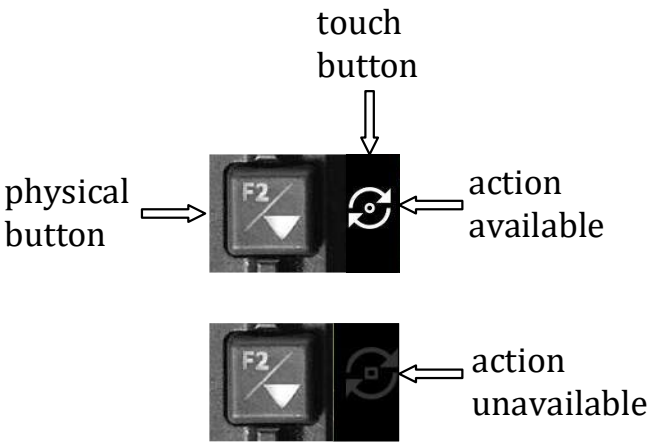
1. **Plan:** Map resources and flight planning
2. **Fly:** operate eBee VISION
3. **Settings**
4. **Information:** system information and logbook
5. **Connection status**
6. **Gallery:** manage data from the system.

3.2 Piloting interface

3.2.1 GCS commands

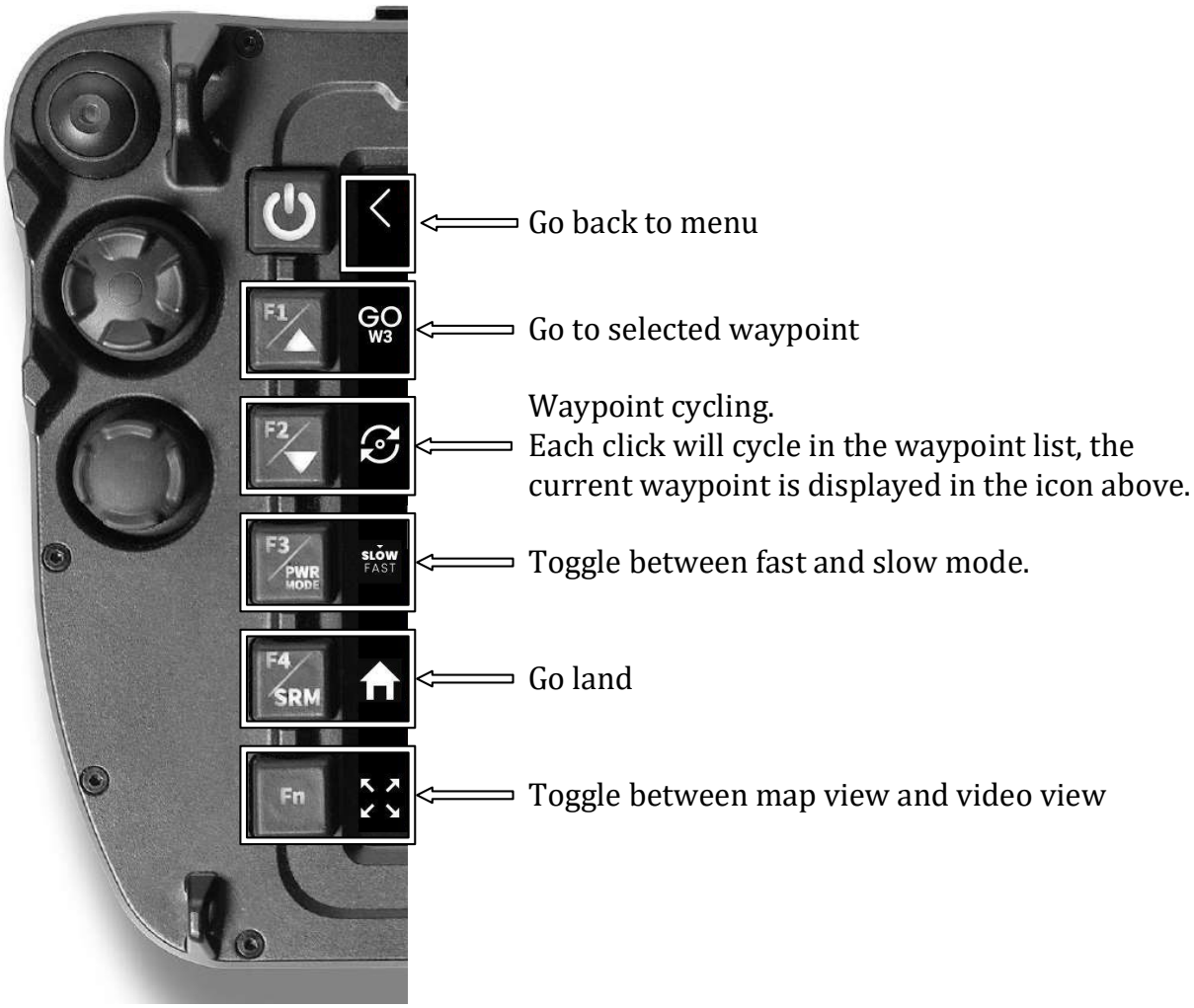
3.2.2 Functions buttons & functions ribbons

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.



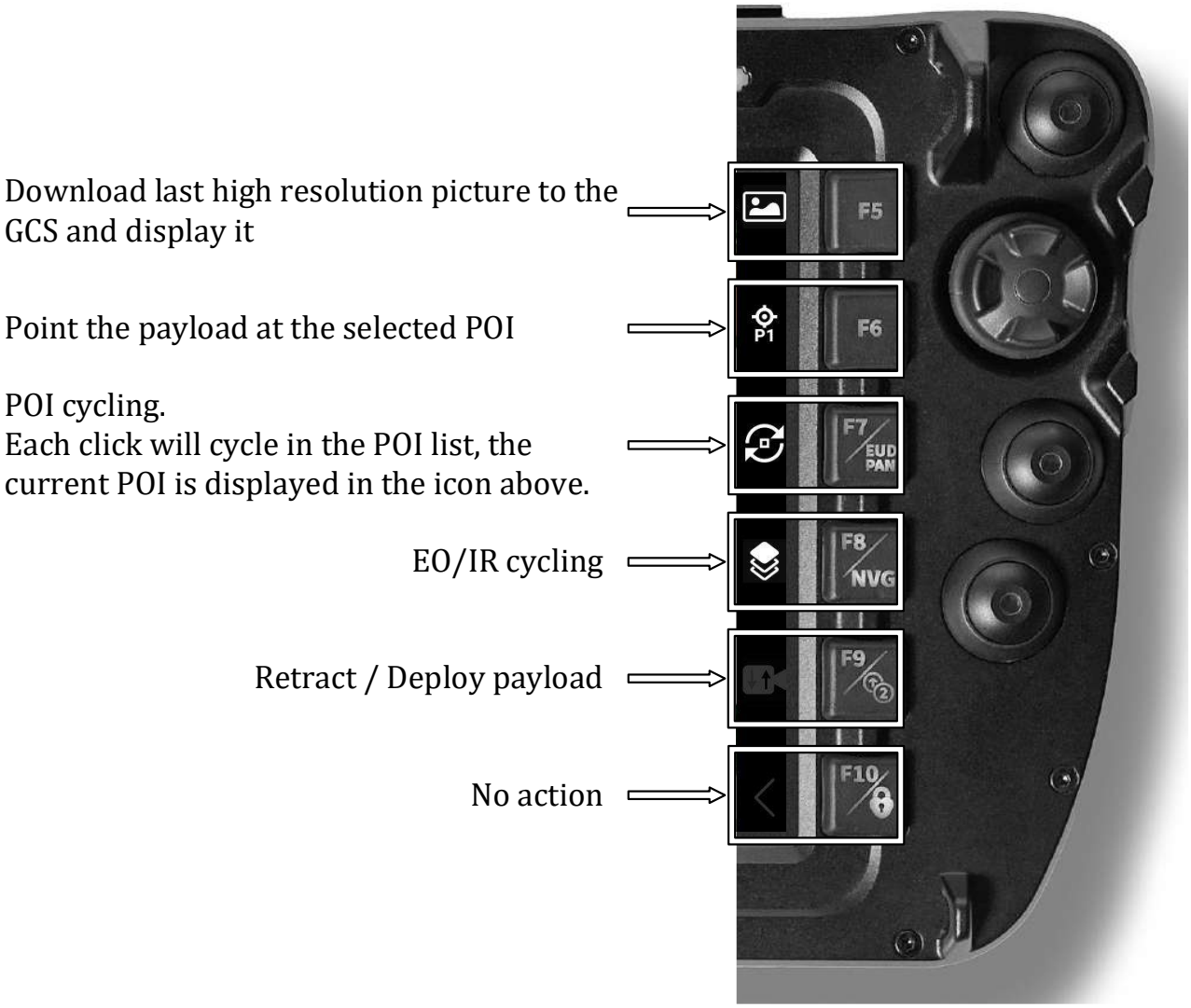
3.2.2.1 Drone functions

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



3.2.2.2 Payload functions

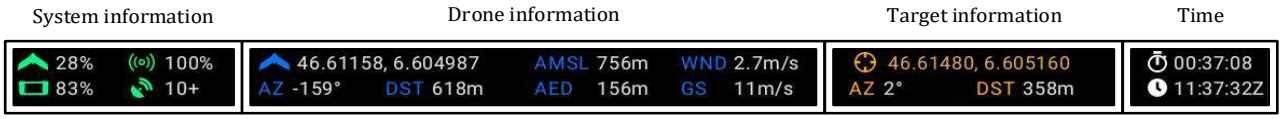
The right side of the GCS is dedicated to payload functions.



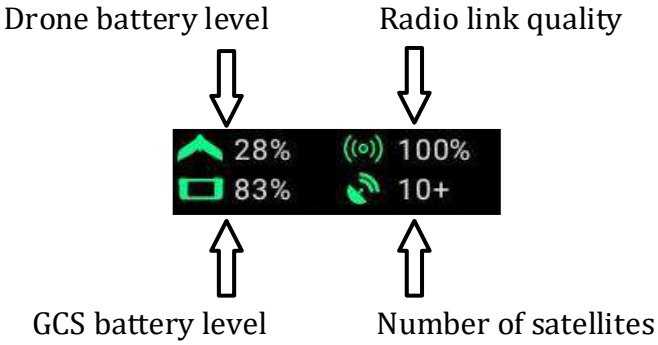
3.2.3 Telemetry ribbon

The telemetry ribbon is composed of 4 sections:

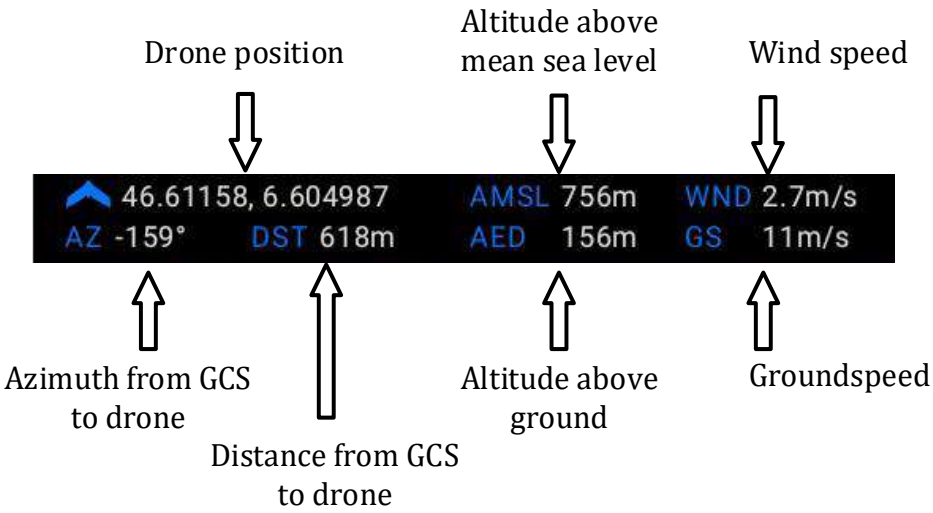
- System
- Drone
- Target
- Time



3.2.3.1 Telemetry ribbon: system information

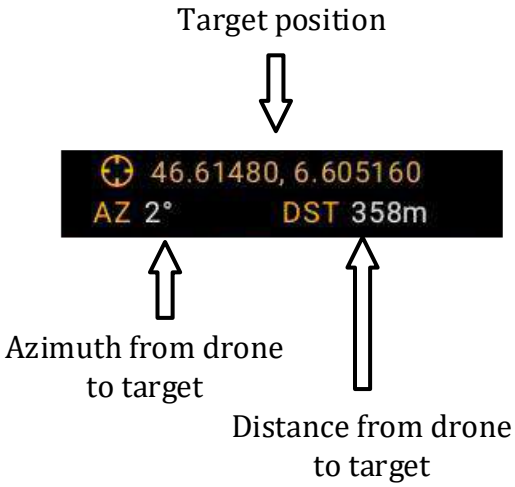


3.2.3.2 Telemetry ribbon: drone information



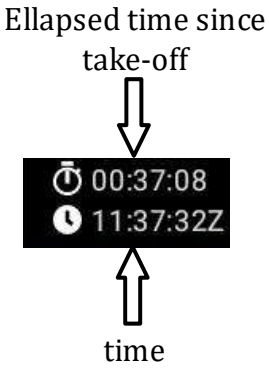
ⓘ	Note
• Click on the drone position to center the map on the eBee VISION • Altitudes can also be checked by using the terrain profile (click on secondary drone control joystick) • Units can be changed in the interface settings (detail in 3.6.1)	

3.2.3.3 Telemetry ribbon: target information



ⓘ	Note
• The color of the target position reflects the estimated precision (detail in 4.4) • Units can be changed in the interface settings (detail in 3.6.1)	

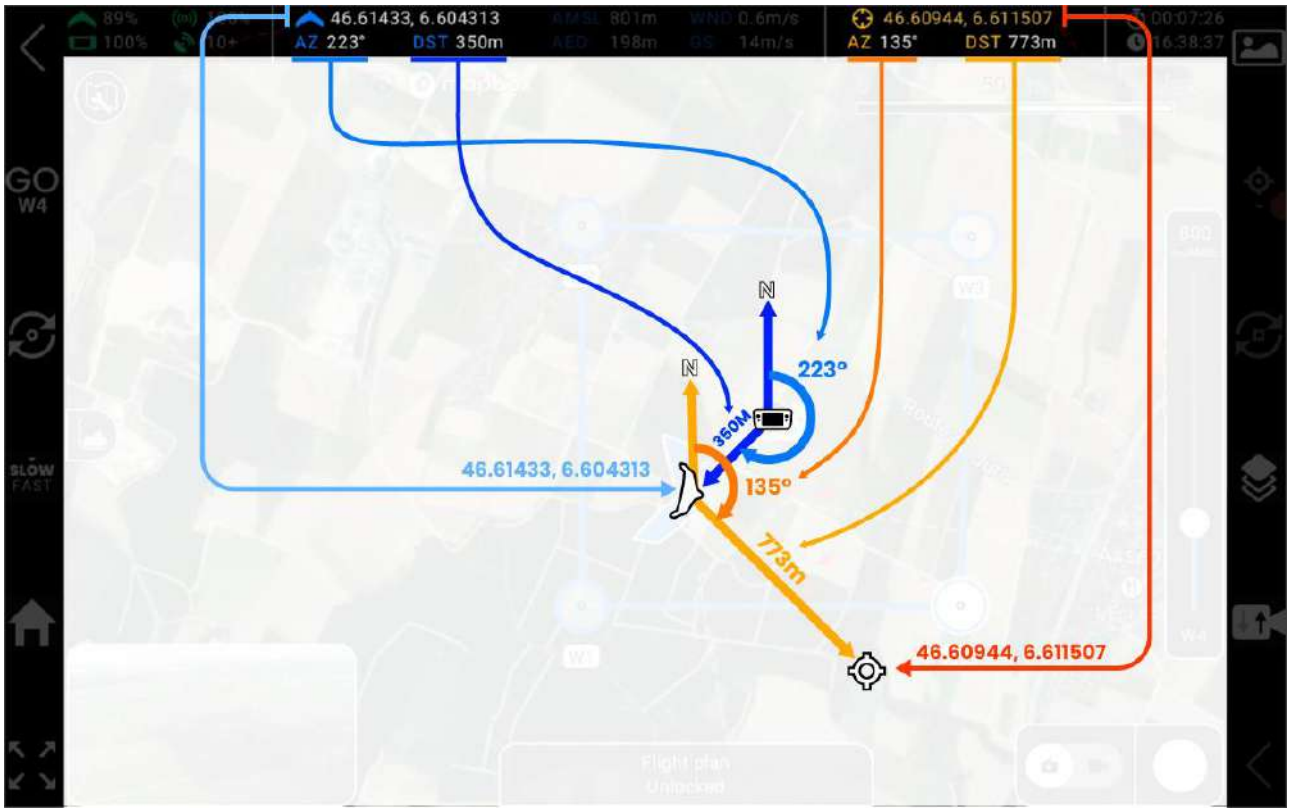
3.2.3.4 Telemetry ribbon: time



ⓘ	Note
• Time reference can be changed in the interface settings (detail in 3.6.1)	

3.2.3.5 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.



3.2.4 Pilot views

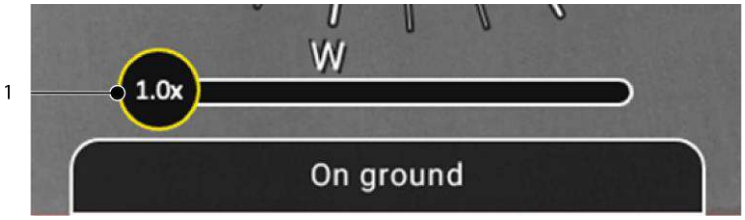
Pilot can switch between video and map view. All the eBee VISION app is thought so that the operator can focus on the video view and needs to switch to map as little as possible.

3.2.4.1 Map view:

3.2.4.2 Video view:

(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.



ⓘ	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.	

3.2.5 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.

3.2.6 Status bar

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

3.2.6.1 eBee VISION states

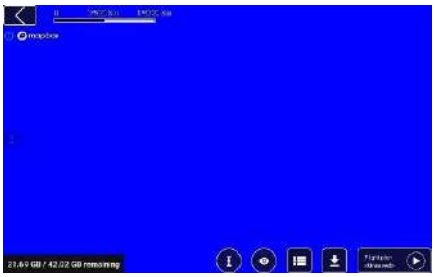
Title	Description
On ground	Drone is on the ground, running its preflight checks.
Ready for take-off	Drone is on the ground ready for take-off.
Motor ramping	Drone motor is ramping up and payload is calibrating.
Taking-off	Drone is climbing before being able to begin a user action
Hold	The drone is performing 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)

3.2.6.2 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.

3.3 Mission preparation

When entering the plan menu for the first time no data is loaded in the GCS, which will result in a blue screen.

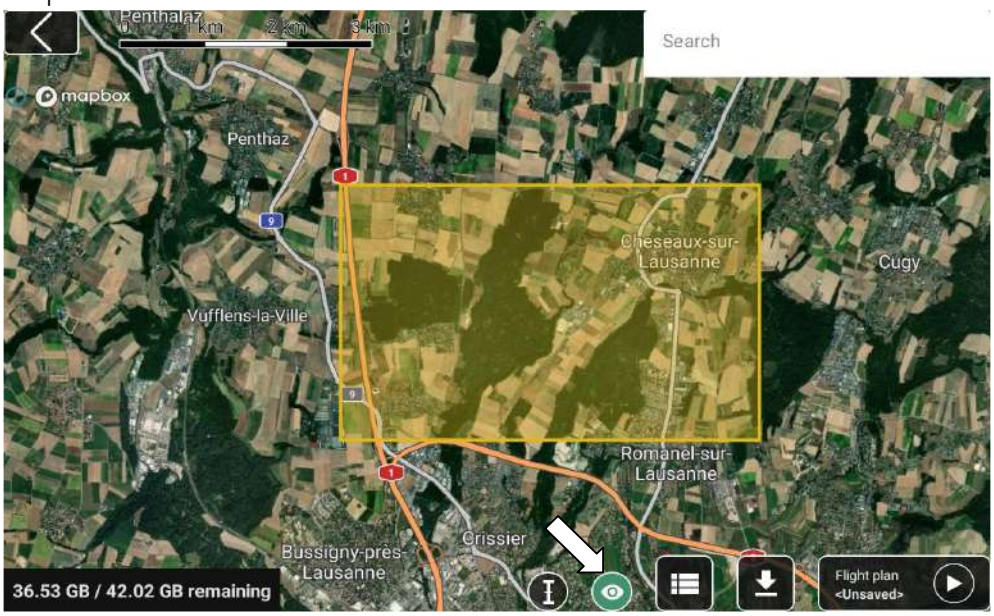


3.3.1 Import map and elevation data

Maps and elevation data can be downloaded from mapbox or loaded locally in the GCS.

3.3.1.1 Download from mapbox

1. Connect the SRoC to the internet using Wi-Fi.
2. The app will start displaying mapbox data.
3. Select the desired location by finger navigation or using the search bar.
4. Open the import menu and select “preload visible area”, this will download both map tiles and elevation data.



5. Once the download is finished, click on the eye icon and check that the yellow area corresponds to the desired area.

ⓘ	Note

- The resolution of the tiles is the one displayed on screen. To get detailed maps consider downloading several smaller tiles rather than a large one.

- By clicking on the elevation icon and selecting a point on the map the elevation will be displayed. This can be used to double-check the elevation data.

3.3.1.2 Local importation

1. Load your files into the GCS.

ⓘ	Note

- Map tiles format: jpeg, jpeg2000, png
- Elevation data format: tiff, dted1/2
- Max file size: 100 Mb

2. Open the import menu and select “import map tiles”
3. Locate your files using the file system and select them.

ⓘ	Note

- It is possible to import several files at the same time
- Importing large files may take a few minutes.

4. Open the import menu and select “import elevation data”
5. Locate your files using the file system and select them.
6. Click on the layer icon and select one of your files to center on the selected region.
7. Click on the eye icon to display the elevation data and check that the desired region is covered.

ⓘ	Note

- By clicking on the elevation icon and selecting a point on the map the elevation will be displayed. This can be used to double-check the elevation data.

3.3.2 Import KML/KMZ

KML and KMZ files can be imported to help with flight planning.

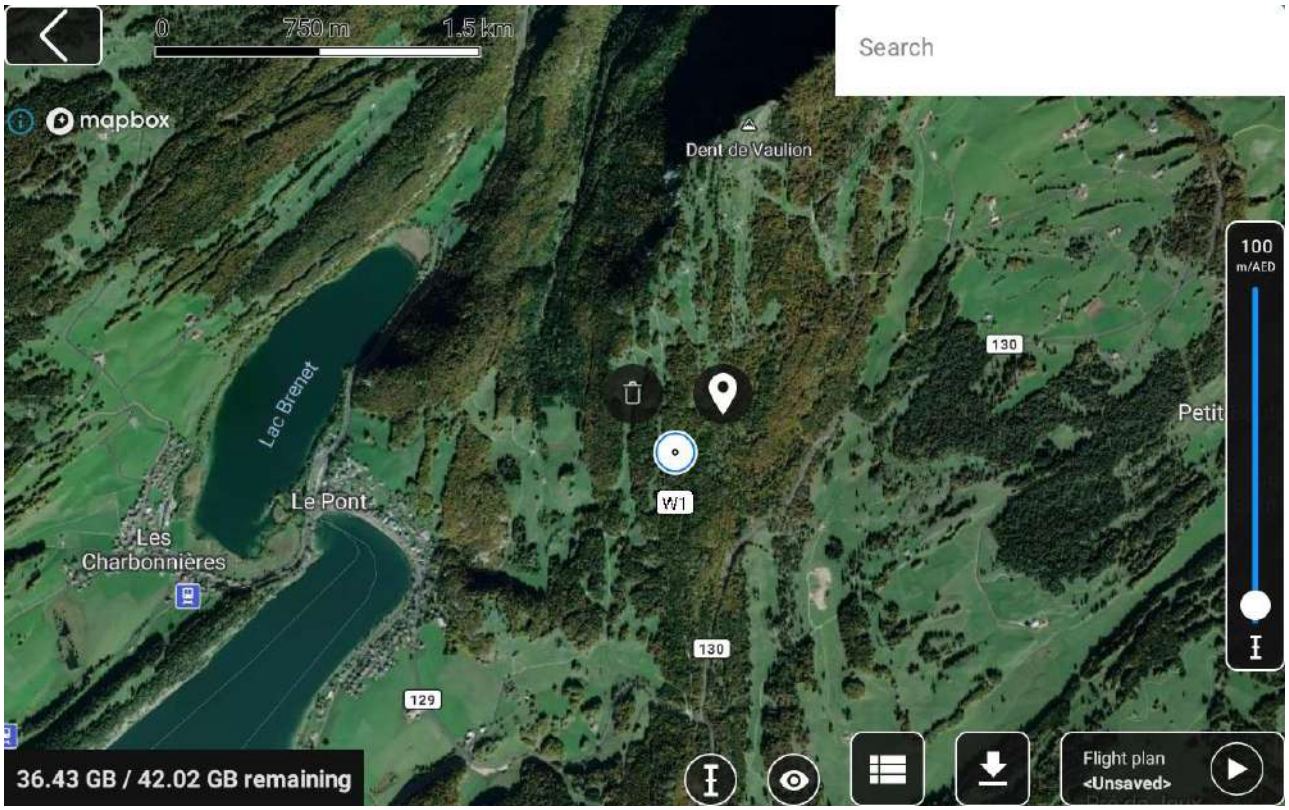
1. Load your files into the GCS.
2. Open the import menu and select “import KML/KMZ”.

3. Locate your files using the file system and select them.
4. Click on the layer icon and select your files to display them.

3.3.3 Create flight plan

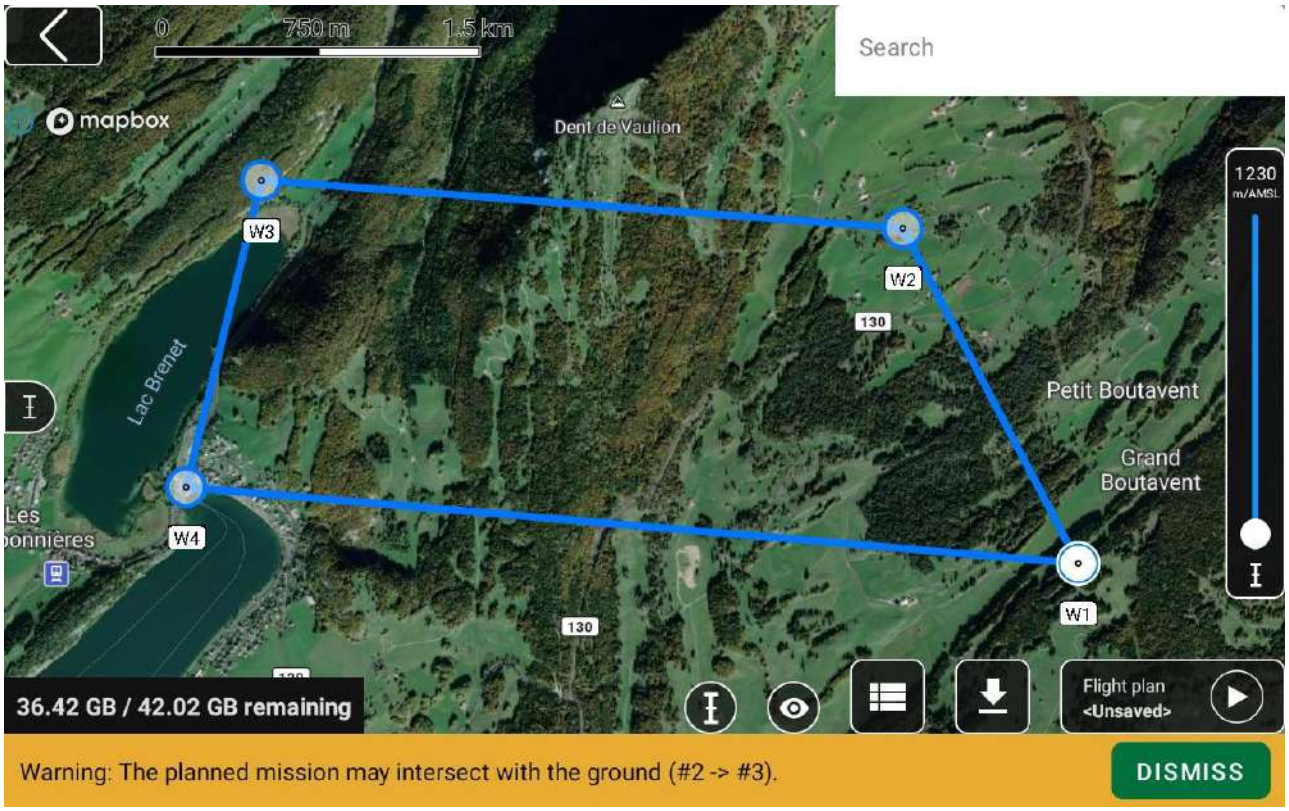
Waypoint are added by a single press on the screen.
Once a waypoint is defined it is possible to:

- Move it: drag and drop or given coordinate.
- Change its altitude with the lateral slider.
- Delete it by long pressing it and select the delete icon .
- Move it to a given location by long pressing it and selecting the location icon then input the desired coordinates with the virtual keyboard.



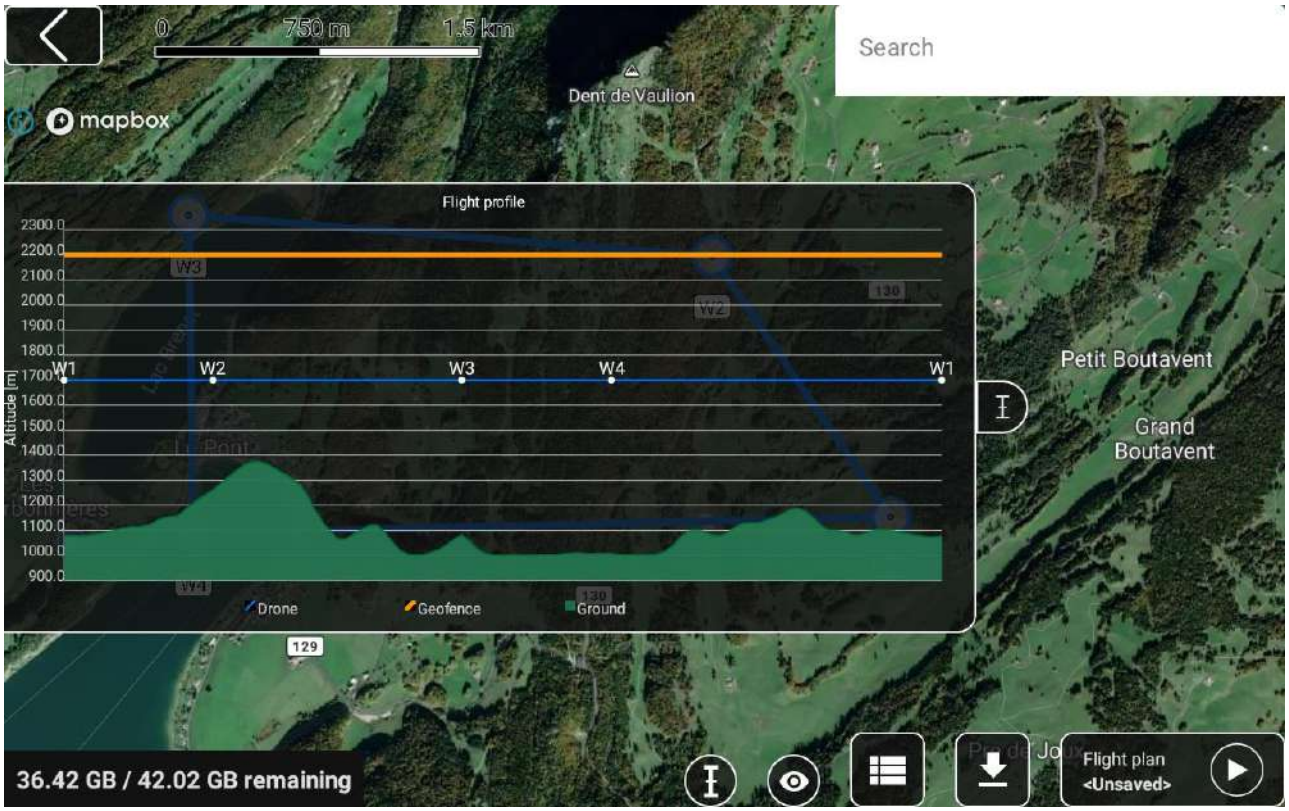
Depending on the altitude setting AMSL or AED (detailed explanation on setting in 3.6.2), the next waypoint will be set differently.

AMSL mode: the AMSL altitude is kept between waypoints.
The eBee VISION app will display a warning in case the flight path is intersecting the ground.

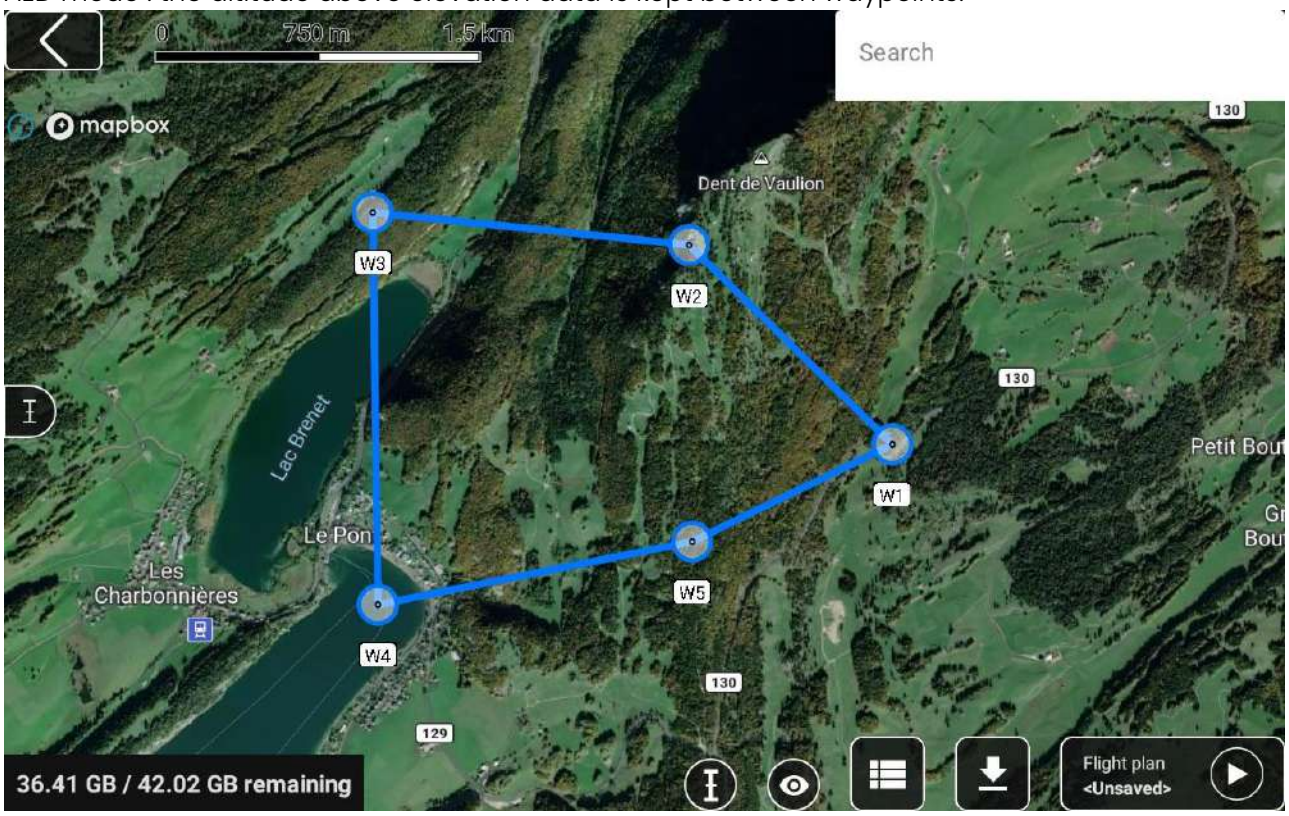


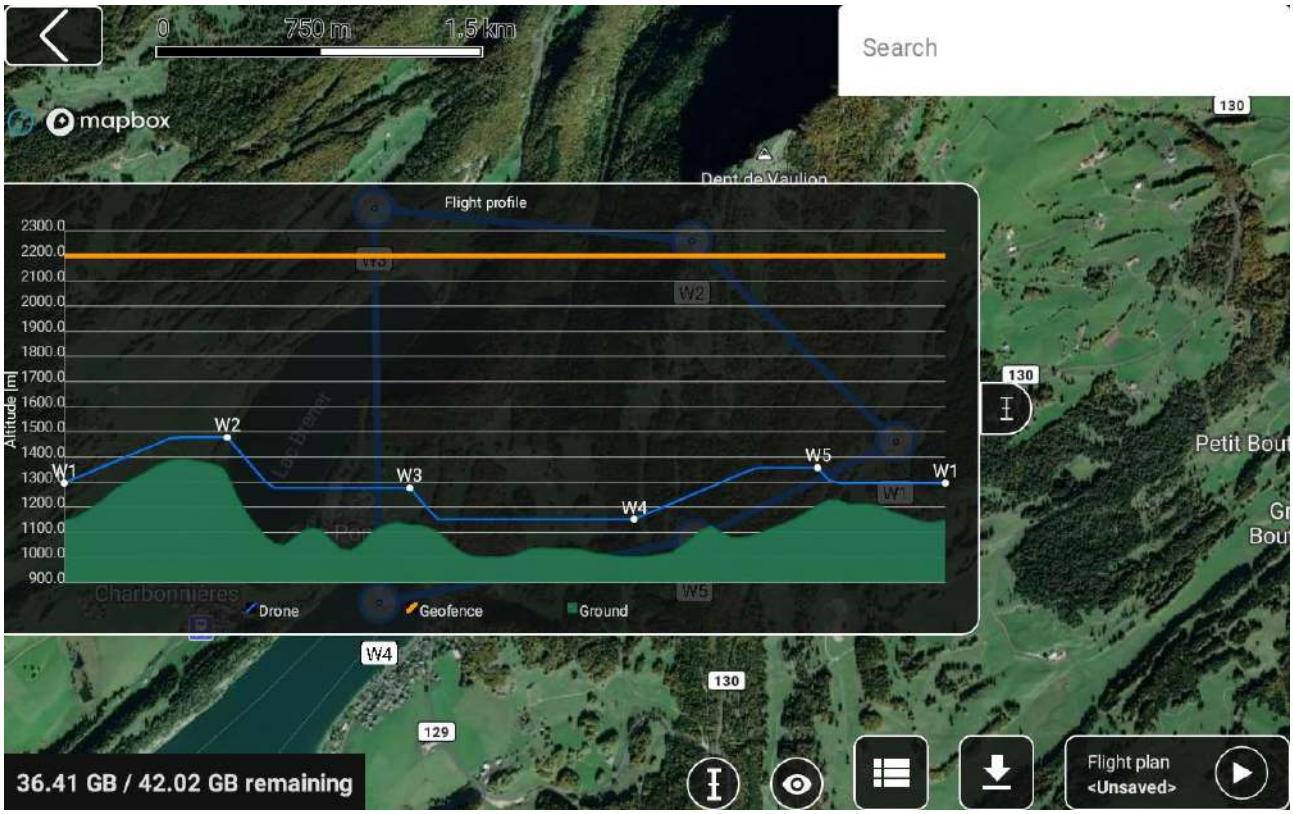
User can check the altitude profile (by pressing secondary drone joystick or drag the flight profile icon on the left side of the screen) to solve flight planning issues.

Once the flight planning is correct, no warning is displayed.



AED mode : the altitude above elevation data is kept between waypoints.





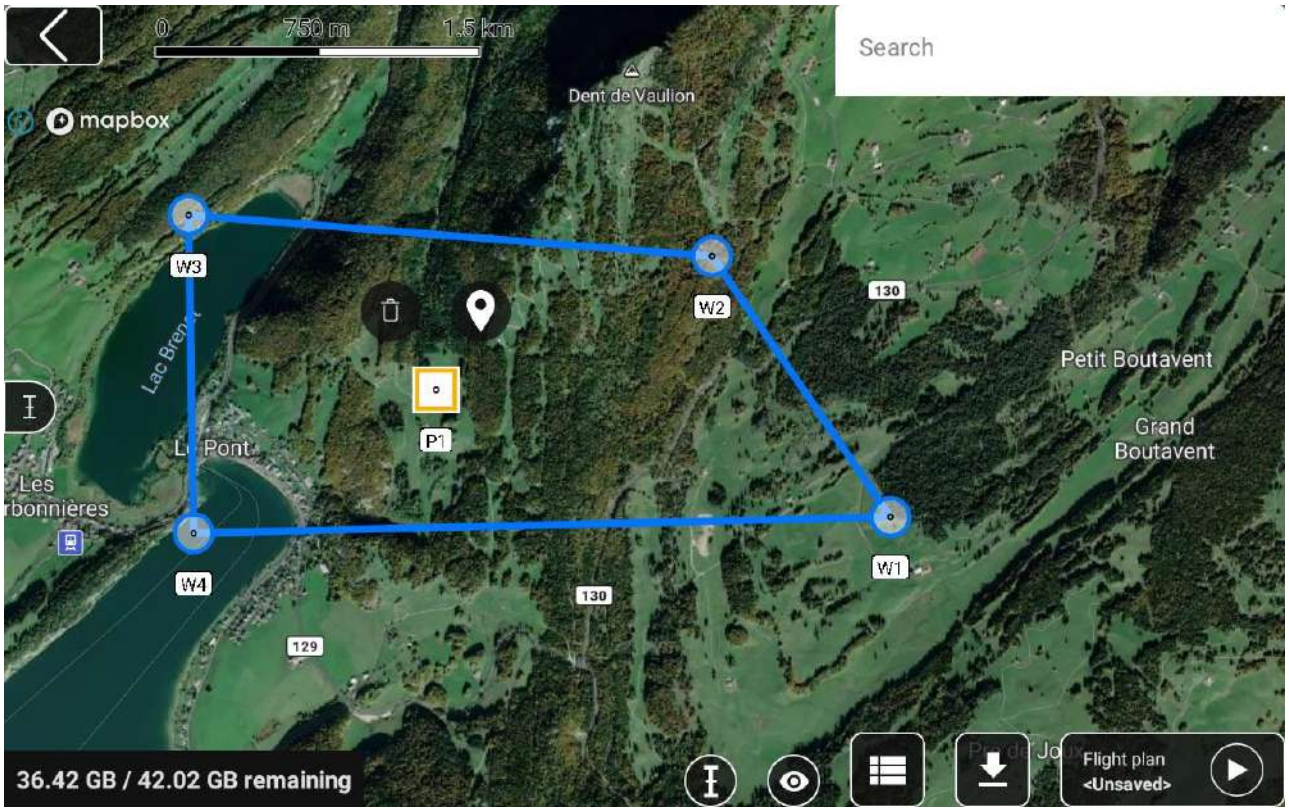
ⓘ	Note

- To gain time, it is better to first choose the desired altitude mode in the flight settings, then set the first waypoint of the mission at the desired location and altitude and then to use the automatic altitude setting rather than editing each waypoints' altitude separately.
- AED mode will result in a lot of altitude variation, this will affect both flight time and furtivity

3.3.4 Add point of interest (POI)

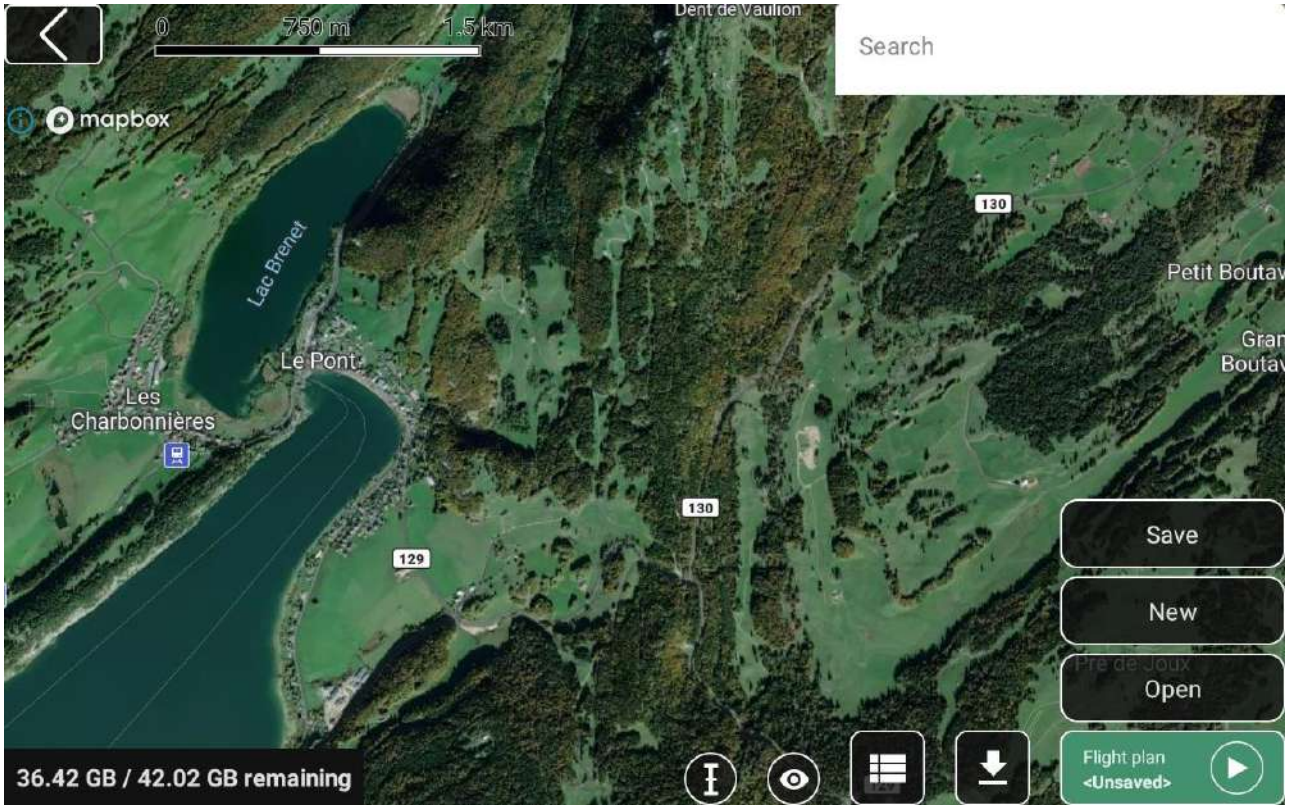
Points of interest are added by a long press on the screen.
Once a POI is defined, it is then possible to:

- Move it: drag and drop or given coordinate.
- Delete it by long pressing it and select the delete icon .
- Move it to a given location by long pressing it and selecting the location icon then input the desired coordinates with the virtual keyboard.



3.3.5 Save / Load existing flight plan

Flight plans can be stored into the GCS memory.

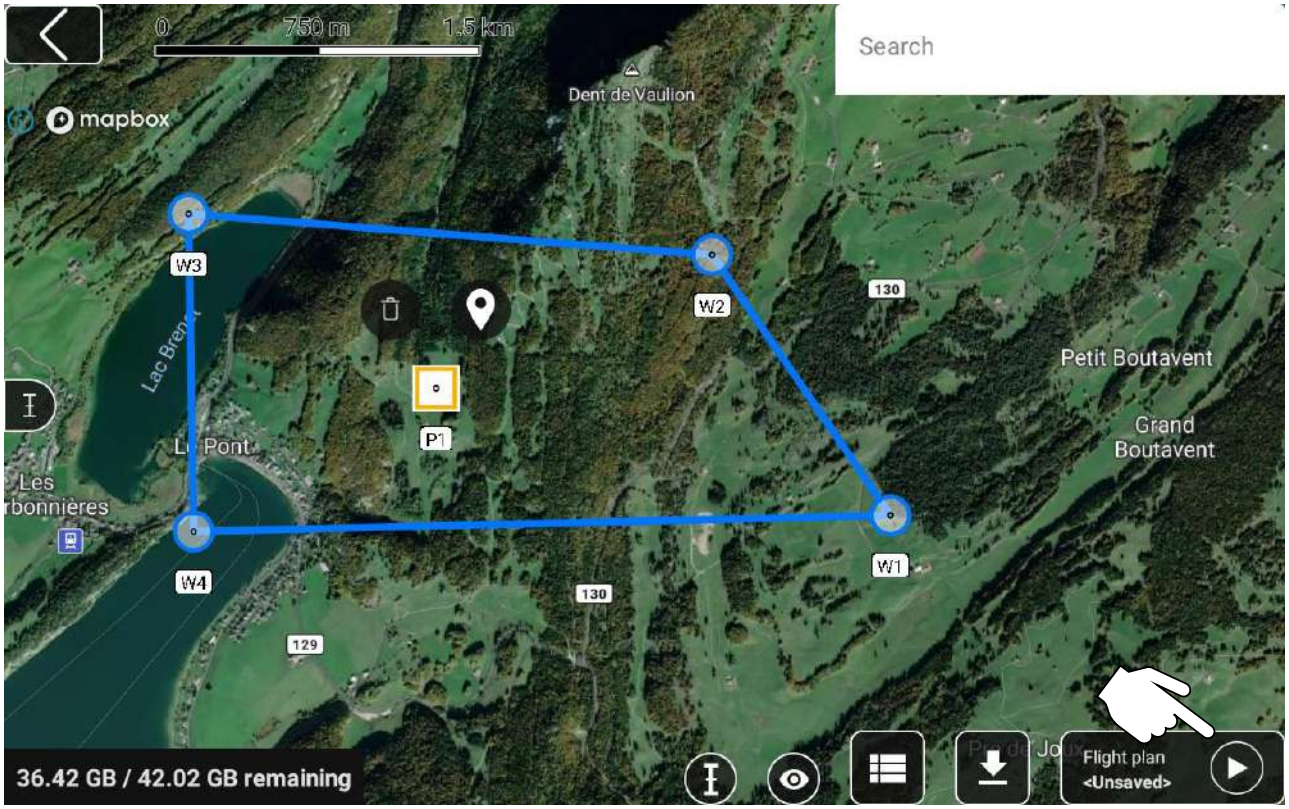


Press the flight plan menu and select the desired operation.

ⓘ	Note
• Current flight plan will be erased totally by pressing new	

3.3.6 Engage mission

Once the mission is ready, it is possible to directly go into the fly mode by clicking the play buttons.



3.3.7 Fast flight plan

If no flight plan has been created or loaded, eBee VISION will create a default flight plan around its first GNSS position.
The default pattern is a square with sides of 1 km / 0.62 mi.

3.4 Flight modes

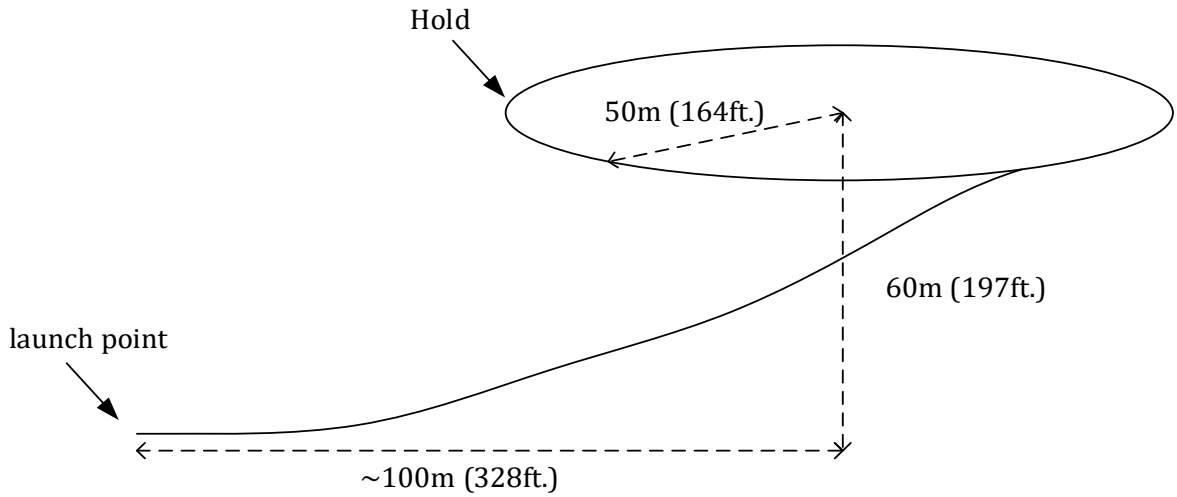
3.4.1 Take-off

⚠	Warning
• Keep the propeller area free at all times 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 3.4.11) 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

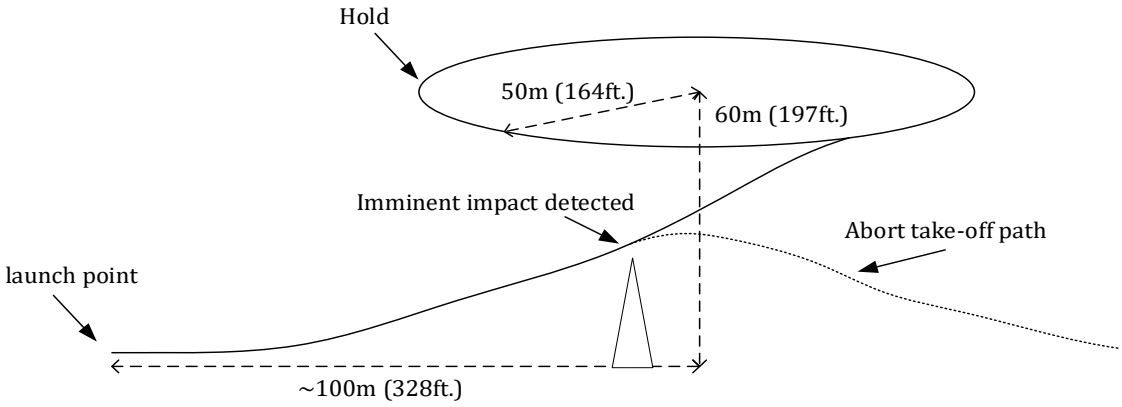
At the end of the initial climb eBee VISION performs a hold and waits for user instructions. Depending on wind conditions and quality of the hand launch, it will take approximately 100m / 328ft for eBee VISION to finish the initial climb.



ⓘ	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.



Users can turn off this behavior by disabling the ground sensor. More details in 3.6.3.3.5.

3.4.1.1 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

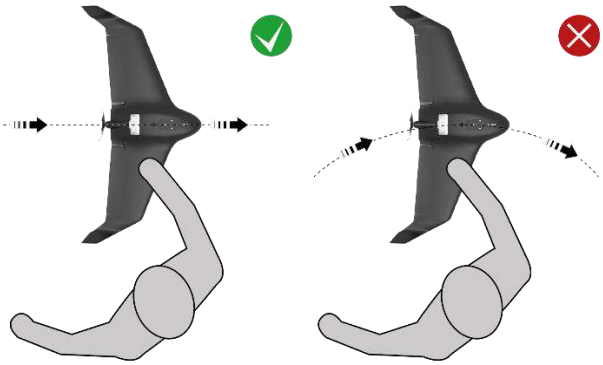
- Shake-shake can also be used to interrupt the take-off procedure.
- Performing a shake-shake does not require strength.

3.4.1.2 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.

ⓘ	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.

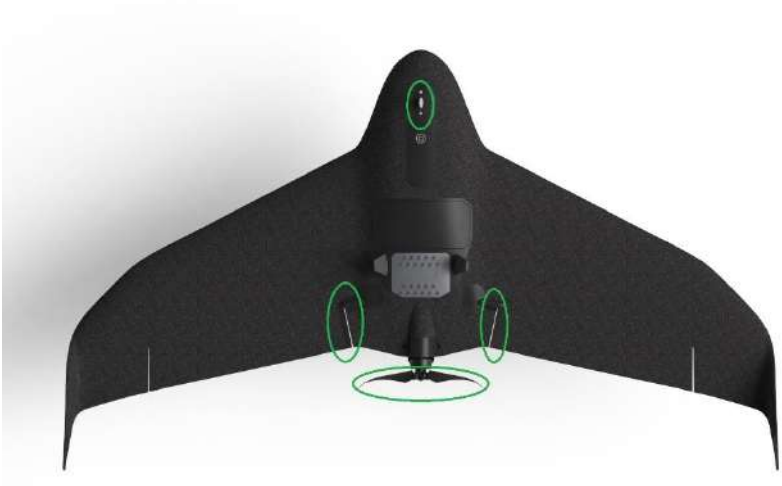


For some users it is easier to perform a two-hand launch as it requires less hand strength and reduces the possibility to induce yaw motion during launch.

Shake-shake visual control

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

3.4.1.3 Pre-flight inspection



1. Make sure that the pitot probe is properly screwed and that its holes are free of obstructions.
2. Make sure that the control surfaces can move freely by moving them manually.
3. Make sure that the propeller is not damaged.

4. Make sure that the ground sensor is clean.
5. Make sure that the payload is not obstructed (grass, sticks, mud etc.).

3.4.1.4 Take-off procedure

1. Check the wind direction and position yourself accordingly.

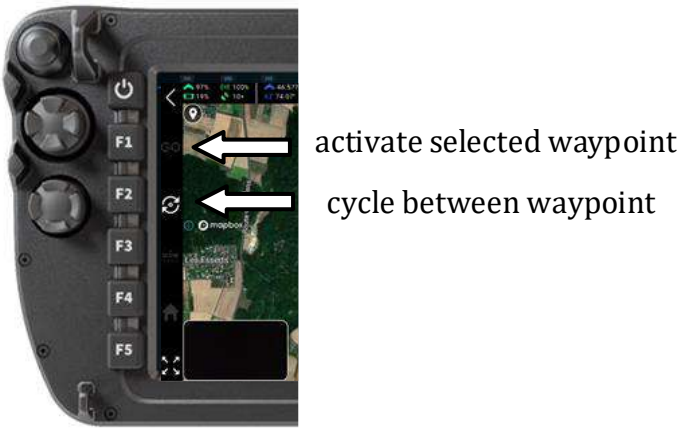
2. Perform “shake-shake”, motor will start spinning.
3. Visually check the payload calibration and control surfaces motion.

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

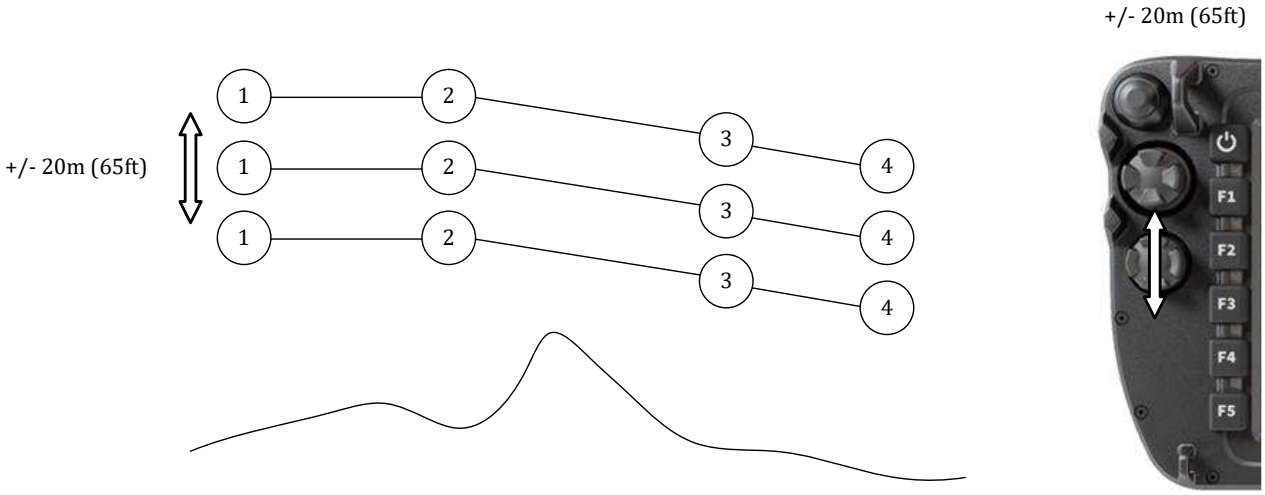
ⓘ	Note
• Take-off procedure can be interrupted by making a shake-shake motion. • The payload is retracted during the take-off. • The user is not allowed to deploy payload during take-off to prevent damage to the payload.	

3.4.2 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.



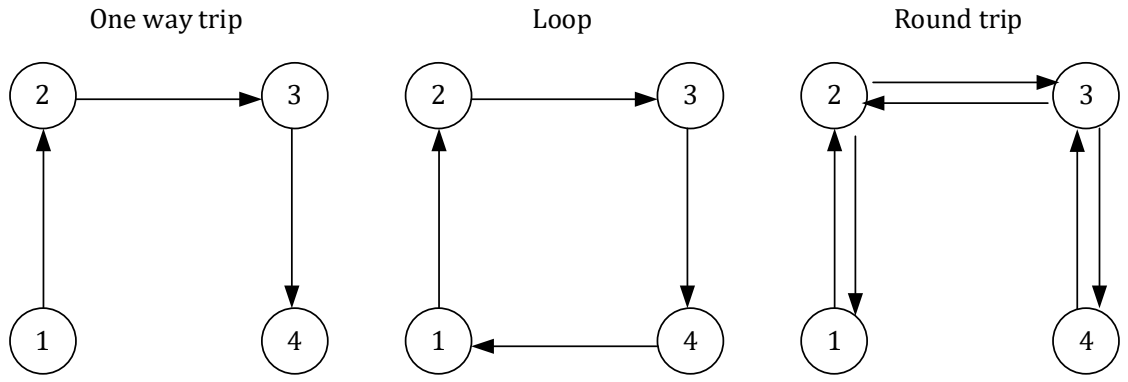
Each vertical click on the secondary drone control joystick will increase or decrease the altitude of each waypoint of the flight plan 20m / 65ft.



ⓘ	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.

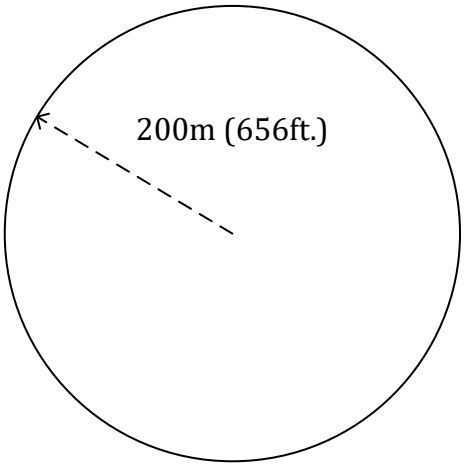
3.4.3 Observation

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

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).

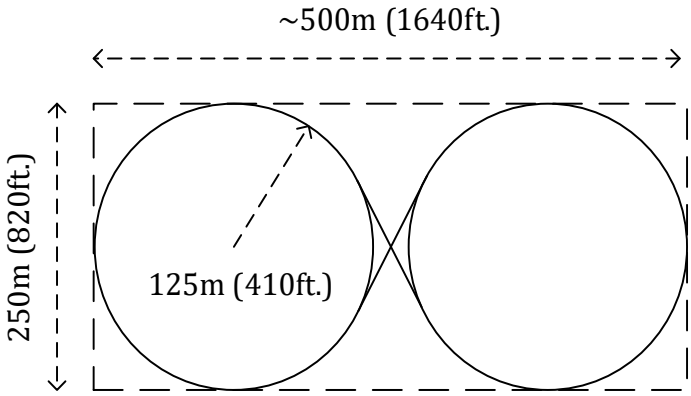
3.4.3.1 Close range: circle



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

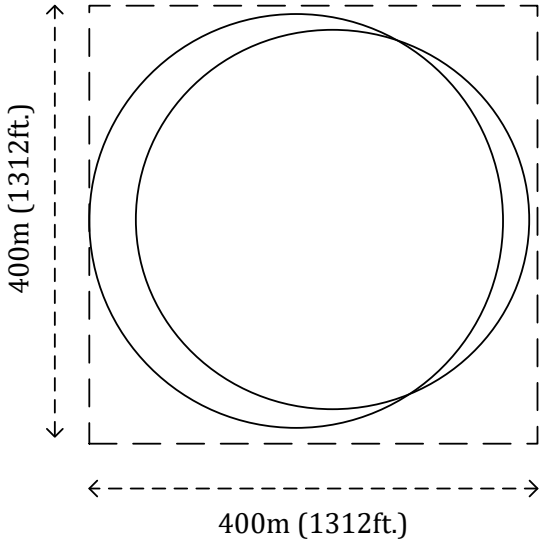
ⓘ	Note
• For close range observation you may consider scooting mode to get different controls over the eBee VISION trajectory (see 3.4.4)	

3.4.3.2 Long range: 8-shape



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.

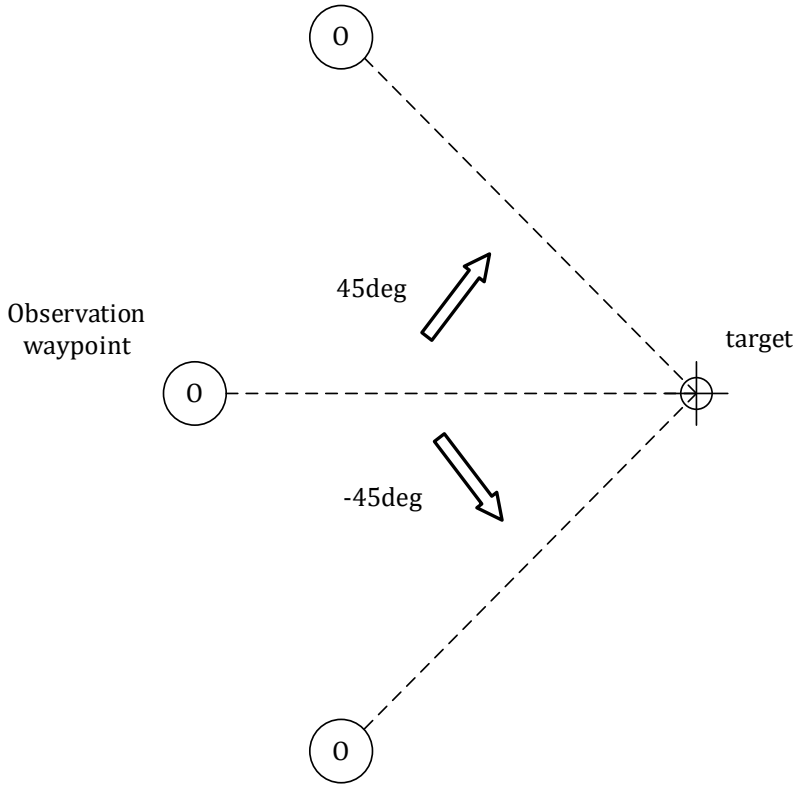
3.4.3.3 Long range: ellipse



The default ellipse is approximately 400x400 m² /1312x1312 ft², 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.

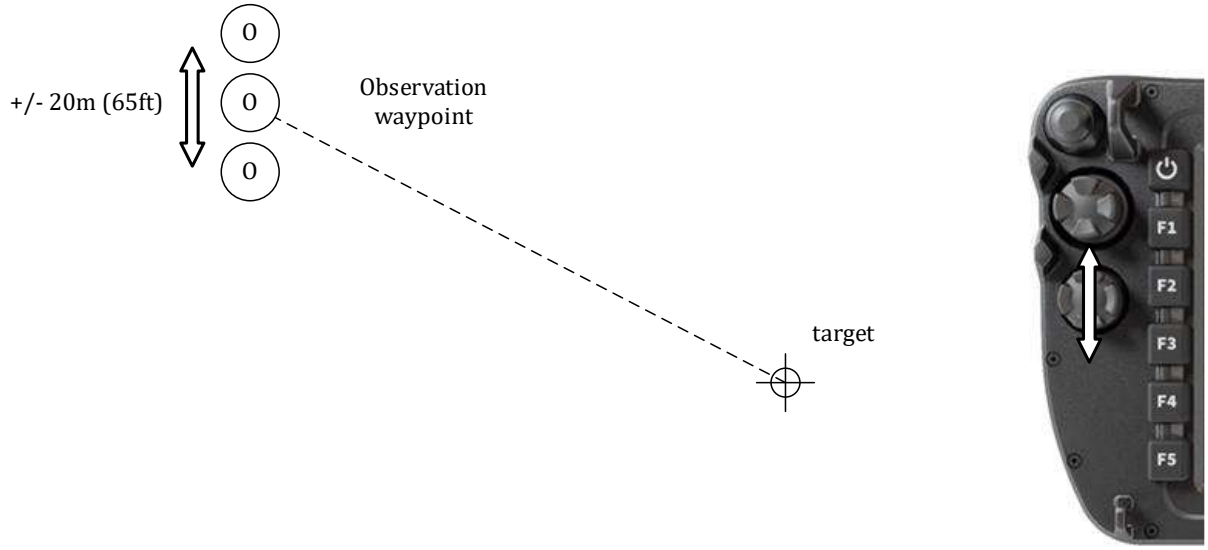
3.4.3.4 GCS command in observation

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.



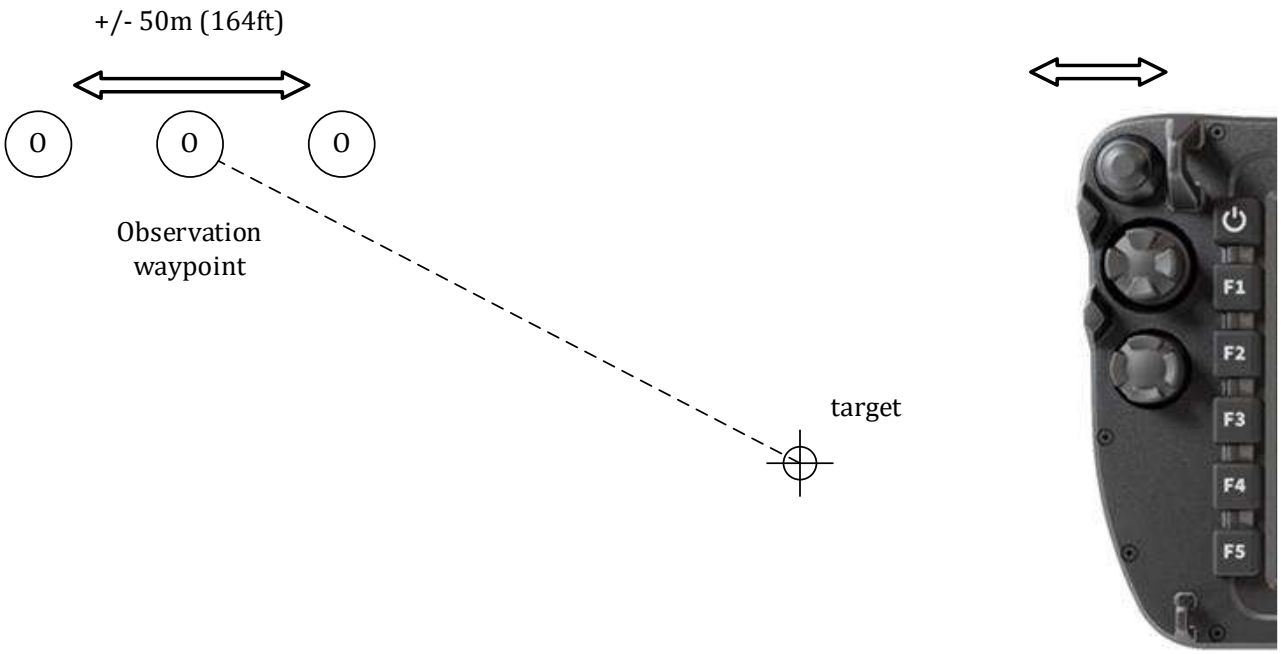
	Note
• Rotation of the observation waypoint is especially useful to observe different sides of a building from a distance. • Rotating the observation waypoint will result in a change of the wind conditions and therefore an adaptation of the size of the observation flight zone. • Depending on the observation 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.).



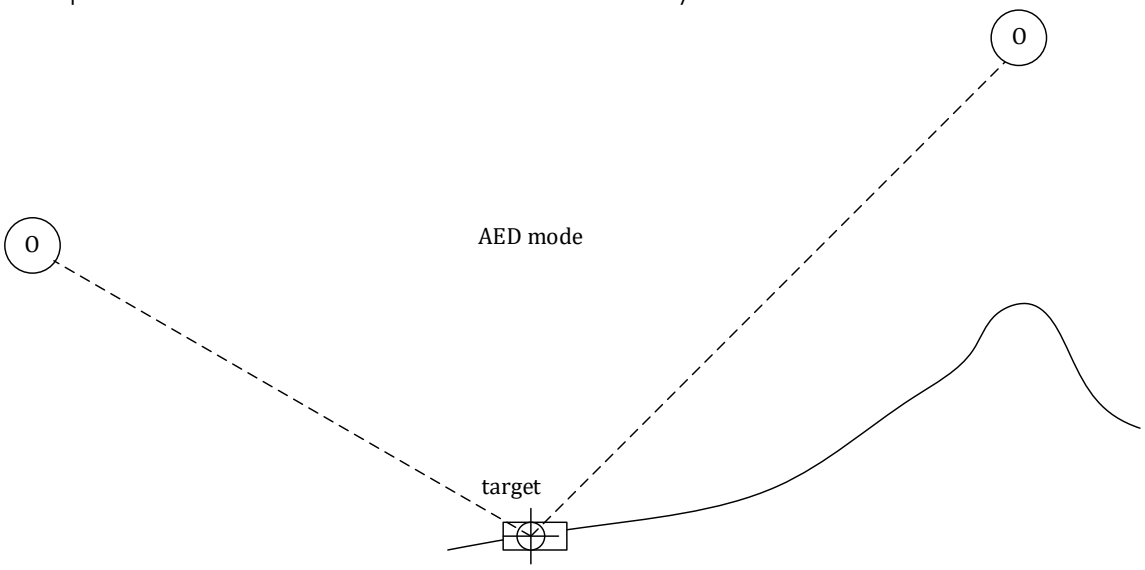
	Note
• After changing the altitude remember to check altitude profile by clicking on the secondary drone control joystick	

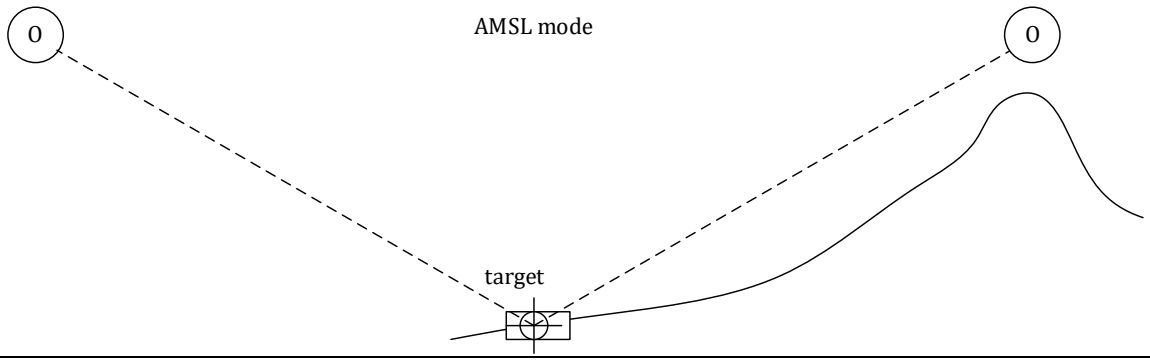
Each push on the distance joystick will increase or decrease the distance between observation waypoint and current target of 50m / 164ft.



	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.





3.4.4 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.

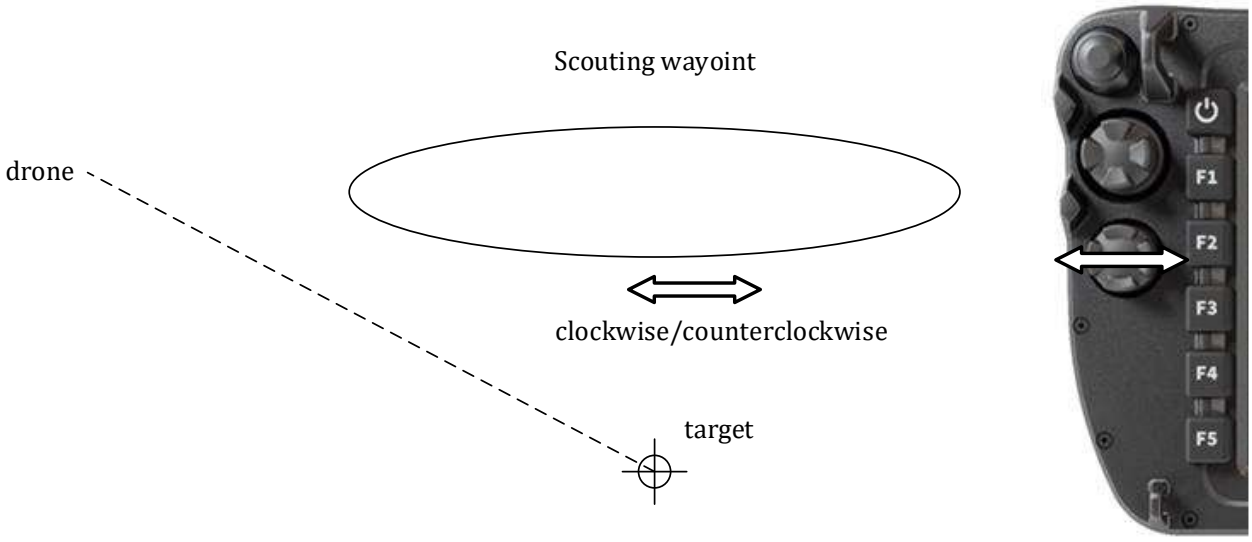
When Scouting is triggered, eBee VISION will go in the direction of the current target and scouting waypoint is displayed on the map.

Users should use the payload joystick to aim at the desired location and eBee VISION will fly in that direction.

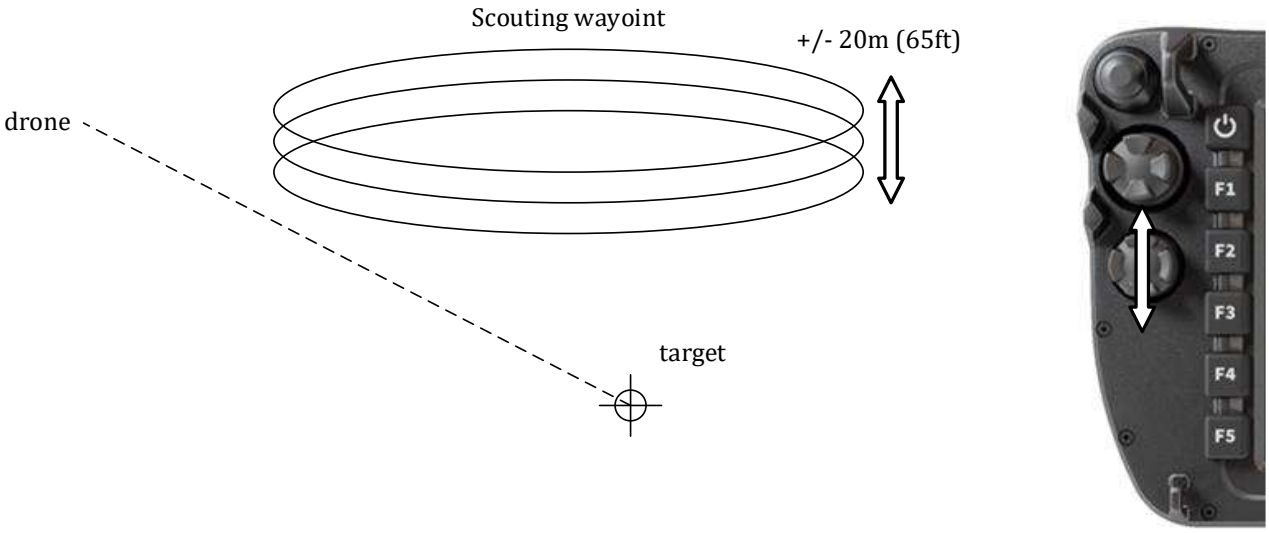
In case the moving target is too fast, user can use fast mode by pressing the speed button (physical or touch screen).

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

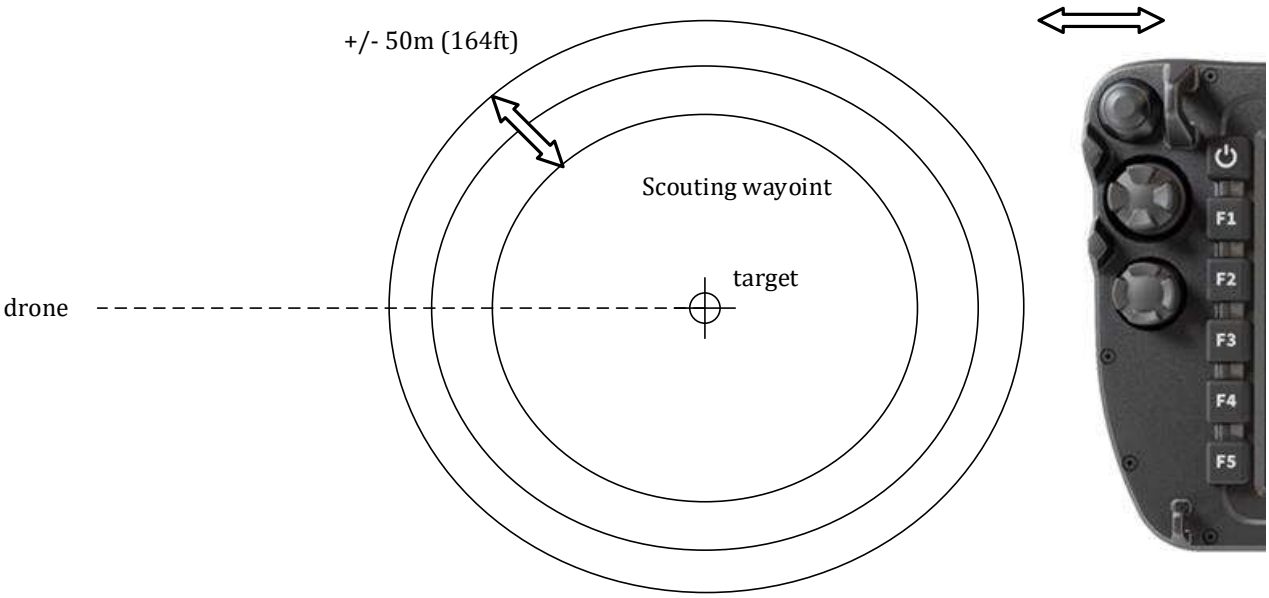
Each horizontal click on the secondary drone control joystick will switch the rotation direction of the scouting waypoint between clockwise and counterclockwise.



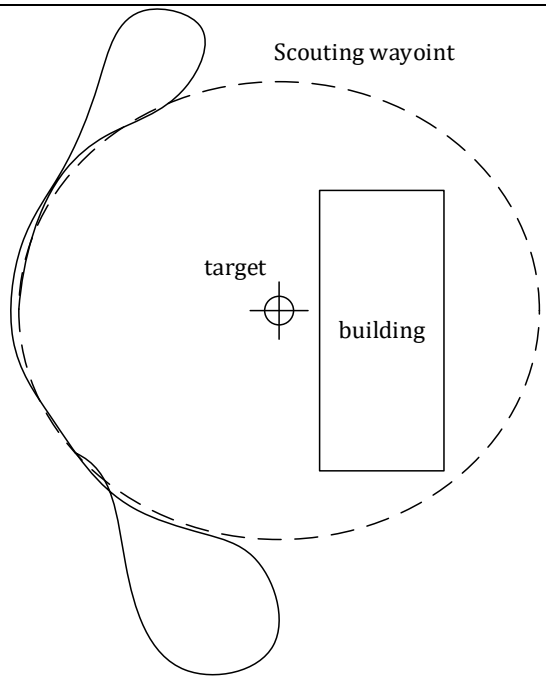
Each vertical click on the secondary drone control joystick will increase or decrease the scouting waypoint altitude of 20m / 65ft.



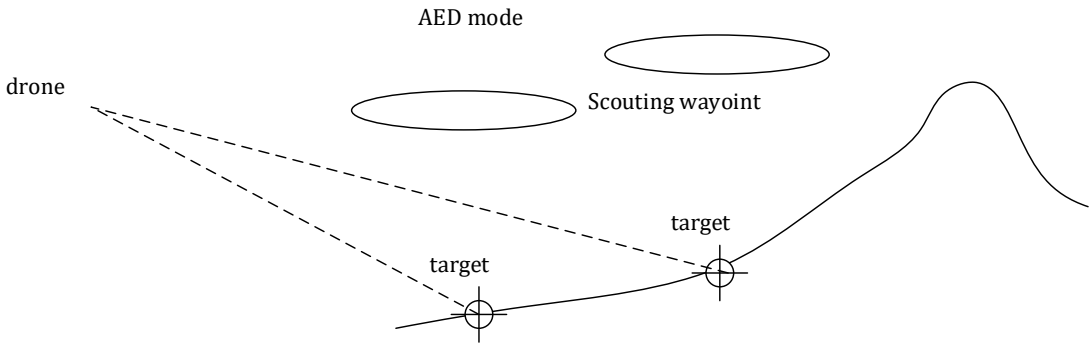
Each push on the distance joystick will increase or decrease the radius of the scouting waypoint by 50m / 164ft.

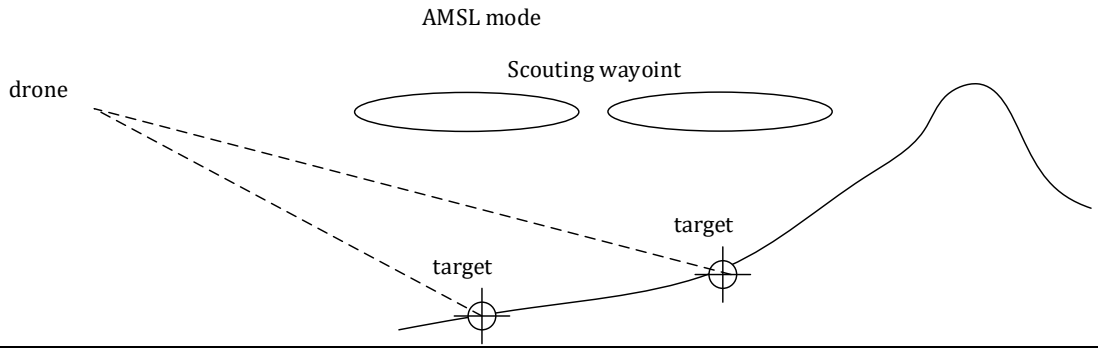


ⓘ	Note



- 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.





3.4.5 Manual

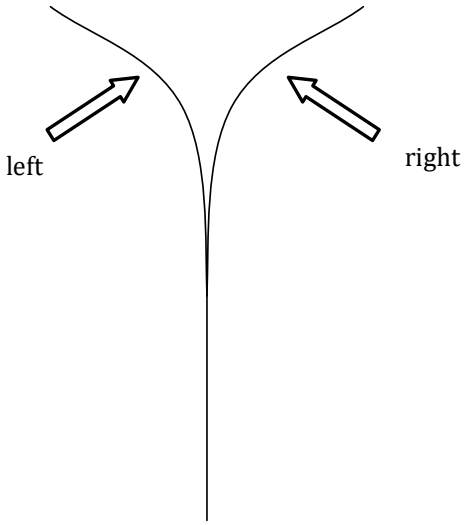
In manual mode, the user takes control of the autopilot. All the flight safety are engaged making it extremely easy to pilot eBee VISION. When engaging manual mode, the payload will look in the forward direction to give FPV (first person view) conditions.

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:

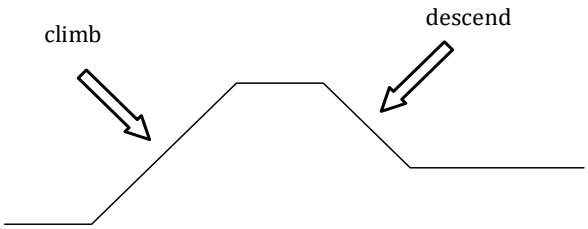
left/right

eBee VISION path
(top view)



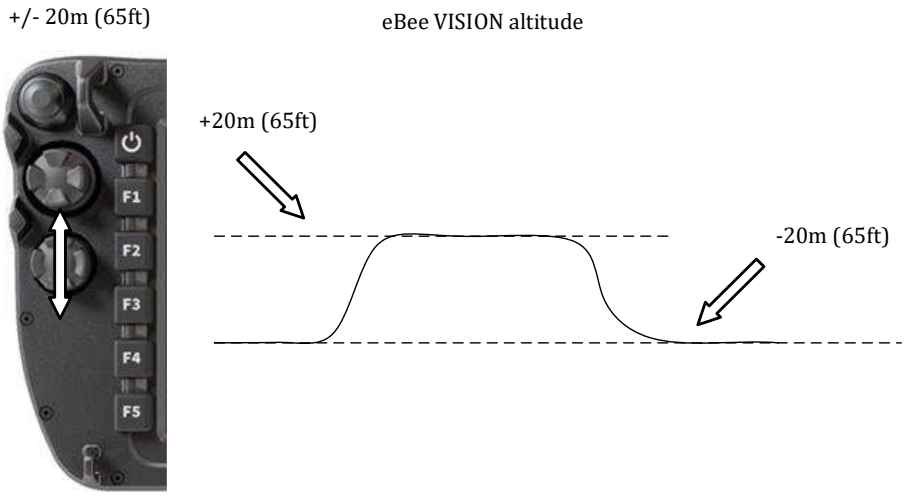
climb/descend

eBee VISION altitude



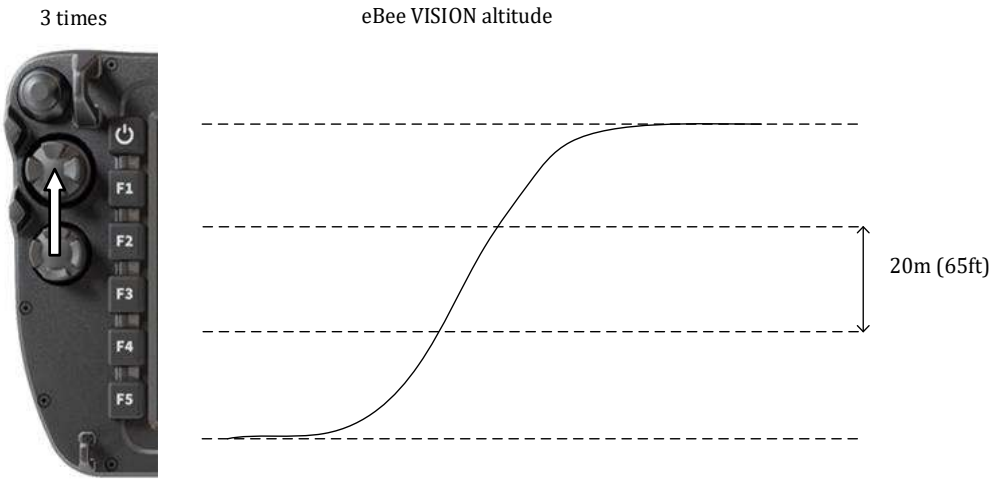
ⓘ	Note
User can select the desired reaction on the main drone control joystick in the setting (3.6.1) menu, by default pushing up the joystick is making the eBee VISION climb.	

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



ⓘ	Note

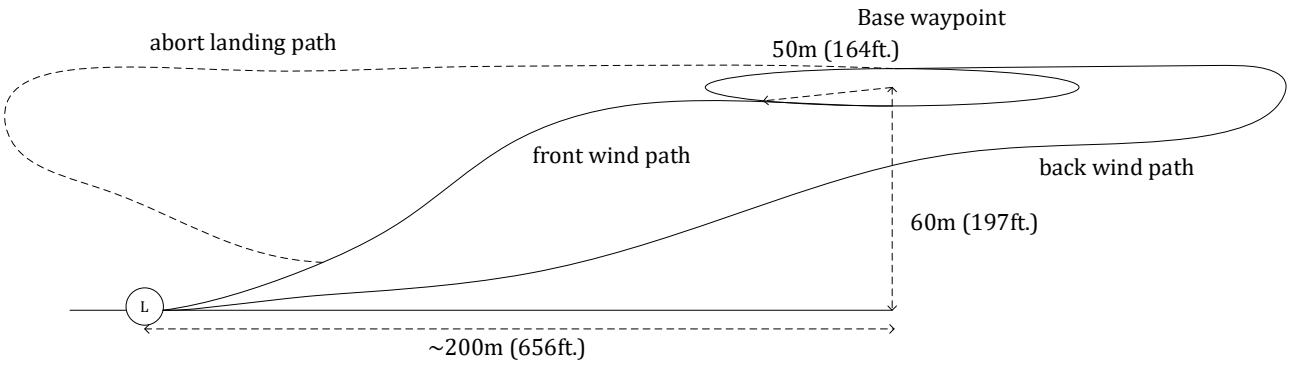
Pushing the secondary drone control joystick up or down several times will cumulate the altitude steps.



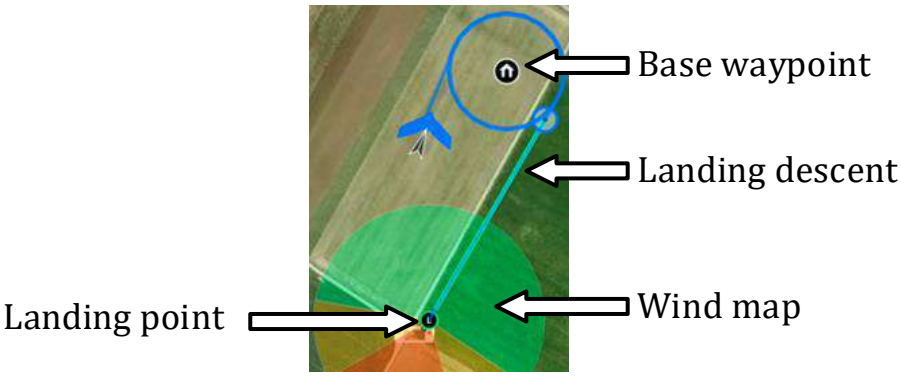
3.4.6 Landing

Landing is triggered using the go land button (physical or touch screen)

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



By default, the landing point is place at take-off location, once eBee VISION is in flight it can be moved on the map using the touchscreen. Landing location is represented by the L waypoint on the map. When zooming on the landing location, the display will switch to the detailed view of the landing:



Landing is composed of the following steps:

- "go land" command.
- eBee VISION goes in a straight line to base waypoint.
- eBee VISION is waiting for clearance.
- "clear landing" command.
- eBee VISION engages descent based on wind
- "abort landing" command may be used to cancel landing procedure
- eBee VISION lands

i	Note

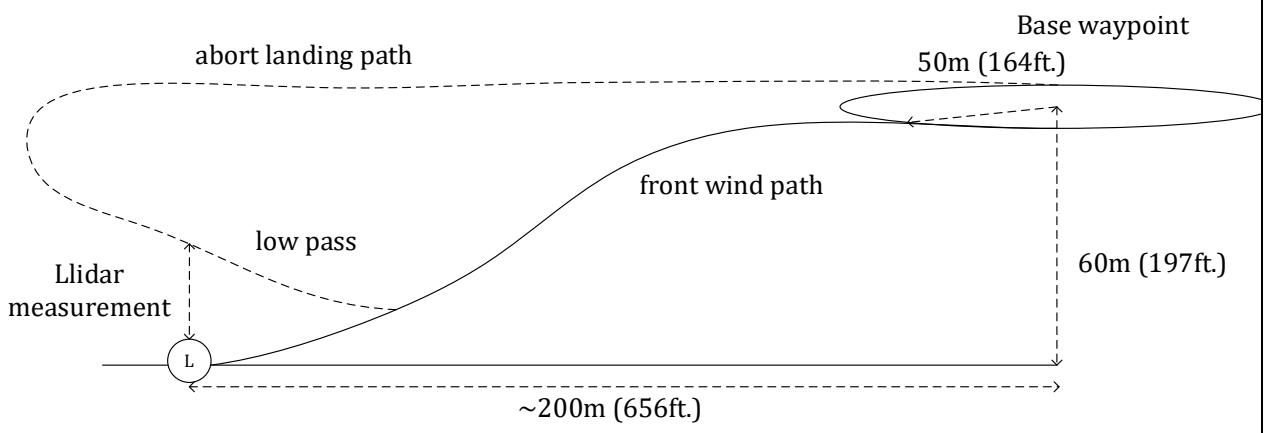
Landing clearance is giving you time to check your landing parameters, make good use of it:

- check landing point position and wind condition using the map view.

Keep in mind that go land is affected by altitude mode, for more detailed refer to 3.6.3.2

ⓘ	Note

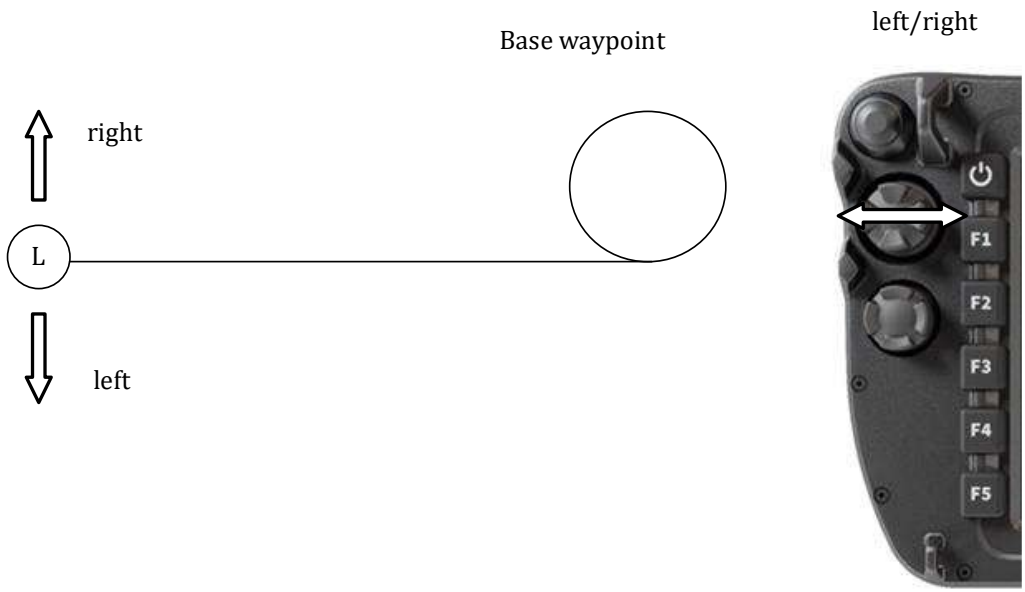
During descent if landing point altitude is incorrect, eBee VISION will perform a low pass. During low pass eBee VISION flies over the landing point to measure it with ground sensor, climbs again and goes back to base waypoint to wait for new clearance.



A low pass is more likely to occur after a long flight time due to the accumulation of altitude errors over time.
If the landing point location is changed after a low pass, 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

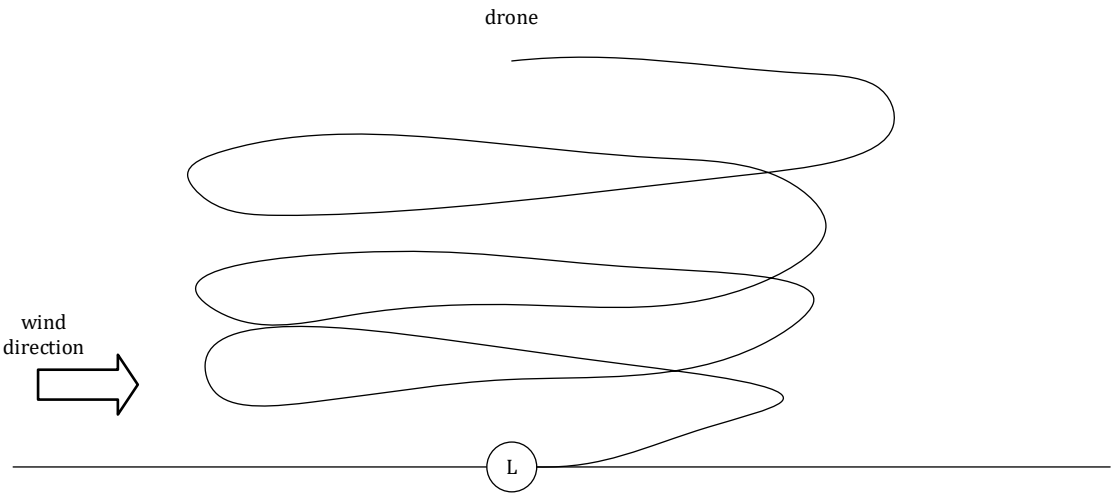
Before clearing landing for eBee VISION:

- 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.

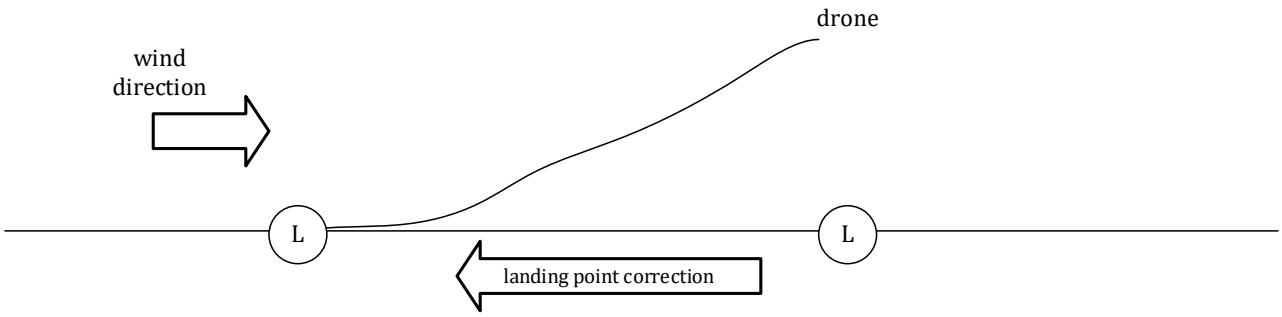
3.4.7 Silent Tactical Landing (STL)

eBee VISION offers an alternative landing strategy called STL. STL can be performed anywhere and is completely silent.
To perform STL just hold both hold and photo buttons for 2 seconds.

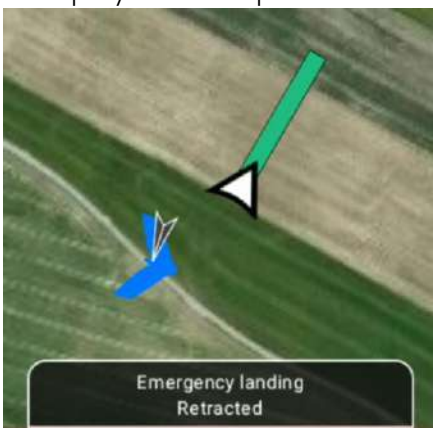
When triggered, the eBee VISION will place a point below its current position and glide to it to face into the wind.



If STL is triggered close to ground, eBee VISION may not have sufficient time to end its course facing the wind, in that case it will land at the closest possible point.



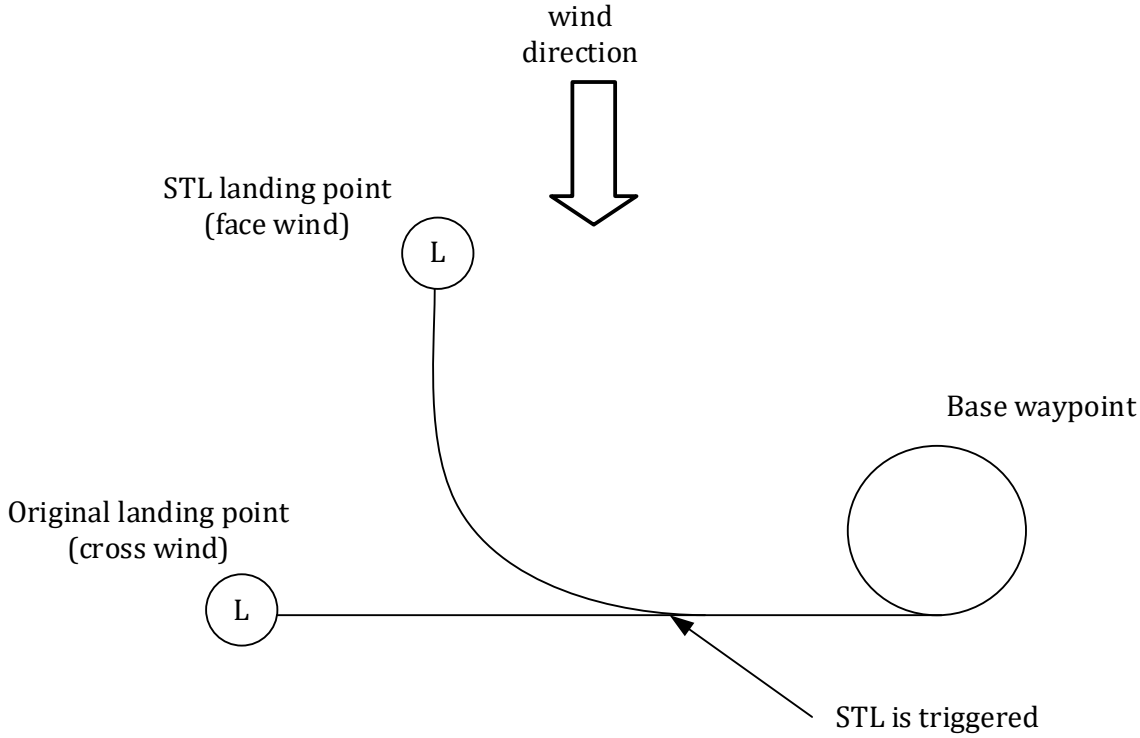
The position of the landing point is displayed on map.



⚠	Warning
Since motor is turned off during the STL procedure, the accuracy of the landing is decreased.	

ⓘ	Note

STL can be combined with standard landing for difficult terrain.
Triggering an STL during descent will result in eBee VISION turning to face wind.



3.4.8 Fast Escape

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

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.	

3.4.9 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.

ⓘ	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	

3.4.10 Hold

Users can activate hold mode by pressing the hold button.

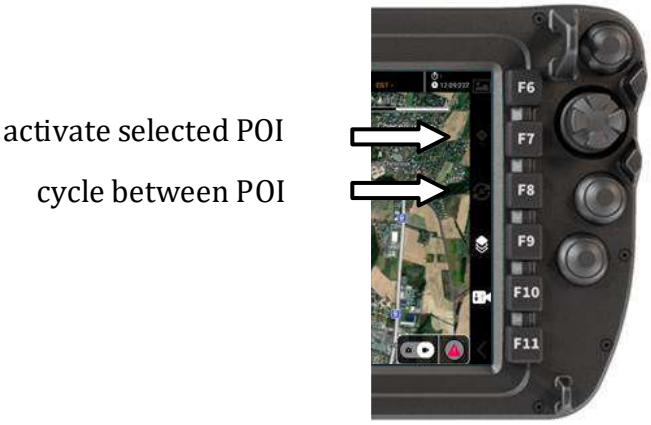
In hold mode, eBee VISION will perform a 50m / 164ft radius circle at its current position and altitude.

ⓘ	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	

3.5 Payload

3.5.1 Select and activate POI

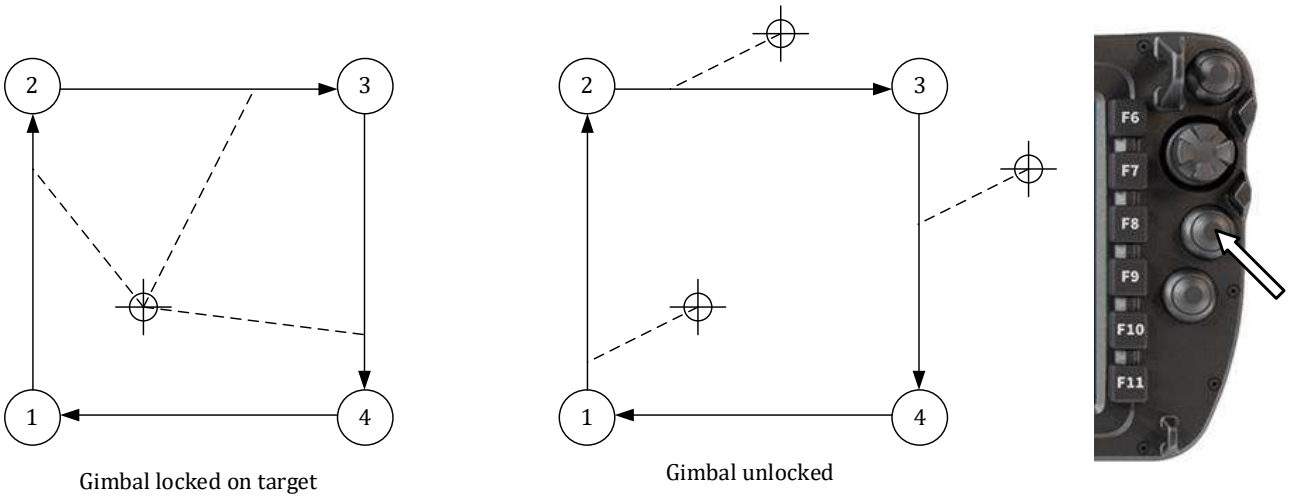
Like for the waypoint, user can cycle between POIs and activate the desired one to have the payload pointing in its direction.



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

3.5.2 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.



ⓘ	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 pilote.	

3.5.3 deploy / retract / transit

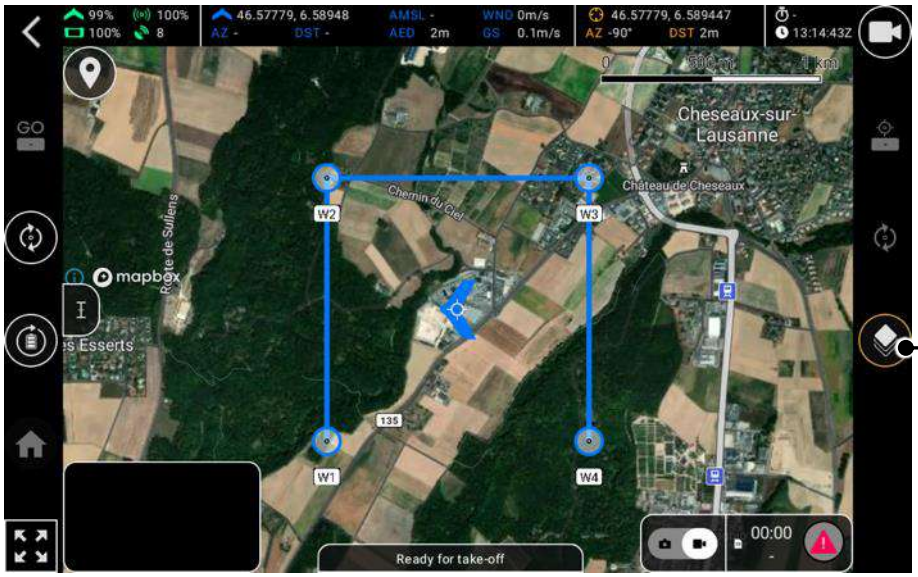
The payload has 3 positions:

- **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 cameras pointing 45° down and forward. This state is used to reduce drag while keeping some limited visibility around the drone when transiting to a mission zone.
- **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.

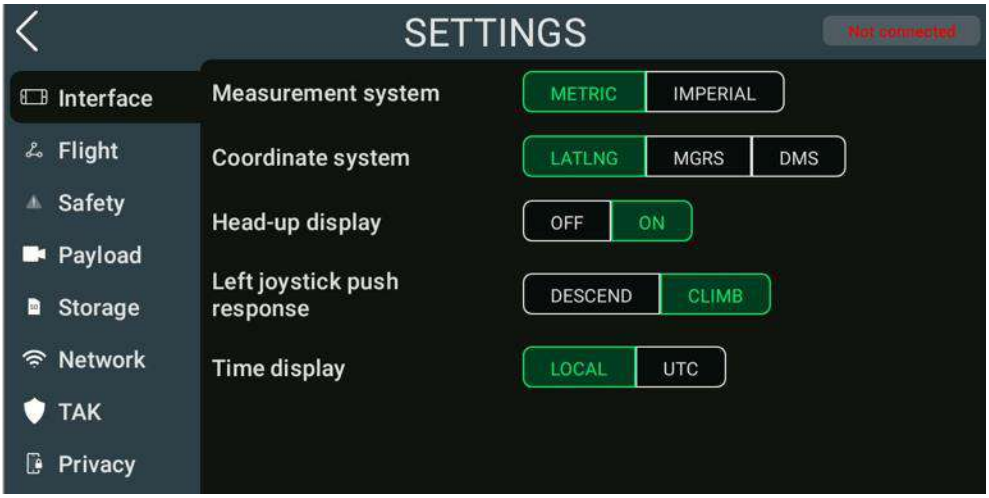
3.5.4 Thermal sensor calibration

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).



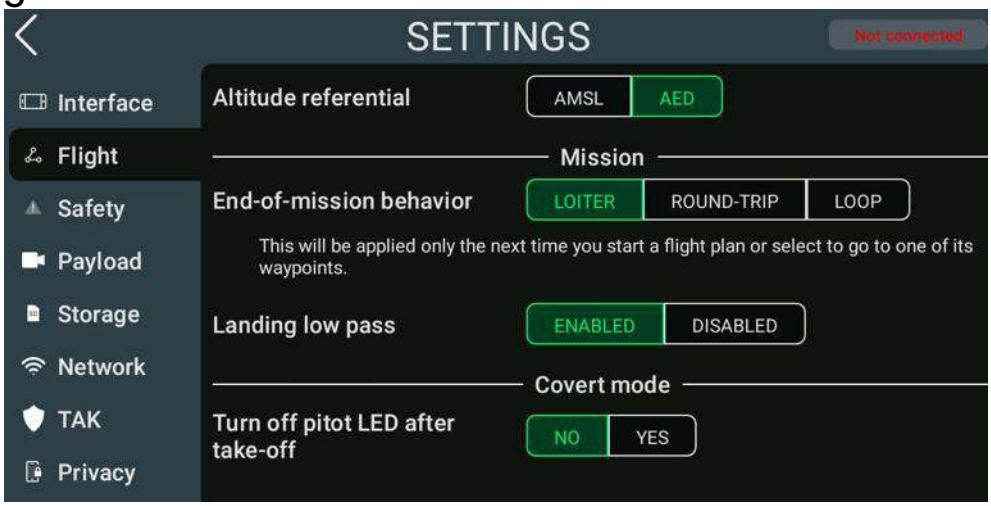
3.6 Settings

3.6.1 Interface



- **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.

3.6.2 Flight



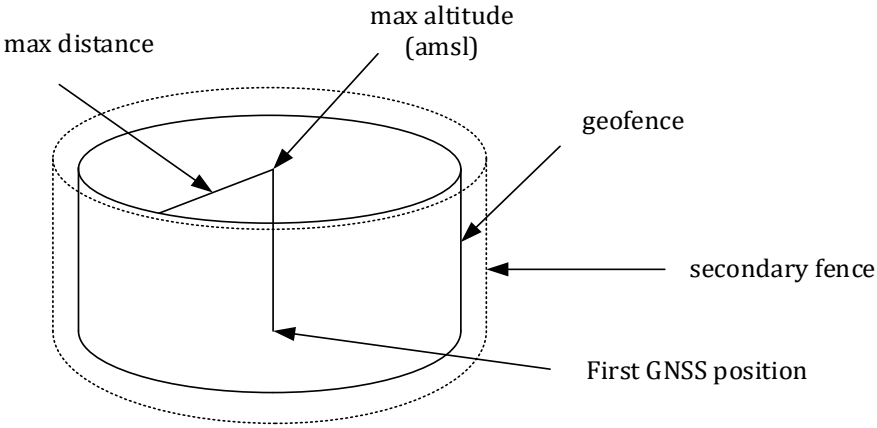
- **Altitude referential**:
  - **AMSL**: the drone will fly at constant altitude.
  - **AED**: the drone will fly at constant height above the terrain.

- 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

3.6.3 Safety

3.6.3.1 Geofence

eBee VISION geofence is a cylinder. The center is defined at the first valid GNSS position of eBee VISION. The height and radius of the cylinder are defined in the safety settings.



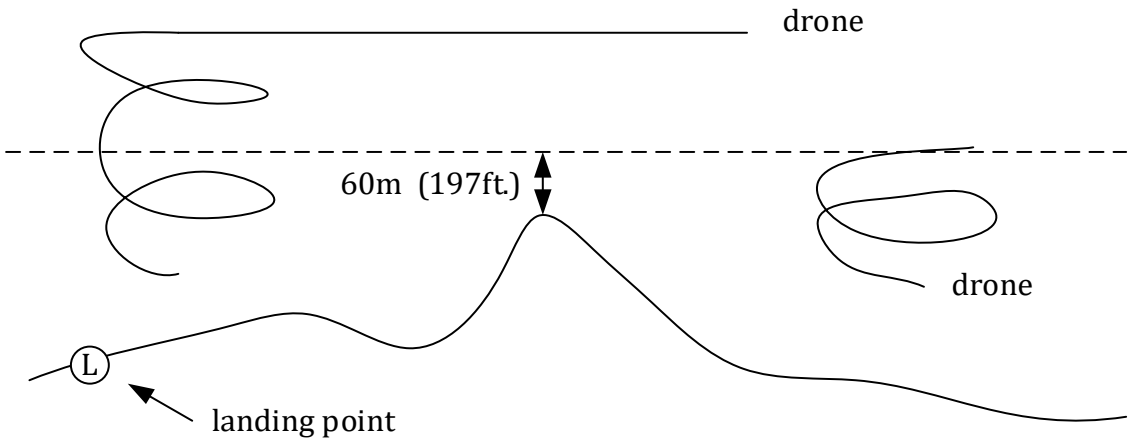
The geofence is defined by two layers. The inner one that is defined by the user via the setting and the outer one that is 250m / 0.12mi larger and 20m / 66ft higher.
If eBee VISION breaches the geofence, it will engage a maneuver to go back inside and perform a hold pattern once it has successfully entered the geofence.
In case eBee VISION breaches the outer layer, it will start an STL at the current location.

3.6.3.2 “Go land” function

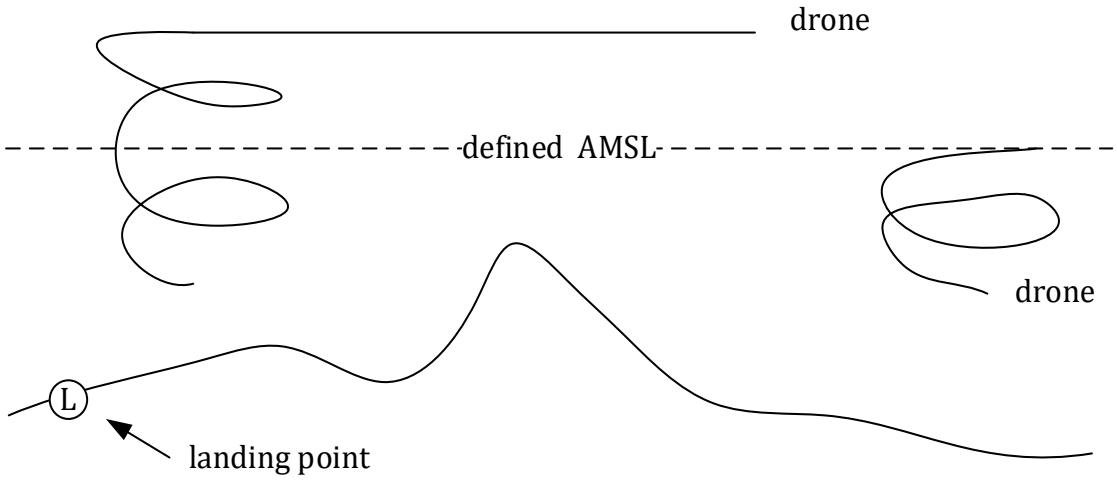
The “Go land” function is the first step of the landing, it defines the path between eBee VISION’s current position and the base waypoint. “Go land” is also used as an automatic behavior in case of issue.

When a “go land” is triggered, eBee VISION will follow the shortest path between its current position and the base waypoint, which is a straight line.
The altitude strategy is defined in the setting.

In AED mode, eBee VISION will climb to 60m / 197ft above the highest point on its path or keep its current altitude if higher. eBee VISION will go down once on base waypoint.



In AMSL mode, eBee VISION will climb to the defined AMSL or keep its current altitude if higher. eBee VISION will go down once on base waypoint.



⚠	Warning
In AMSL mode make sure that the chosen altitude is higher than the highest point in the geofence as eBee VISION may fly over it during “go land” procedure.	

3.6.3.3 Safety actions

3.6.3.3.1 Low endurance / battery

The drone automatically determines the battery percentage at which the drone must engage a "go land" procedure on the defined landing location to land with enough battery to allow some landing aborts.

⚠	Warning
If low endurance is turned off, and mission is carried over, eBee VISION won't 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.	

3.6.3.3.2 Strong wind

The drone automatically engages a "go land" procedure on the pre-defined landing location when the wind is too strong. This behavior can be disabled using the "**NO ACTION**" setting.

⚠	Warning
If the mission is carried over with high wind, eBee VISION may not be able to maintain a correct flight path, as a result it becomes difficult to obtain good video feedback. If wind goes above 25 m/s / 56mph, eBee VISION won't be able to fight it and will be carried away by the wind.	

3.6.3.3.3 Airspeed malfunction

eBee VISION can detect an issue with the pitot tube. When this happens eBee VISION will assume that the wind is constant to keep flying. User can choose if eBee VISION should perform a "go land" or keep flying.

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

3.6.3.3.4 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 accuracy of the

position is degraded over time due to the cumulation of errors. The user can choose if eBee VISION should perform a “go land” or keep flying.

	Note
• eBee VISION’s GNSS antenna features low gain from the region below the drone which makes it more resilient to cheap GNSS jammers. • eBee VISION should be operated around 200m / 656ft which makes it outside most cheap GNSS jammer range.	

	Warning
• The user cannot turn off GNSS manually. • eBee VISION is not able to detect spoofing.	

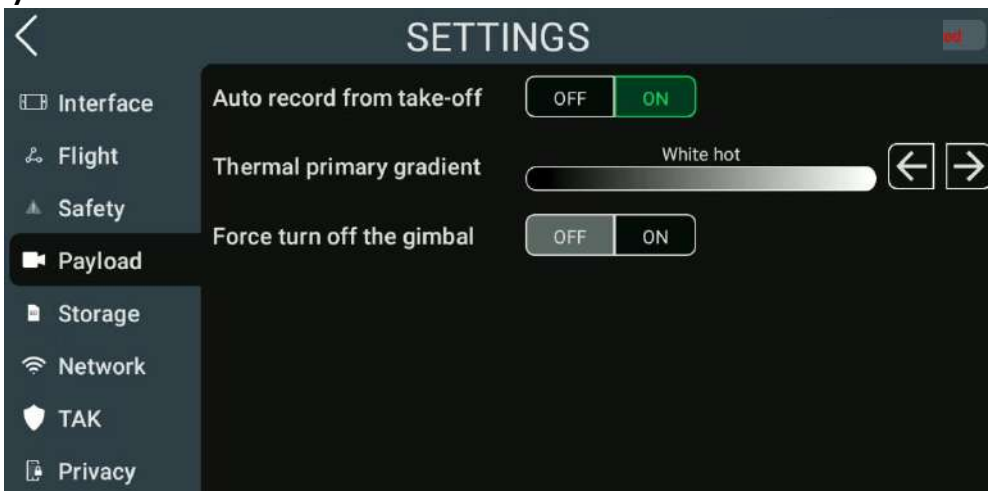
3.6.3.3.5 Ground Avoidance

eBee VISION’s ground sensor has a range of approximately 100m / 328ft. It can be used to avoid collisions with unexpected obstacles. If an obstacle is detected eBee Vision will perform a fast climb and hold. The user can decide to turn-off the ground sensor.

	Warning
• Clouds or fog are perceived by eBee VISION as obstacles and will trigger some unexpected climbs. • Turning off the ground sensor removes the possibility to perform a low pass at landing therefore reducing the accuracy. • In cloudy / foggy conditions turn off the ground sensor for the mission and turn it back on before landing.	

	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) which only happens during landing.	

3.6.4 Payload



- **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).

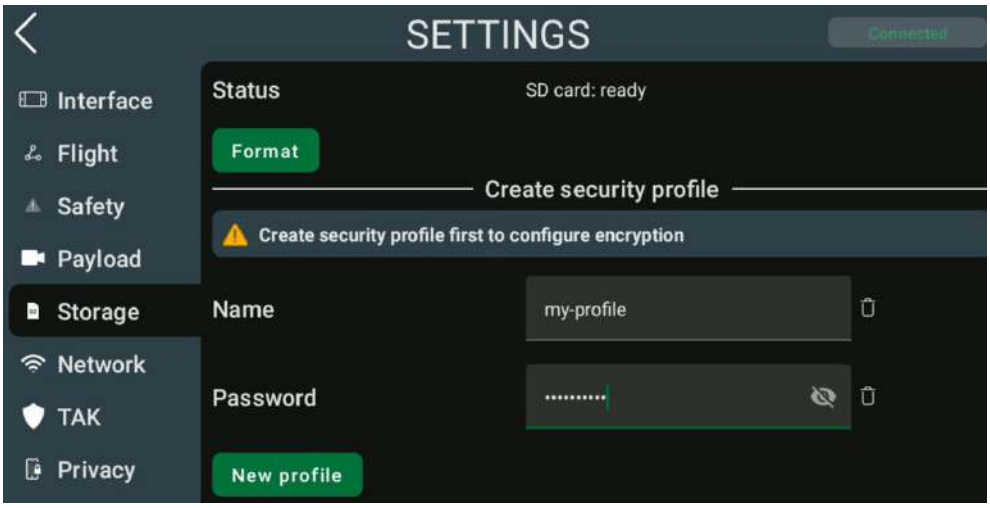
Force turn off the payload: Disable the payload for the flight. The payload doesn't calibrate at shake-shake and isn't deployed during the flight.

3.6.5 Storage

3.6.5.1 Encrypting microSD card on the drone

1. Got to *Settings* -> *Storage Security*.

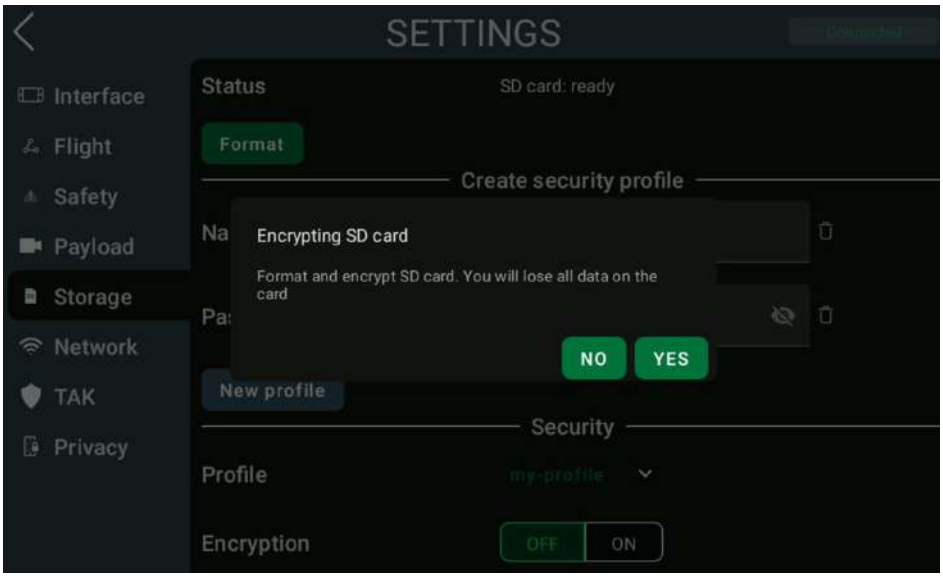
2. Create a security profile by providing *Name* and *Password* then tap on *New profile*.



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.

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

4. Tap *Yes* to start encryption.

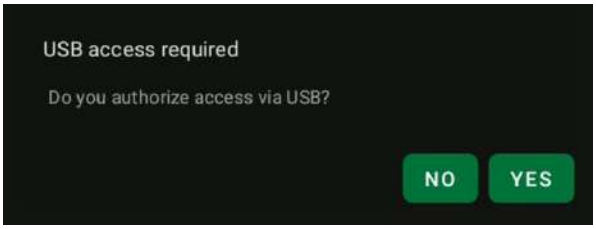


5. Once the formatting is complete the SD card on the Drone is encrypted and you can only access the data stored on this SD card by connecting the Drone to the GCS and using this profile on this GCS.

3.6.5.2 Retrieving encrypted data from the drone

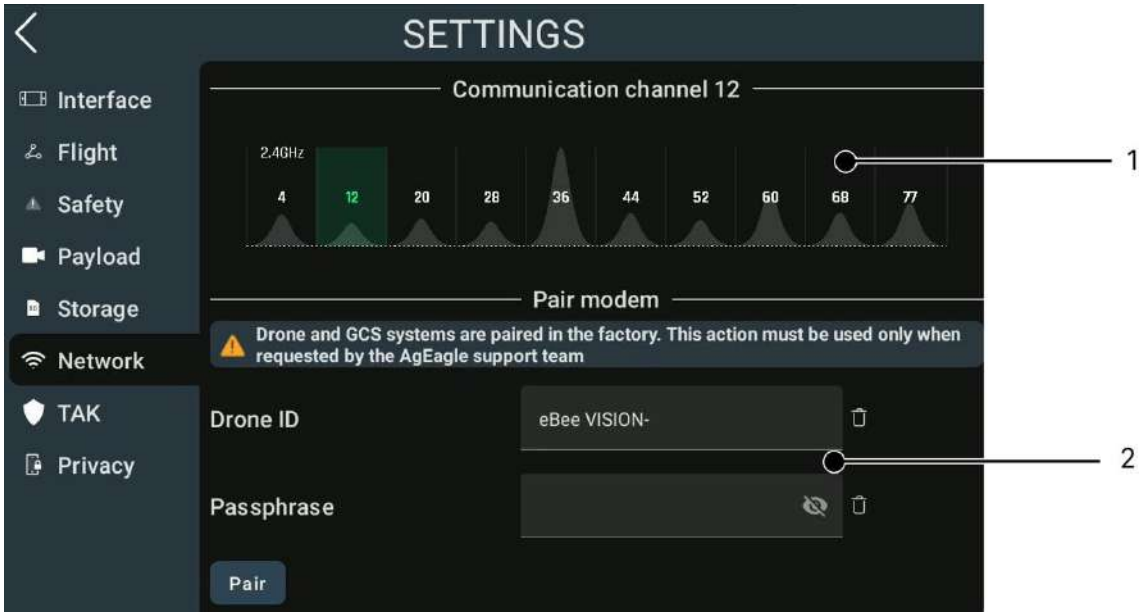
To retrieve encrypted data from the SD card:

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.



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.

3.6.6 Network



(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.

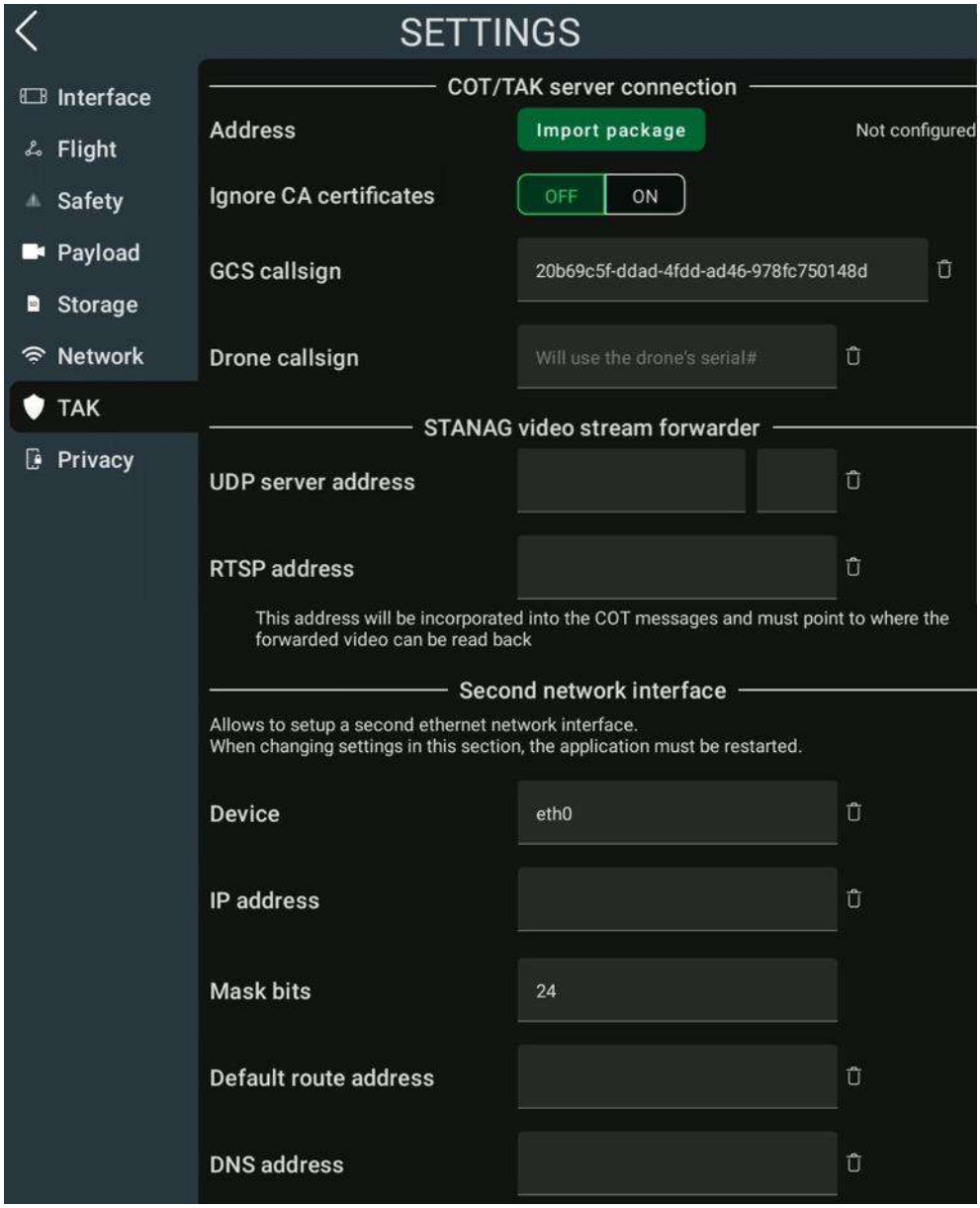
- Click on the channel band to select another channel. Currently active channel is highlighted in green.
- A popup will ask you to confirm the channel selection.

Modem pairing: in case the user needs to pair a new drone with the GCS:

- Power ***ON*** the new Drone.
- Go to ***Settings*** -> ***Network*** -> ***Pair modem***.
- Set ***SSID*** and ***Password***, provided with the new Drone.
- Click ***Pair***.

GCS will pair to the new Drone and confirm the connection with a popup.

3.6.7 TAK



COT / TAK server connection

Click import package to configure COT / TAK server connection. Once configured, the address of the server is displayed, and connection statistics can be viewed in the info menu. One can disable CA certificate verification in case of connection issue

- GCS callsign: the callsign of the GCS broadcasted to the TAK server. Defaults to the device UID.
- Drone callsign: defaults to the drone serial number. Used to identify the drone when broadcasted to the TAK server.

STANAG video streamer forwarder

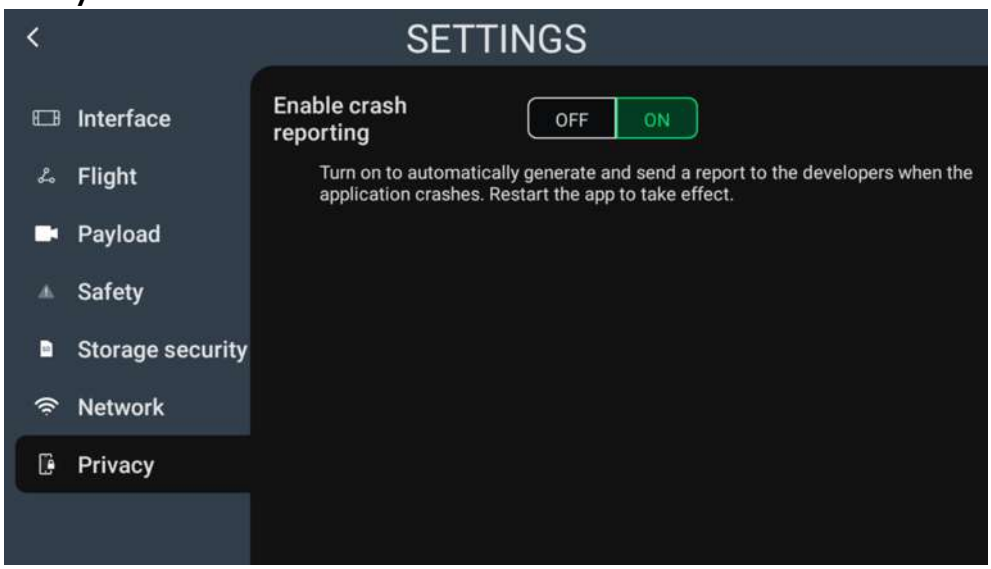
The application can be configured to broadcast the drone video stream through a network, either through the WiFi, 4G/Cellular or a MANET-like radio connected through the Nett-Warrior connector.

- UDP server address/port: provide MPEG compatible UDP server address to which the video stream from the GCS will be forwarded to.
- RTSP address (optional): read-back address where the RTSP video stream is available. This information is embedded into COT messages and broadcasted to the TAK server.

Secondary network interface

Set of network parameters used to configure the second ethernet network interface when a MANET-like radio connected through the Nett-Warrior connector and used to connect to the TAK server.

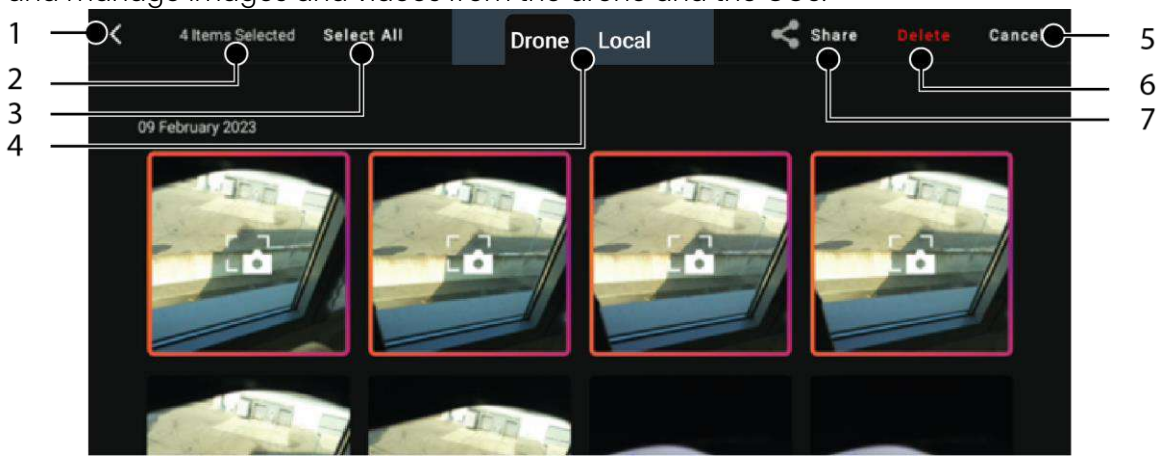
3.6.8 Privacy



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

3.7 Gallery

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



Gallery information:

(1) Back

(2) Number of items selected

(3) Select individual or all data

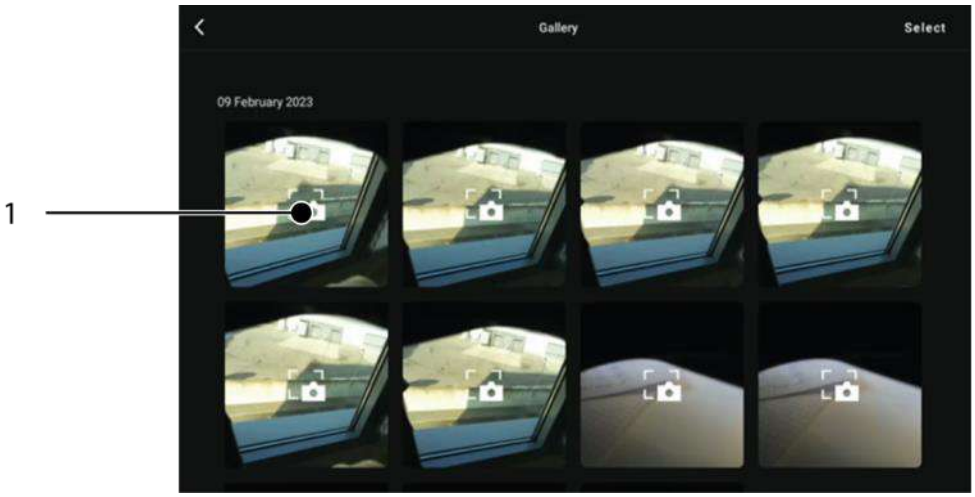
(4) Select Drone or Locawing2l memory (internal memory of the GCS)

(5) Cancel selection

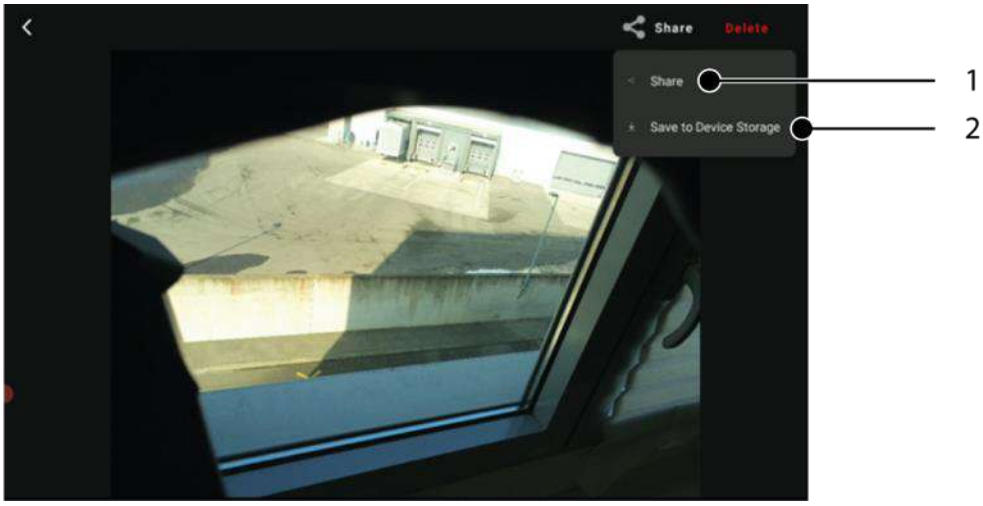
(6) Delete individual or all data

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

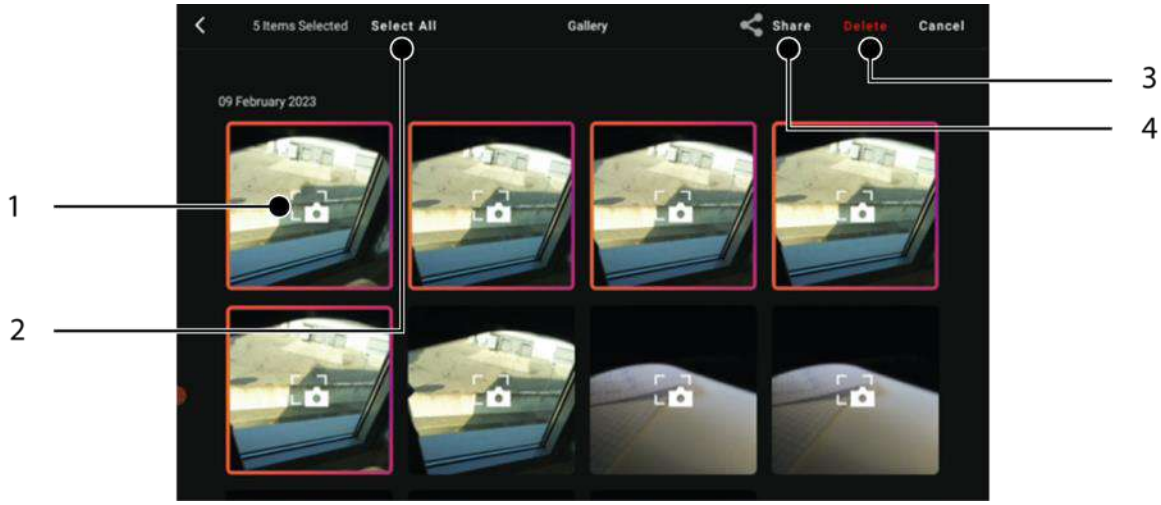
ⓘ	Note
• eBee VISION must be connected to use the drone gallery	



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



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.



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 medias.

3.8 Information Menu

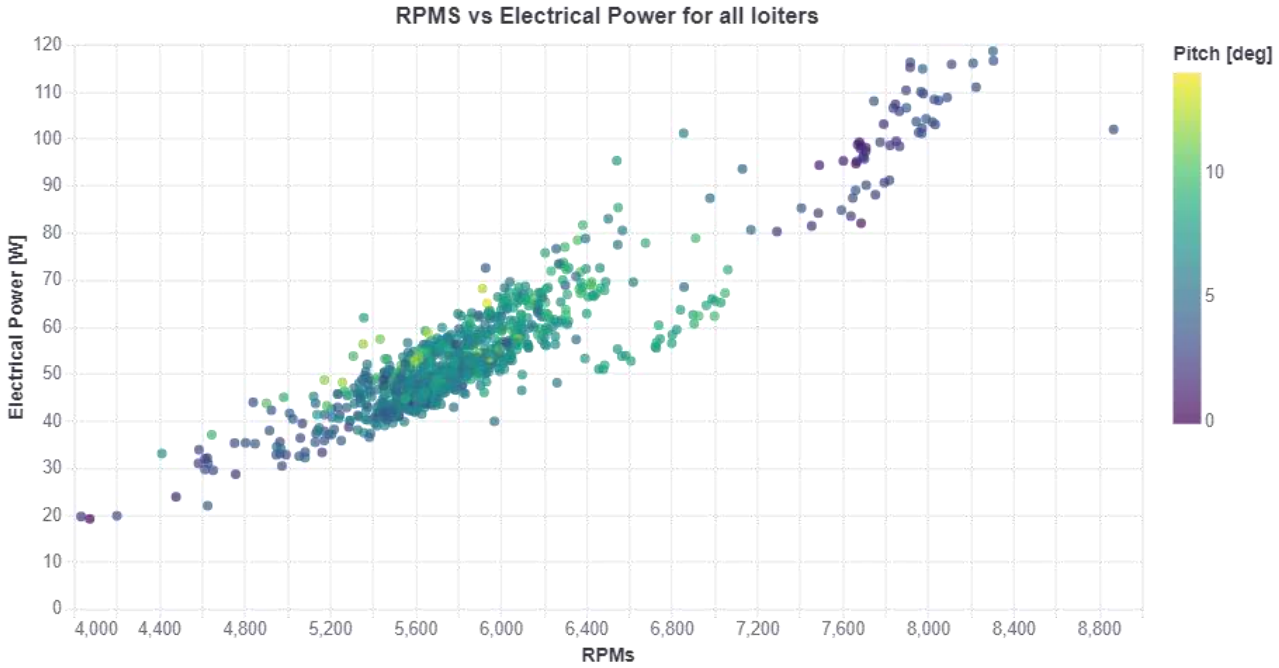
Information gives access to extended information about the system.

Menu	Available information
Drone	firmware version
	serial number
	hardware version
	log name
	battery serial number
	battery cycle count
GCS	app version
TAK	TAK status
Logbook	drone serial number
	flight id
	take-off time
	landing time
	duration
About	list of used libraries

4 Advanced technical topics

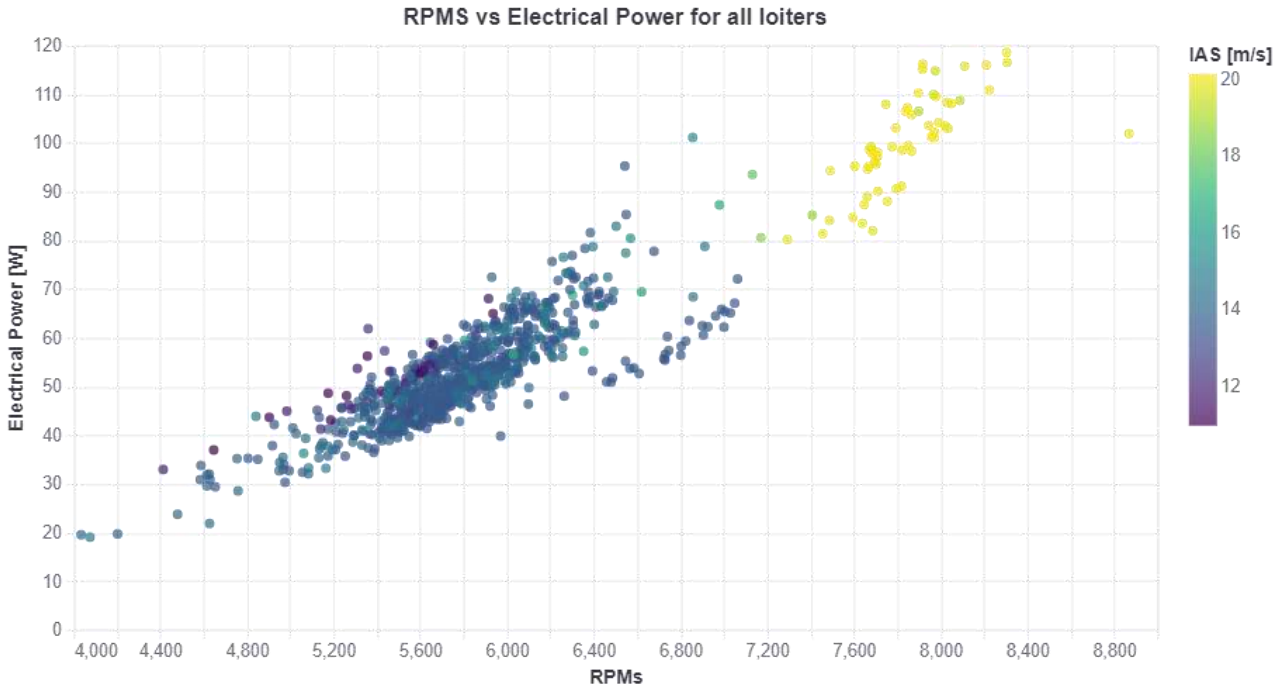
4.1 Power consumption

The power consumption is extracted from the analysis of 1000 samples.
Each point is the average power consumption during a complete loiter.



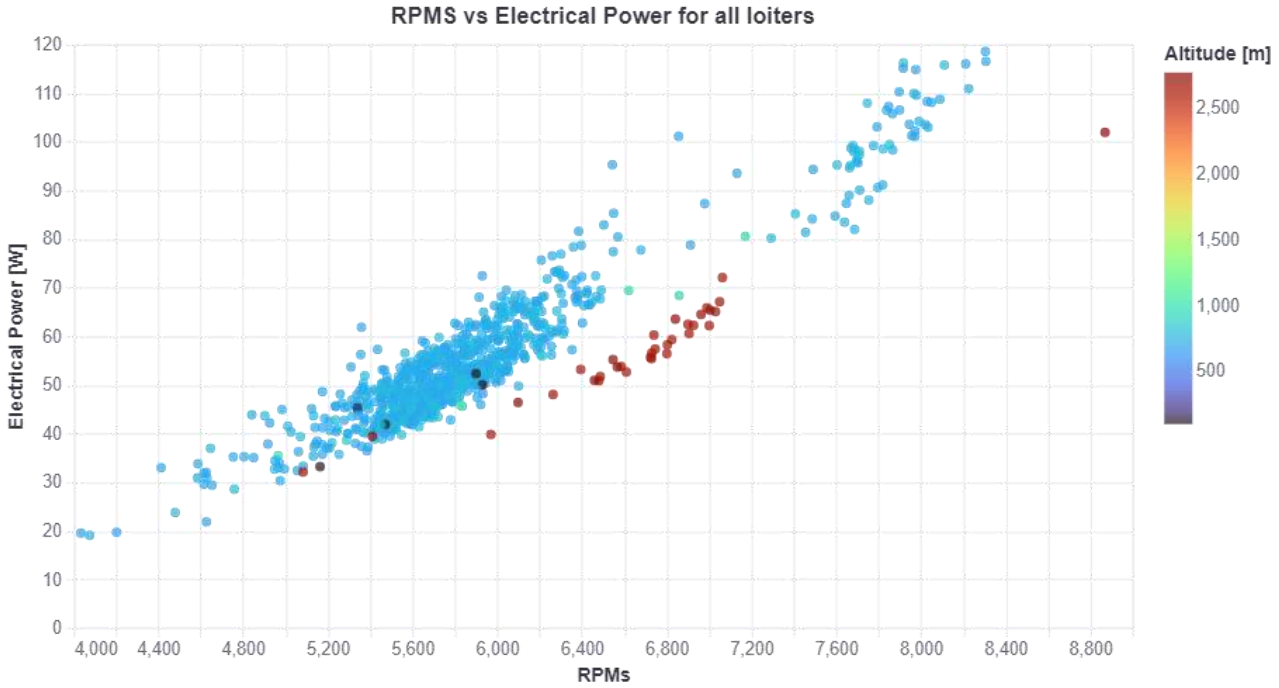
The consumption varies from 20W up to 120W.
The main point cloud (between 20W and 80W) shows a direct relation between consumption and pitch of the aircraft. This phenomenon is an image of the vertical wind, ascending wind results in low power consumption and lower steady-state pitch to maintain altitude. On the other hand, descending wind results in high power consumption and high steady-state pitch to maintain altitude. The average power consumption is 50W, the environmental conditions have a big impact on the consumption causing variations from 40W to 70 W in most cases.

The following graph shows the same data but enhances the dependency to airspeed.



The points at 20 m/s / 45 mph correspond to the fast mode. It generates a power consumption of approximately 100[W] which is twice the standard cruise consumption.

Finally, the data can be sorted regarding the altitude.



It shows that most of the testing is performed at 650m AMSL.
It also shows that at high altitude since the air density is reduced, the propeller is spinning faster for the same thrust and therefore power consumption.

4.2 Flight time

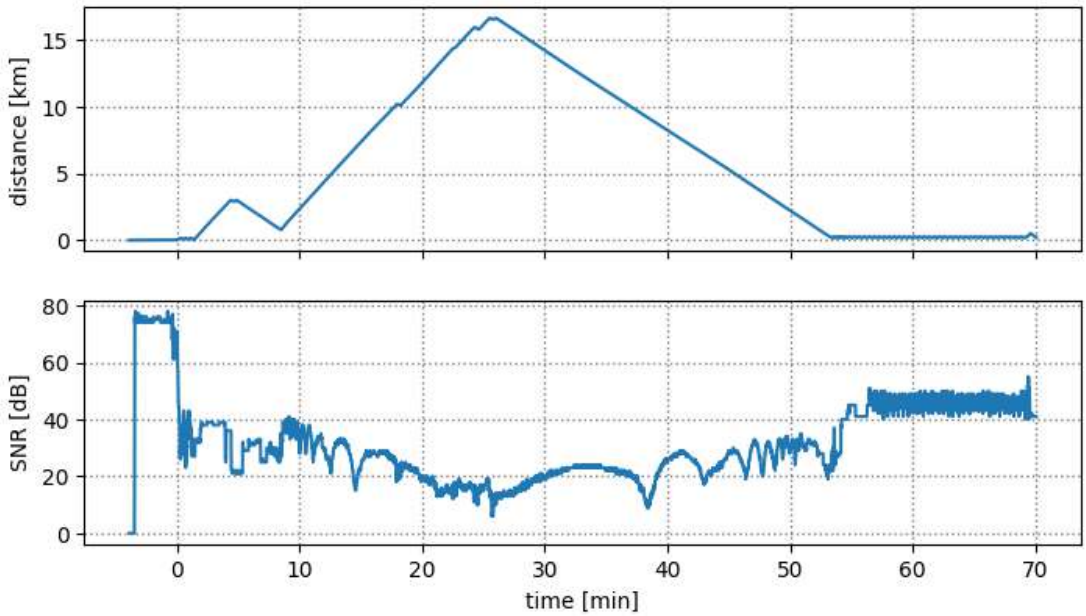
Based on the power consumption extracted from 4.1 and the battery parameters from 2.3.1.1 the flight time can be deduced.

This table gives the estimated flight time depending on the battery usage and power consumption.

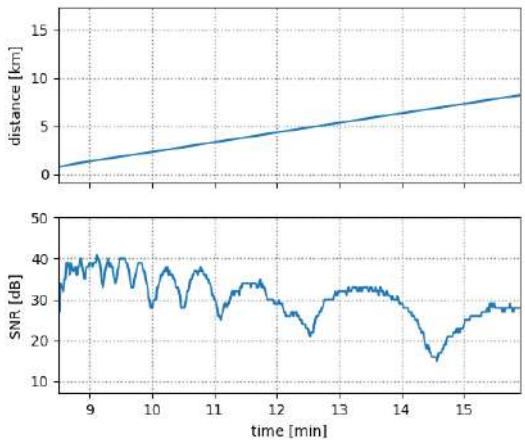
Battery usage	40W	50W	70W	100W
95%	100min	73min	57min	40min
85%	89min	65min	51min	36min

4.3 Radio-link quality

The following data is extracted from elongation test flight with the ultra-compact antenna.
The time origine corresponds to the take-off time.



The video link has been lost at 16.5 km / 10.25 mi.

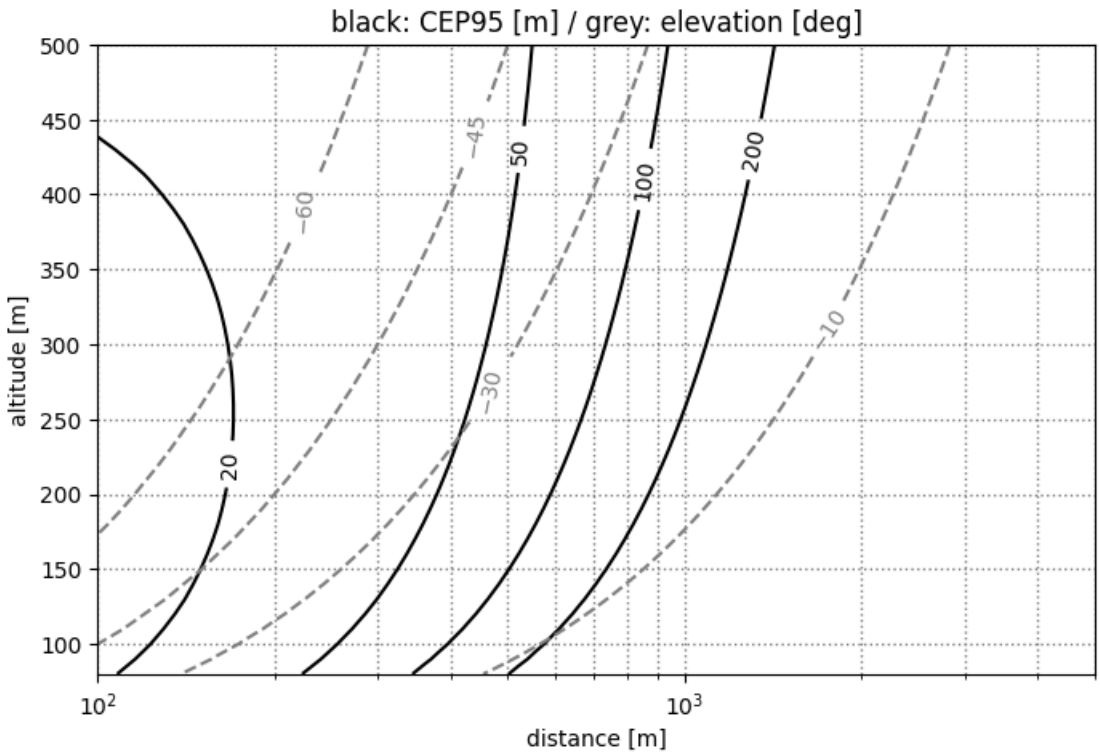
ⓘ	Note
	During long range flights the link quality presents oscillation due to fading effects. In practice, if the link quality is degraded, it can be improved by moving the drone further away.

4.4 Coordinate of target accuracy

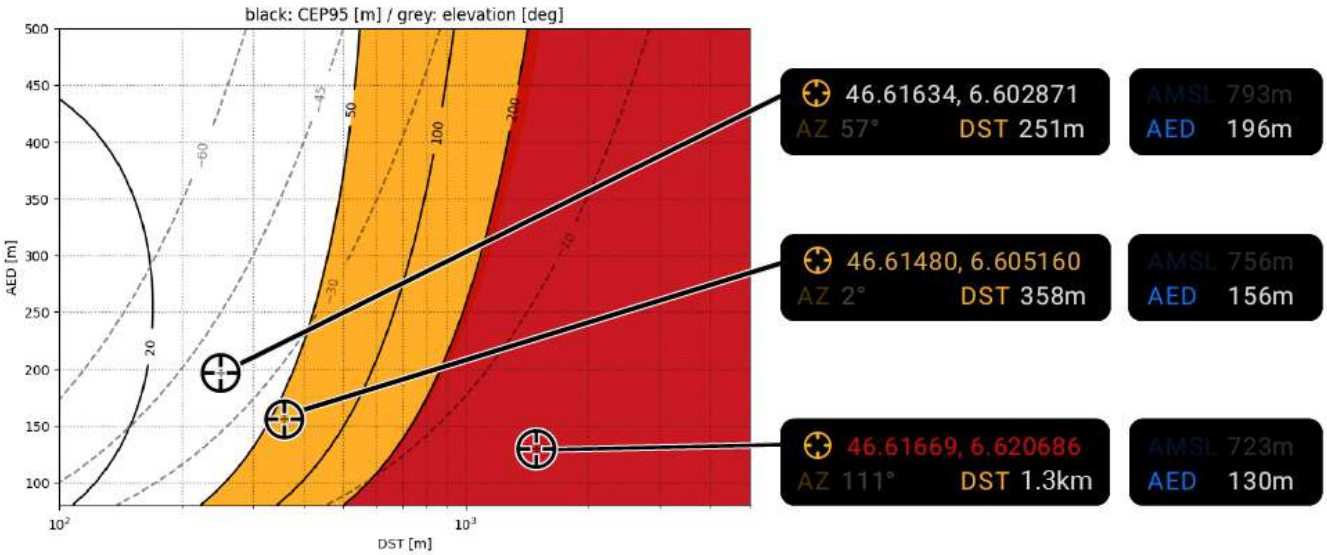
The circular probable error at 95% (CEP95) of the coordinate of target depends on the observation conditions:

- Distance to target
- Altitude

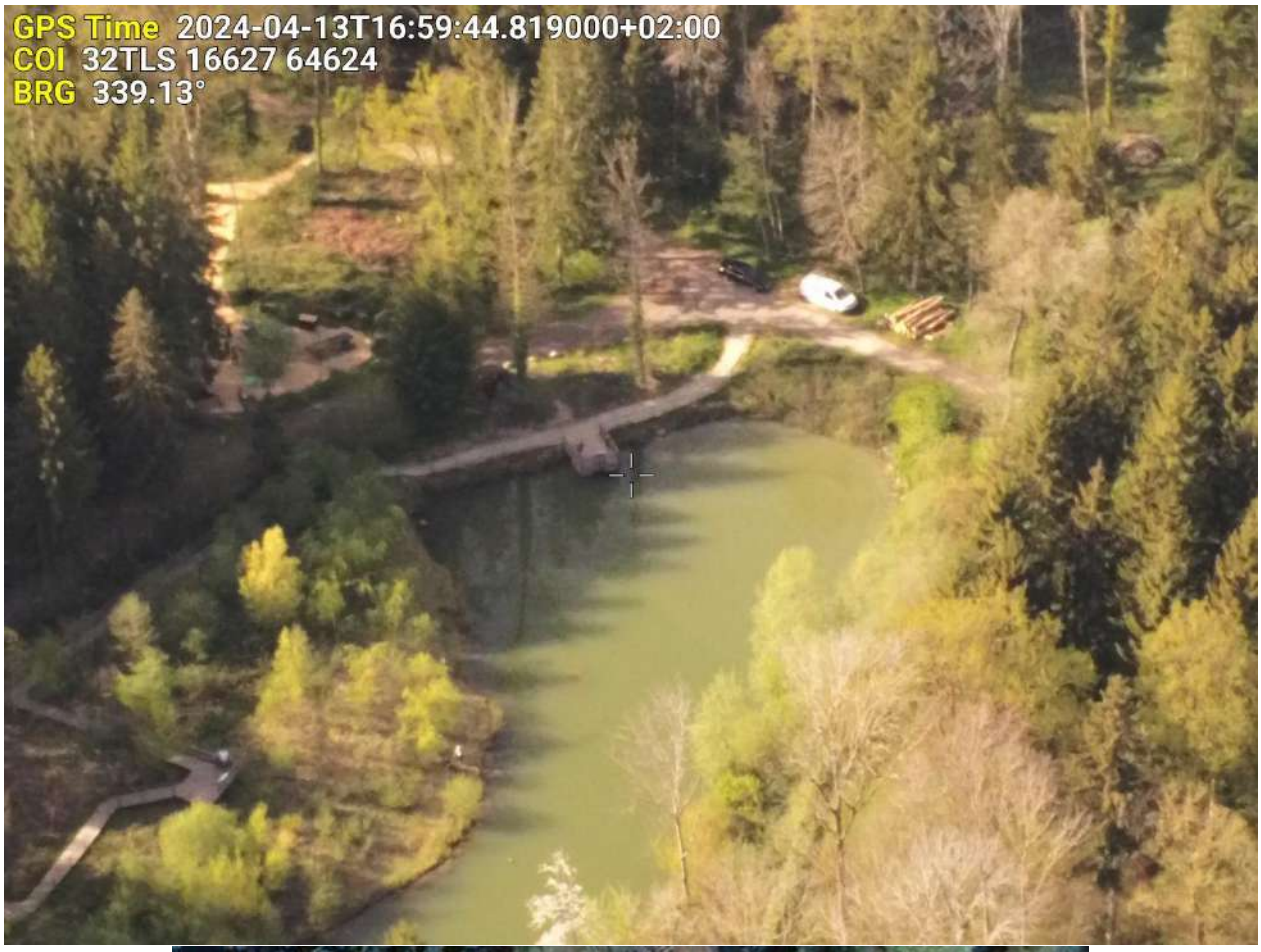
The following diagram can be used to find the right observation conditions:

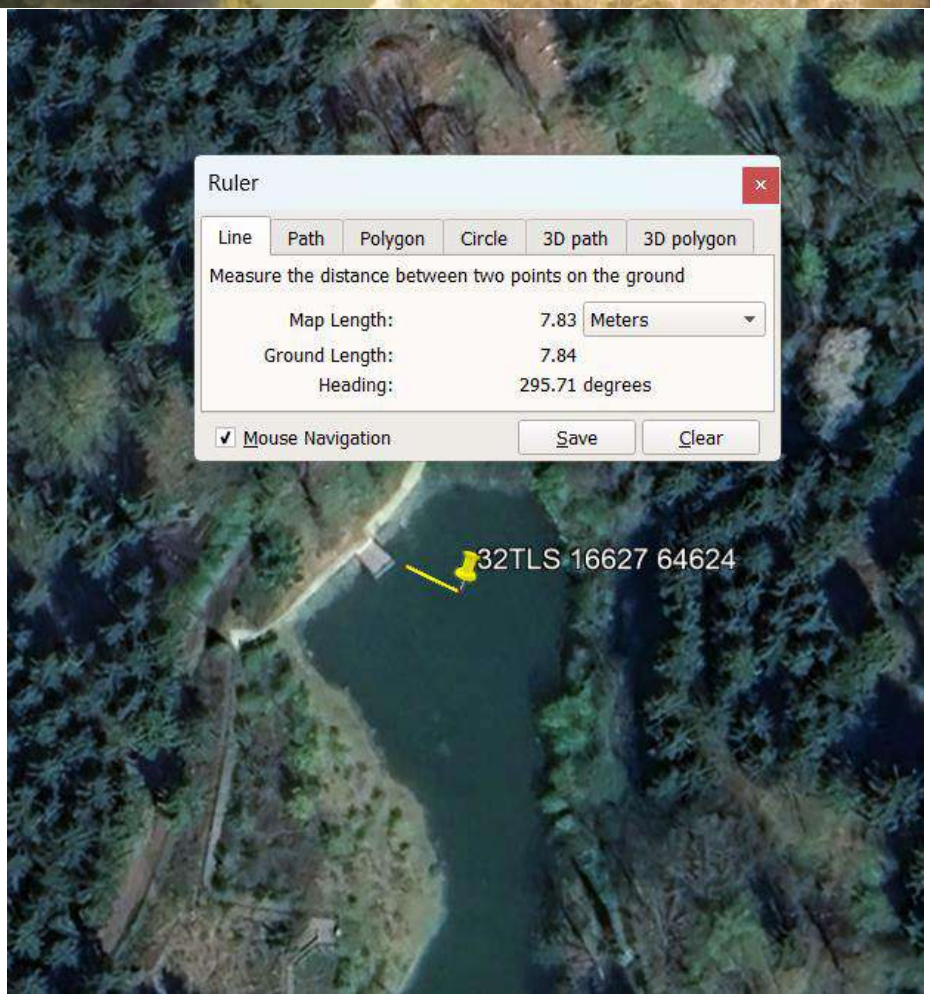


The target section of the telemetry ribbon reflects the accuracy of the target coordinate.



An actual example of eBee VISION's accuracy:

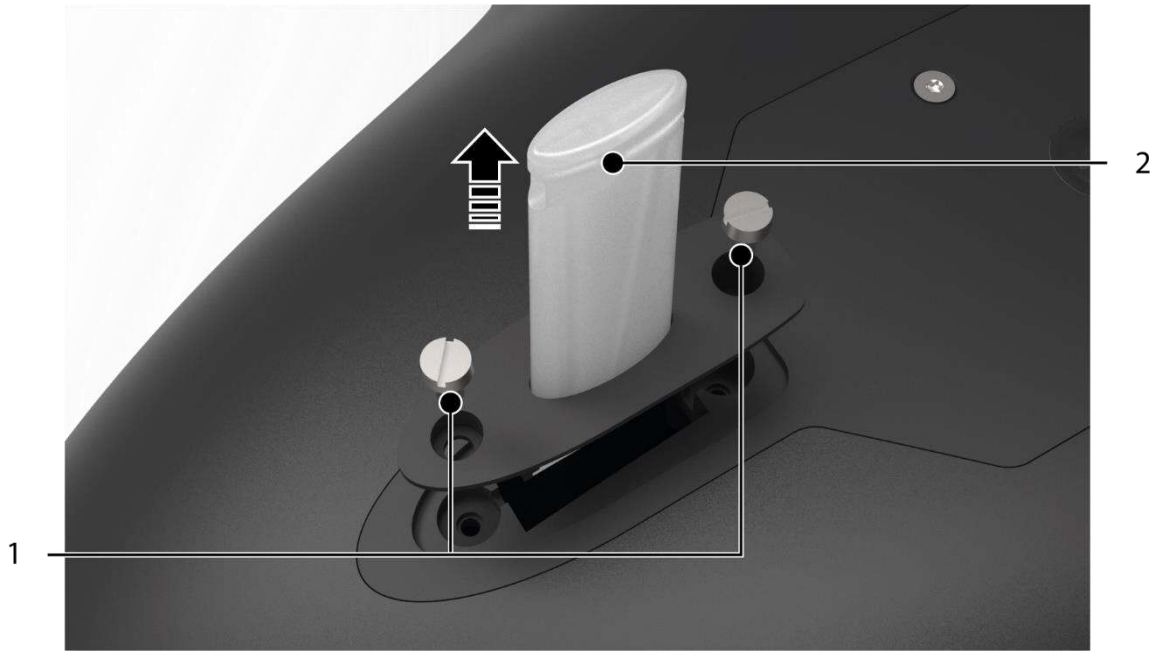

GPS Time 2024-04-13T16:59:44.819000+02:00
COI 32TLS 16627 64624
BRG 339.13°


Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length:
7.83
Meters
Ground Length:
7.84
Heading:
295.71 degrees
Mouse Navigation
Save
Clear
32TLS 16627 64624

5 Maintenance

5.1 Replacing pitot tube

⚠	Warning
• Do not perform any maintenance of the eBee VISION when powered. • Remove the battery before changing pitot tube.	



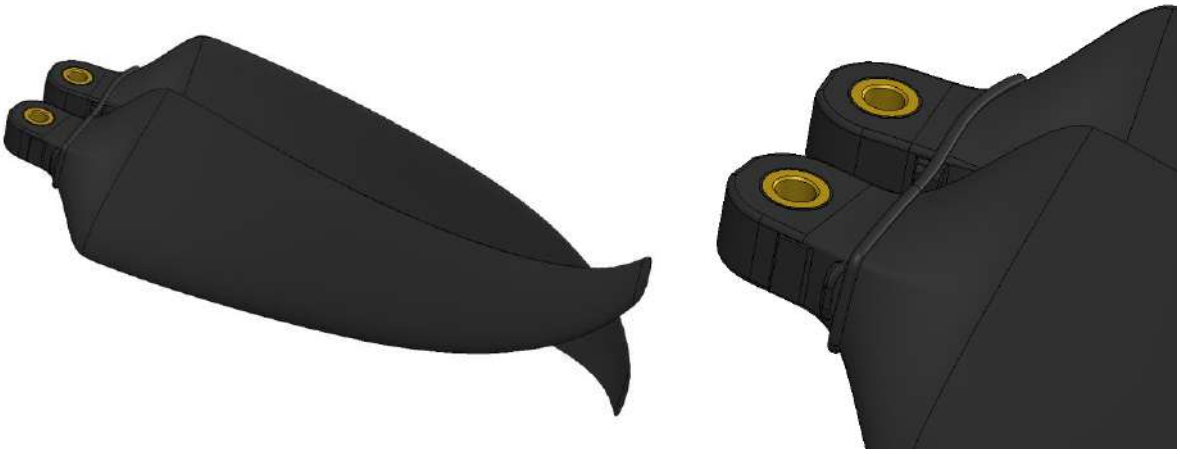
Remove the two screws with the help of a flat head screwdriver (1) and unplug the pitot tube (2). Plug the new pitot tube and secure it with the two screws. Be careful not to overtight the nylon screws.

5.2 Replacing propeller

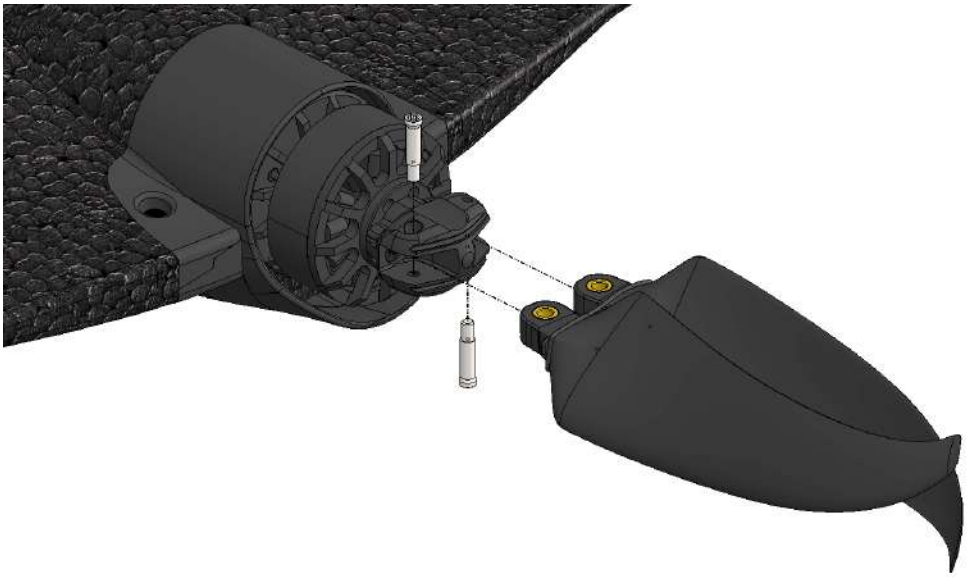
⚠	Warning
• Do not perform any maintenance of the eBee VISION when powered. • Remove the drone battery before changing the propeller blades.	

eBee VISION propeller blades are symmetrical.

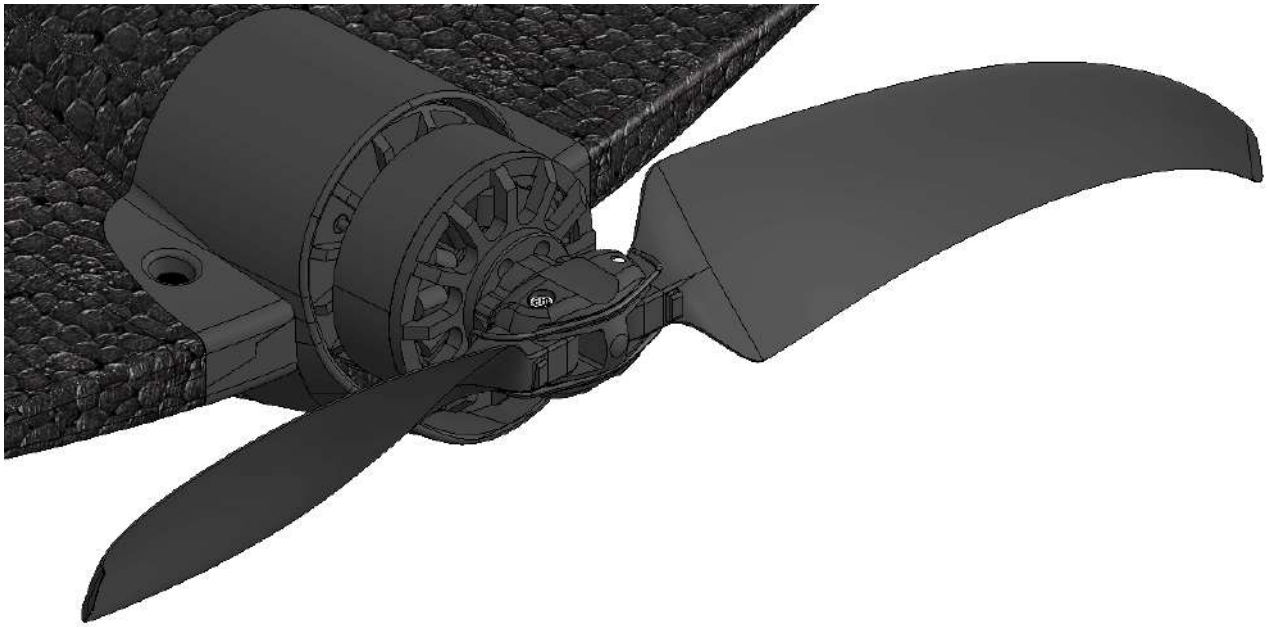
1. Before working on the propeller, switch off the drone and remove the battery for safety reasons.
2. Position the O-ring as shown below, paying attention to the orientation of the propeller blades.



3. Insert this subassembly in the hub.
4. Insert shafts and tighten with a Torx 8 screwdriver (Max Torque 0.8Nm).



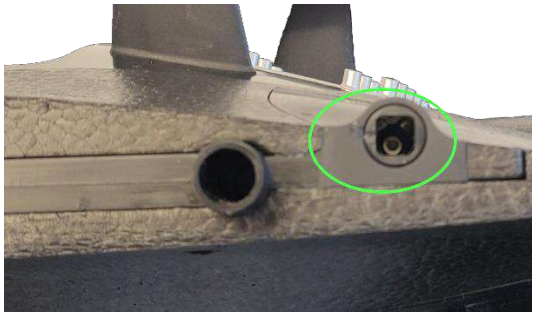
5. Test propeller deployment manually to ensure that it behaves correctly. Check that no jamming occurs during movement.



5.3 Servos trim inspection

⚠	Warning
• Never try to change manually the trim of eBee VISION. • wrong trim position will prevent eBee VISION from flying.	

To control eBee VISION servos' trim, make sure that the mark on the shaft is within the range marked on the body.



6 Software and firmware update

6.1 Software versioning

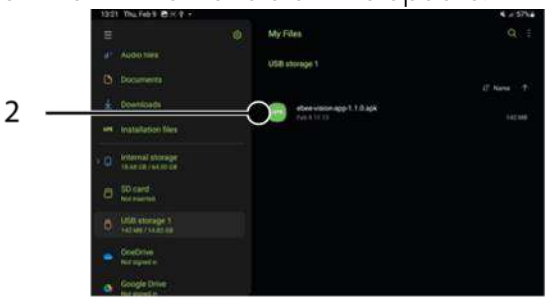
GCS application and drone firmware may be released separately to accommodate new features or critical bug fixes. The version of each of those release follows the semantic versioning rule (X.Y.Z), which can be used to anticipate the nature of the changes:

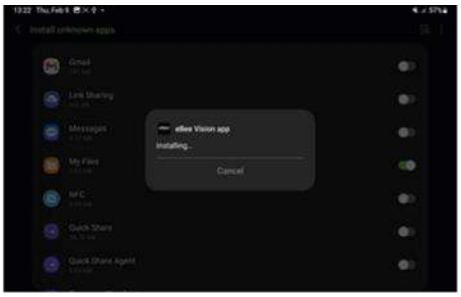
- X: Major change in the drone behavior and safety procedures.
- Y: New feature added to the software. The existing features and behaviors are not affected by that release.
- Z: Bug fix on a specific feature. No behavior modification is expected on other features.

6.2 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.





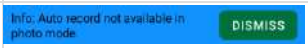
6.3 eBee VISION drone's firmware update

Download the drone firmware file (ebee-vision-fw-X.Y.Z.tar.gz) using the link provided in the release notes. Copy the file at the root of the drone SD card. Insert the SD card in the drone. Insert the battery in the drone and power on the drone. The LED of the drone will blink yellow during the update process then solid blue once done.

7 Troubleshooting

7.1 Pilot notifications

Various Information, Warnings, and Critical failures can be displayed during the eBee VISION drone operation. These notifications will be displayed at the bottom of the GCS screen, in both the video and map view.

Type	Description	Screen time	Display state
Drone flight state	Message to display current drone flight phase. Example: ***Waiting landing clearance.***	The flight phase will constantly be displayed on the screen.	
Pre-flight check	Warnings appearing during preflight check. Example: ***GNSS issue.***	The warning will constantly be displayed on the screen.	
Information	Information appearing when the application of drone configuration is unexpected. Example: **Auto record not available in photo mode.**	The information will constantly be displayed on the screen until it has been solved by either the drone or the operator.	
Warning	Warnings occur when there is an event that requires an automatic response from a drone, or the user's attention and action, but do not compromise the drone's ability to take off or continue flying. Example: ***Low endurance.***	The warning will constantly be displayed on the screen until it has been solved by either the drone or the operator.	
Critical Failure	A Critical Failure is an error that occurs in flight that prevents the continuation of normal flight. This is the most serious type of error that can occur with the drones. In most cases, when a Critical Failure occurs, the flight is aborted and the drone initiates an emergency action which immediately directs it to the ground. Example: **Critical battery**	The warning will constantly be displayed on the screen until it has been solved by the drone and dismissed by the operator. The drone will also display the action it will take during the critical action.	

7.1.1 Information

Title	Pre-Conditions	Notification Message	User Actions
Start 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.	Auto record not available in photo mode.	1. Ignore the information. 2. Change from picture mode to video mode. 3. Change settings to disable auto-recording at take-off.

GCS battery low	GCS battery low and the GCS may shutdown during the flight.	GCS battery is below 20%.	1. Plug the GCS to an external power supply.

7.1.2 Take-off veto

Title	Pre-Conditions	Notification Message	User Actions
Autopilot initializing	Autopilot is being initialized.	Autopilot initializing. Please wait.	1. Keep the drone in an open and stable area.
Battery too low	Battery state of charge (SOC) is too low for takeoff.	Battery too low. Please charge battery.	1. Use a charged battery.
Communication error with motor	A communication error occured in the propulsion chain (battery, autopilot & motor).	Internal communication error with power chain.	1. Reboot the drone. If the issue persists, contact support.
Safety issue	A safety issue prevents the drone to be able to take-off.	Take-off blocked by current warning.	1. Reboot the drone. If the issue persists, contact support.
Geofence not defined	The geofence has not yet been sent to the drone, please wait.	Geofence not defined.	1. Ensure that the drone is connected to a GCS. 2. If the issue persists, reboot the drone.
Communication with battery missing	Problem with battery communication.	No battery communication.	1. Reboot the drone. 2. If the issue persists, try another battery. 3. If the issue persists, contact support.
Gimbal initializing	Gimbal is being initialized	Gimbal initializing, please keep immobile	2. Keep the gimbal immobile.

7.1.3 Warnings

Title	Pre-Conditions	Notification Message	User Actions
Ground Sensor fault	The ground sensor is defective.	Ground sensor fault	Ground avoidance not possible and landing precision decreased. 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 the issue persists, contact support.
Barometer defective	The barometer is defective	Defective barometer	Flight without GNSS not possible. 1. Consider going home and land. 2. Reboot the drone, if the issue persists, contact support.
Magnetometer defective	The magnetometer is defective	Defective magnetometer	Flight without GNSS not possible. 1. Consider going home and land. 2. Reboot the drone, if the issue persists, contact support.
Magnetic perturbations	The magnetometer detects perturbations.	Magnetic perturbations. Please move to clear area.	1. Move the drone away from metallic objects.
No elevation data	The application does not have elevation data for landing or mission points.	Missing elevation data.	1. Go to the Map preparation screen. 2. Preload the area around the current drone position and mission waypoints.
Storage Media full	The storage media is about to be full.	Drone storage is getting low. Consider removing medias from it.	1. Empty your storage media.
Geofence: Home outside or too close to limit	The position of the home is too close to or outside of the geofence limit.	Home position outside of geofence or too close to geofence limit	1. Change the landing direction, or 2. Increase radius of the geofence.
Geofence: Landing outside or too close to limit	The position of the landing point is too close to or outside of the geofence limit.	Landing position outside of geofence or too close to geofence limit	1. Change the position of the landing point, or 2. Increase radius of the geofence.
Geofence: Mission outside or too close to limit	The planned mission is too close to or outside of the geofence limit.	The planned mission is going to breach the geofence	1. Adapt the mission, or 2. Adapt the geofence settings.

Mission too long to compute ground proximity	The planned mission contains too far waypoints to be able to compute the ground proximity alert.	The planned mission is too long for computing ground proximity.	1. Reduce the mission size.
Mission below ground	The planned mission trajectory is very close or below the ground (based on the GCS elevation data).	The planned mission may intersect with the ground.	1. Adapt mission to avoid ground intersection.
GCS battery too low	The GCS battery is below 10% SOC.	GCS battery is below 10%. Please consider charging it.	1. Charge the GCS.
GCS disk full	The GCS disk is getting full	GCS disk free is not enough for 1h of video. Please consider deleting files.	1. Delete files from the GCS.
GCS internal error	The GCS has encountered an internal error.	GCS internal error. Please power off the GCS, wait 2 minutes and power on the GCS.	1. Power off the GCS, 2. Wait 2 minutes, 3. Power on the GCS.
Ground modem communication error	Communication error with the ground modem	Ground modem communication error, please check configuration	1. Check the configuration of the ground modem.
Wi-Fi enabled on the GCS	The Wi-Fi is enabled on the GCS	Wi-Fi enabled. Consider disabling it.	1. Disable the Wi-Fi on the GCS to save energy.
Gimbal IMU failure	Gimbal sensor issue at initialization.	Gimbal IMU failure.	1. Reboot the drone, if the issue persists, contact support.
Gimbal calibration failure	The gimbal could not perform calibration.	Gimbal calibration failure. Trying again. Make sure not to touch the gimbal.	1. Wait for the three calibration attempts. 2. Make sure that the gimbal is not being touched.
Gimbal blocked	The gimbal is blocked.	Gimbal motion is blocked.	1. Wait for the three motion attempts. 2. Make sure that the gimbal is not being touched.
Gimbal communication failure	No communication received from the gimbal	Gimbal communication failure	1. Reboot the drone, if the issue persists, contact support.
Gimbal not controllable	The gimbal cannot be controlled	Gimbal not controllable. Expect landing with deployed gimbal.	**On ground:** 1. Ensure that the gimbal is free to move, reboot the

	because it detected a problem.		drone, if the issue persists, contact support. In flight: 1. Expect a landing with gimbal deployed. Find a smooth landing place.
Vibrations detected	The drone has detected strong accelerations possibly caused by vibrations.	Vibrations detected. Check propeller.	1. Consider going to Home and Land. 2. Check the integrity of the propeller.
Shock detected	A shock on the drone has been detected.	Impact detected.	1. Check the drone integrity after landing.
Landing without lidar	The landing will occur without measuring AGL distance.	Landing without ground sensor. Precision will be decreased.	1. Activate the ground sensor if de-activated, otherwise 2. Expect a landing with decreased precision.
landing direction not recommended	The landing direction is too much cross-wind or back-wind	The planned landing direction is outside of recommended range (based on wind).	1. Change the landing direction to improve the precision and speed of the landing. 2. Use the color code displayed around the landing point when changing the landing direction.
Ground proximity	The drone has detected that it is less than 20 m (66 ft) above the ground. Risk of crash.	Ground proximity detected. If flying in clouds de-activate ground sensor.	Automatic response: The drone climbs 25 m (82ft) or higher if needed to quit ground proximity and starts a Hold. User can: 1. If flying in clouds or fog, the ground sensor can be de-activated to avoid false detections.
Drone spinning	The drone has entered a spin and is falling.	Drone spinning. Attempting flight recovery.	Automatic Response: Drone performs a recovery action, then starts a Hold. User action: 1. Wait for the attempted recovery action to finish. 3. Land the drone and check the drone integrity.

Geofence: Target waypoint outside or too close to limit	The drone is flying towards a waypoint (flight plan, observe, home or base) that is too close to or outside of the geofence limit.	Target waypoint outside of geofence or too close to geofence limit	**Automatic Response:** Drone will start a Hold. **User action:** 1. Adapt the geofence settings (settings panel in the Application), or 2. Adapt the waypoint you are flying to.
Outside of geofence	The drone is flying outside of the geofence volume.	Drone outside of geofence.	**Automatic response:** Drone will go home. **User can:** 1. Turn off the geofence. 2. Increase the radius of the Geofence. 3. Increase the Altitude of the Geofence.
Obstructed airspeed sensor	Drone airspeed sensor is obstructed or defective	Airspeed sensor obstructed (water or dust). Check pitot tube.	**Automatic response:** Drone will go home and must be landed.
Strong wind	Wind estimation stronger than 17m/s.	Strong wind detected.	**Automatic response:** Drone will go home and must be landed unless the wind decreases.
Low endurance	Drone endurance is too low to continue flying its mission, it will come back to ensure a safe return.	Low endurance.	**Automatic response:** Drone will go home and must be landed.
Battery temperature raising	The battery temperature is continuously rising. The drone will come back to ensure a safe return.	Battery temperature rising quickly	**Automatic response:** Drone will go home and must be landed.
Uplink lost	Communication from GCS to drone has been lost.	Communication link lost.	**Automatic response:** Drone will go home and land. **User can:** 1. If the communication link is recovered, the flight can continue.
GNSS fix lost	GNSS fix has been lost.	GNSS fix lost.	**Automatic response:** Drone will fly towards estimated home position and initiate STL when reached. **User can:** 1. Use Assisted Manual to bring the drone to the desired position.

			2. A normal landing cannot be started until GNSS fix has been restored. An STL can be triggered.

7.1.4 Critical failures

Title	Pre-Conditions	Notification Message	User Actions
Drone far outside of geofence	Drone is far outside from its geofence.	Drone far outside of geofence.	**Automatic response:** Drone will initiate an STL. **User can:** 1. Turn off the geofence or increase the radius of the Geofence. 2. Cancel the STL.
Empty battery	Your drone's battery is completely empty.	Battery level critical.	**Automatic response:** Drone will initiate an STL. **No user action possible.** This error is always preceded by a low endurance warning.
Battery temperature	Battery temperature is too high.	Battery high temperature.	**Automatic response:** Drone will initiate an STL. **No user action possible.**
Battery over-current	The battery has measured over-current	Battery over current.	**Automatic response:** Drone will initiate an STL. **No user action possible.**
Battery internal error	The battery had an internal error	Battery internal error.	**Automatic response:** Drone will initiate an STL. **No user action possible.**
Battery low state of health	The battery lost a lot of its capacity	Battery low state of health.	**Automatic response:** Drone will initiate an STL. **No user action possible.**
Motor failure	Propulsion motor has a critical failure.	Motor failure.	**Automatic response:** Drone will initiate an STL. **No user action possible.**
Motor temperature	Motor temperature is too high.	Motor high temperature.	**Automatic response:** Drone will initiate an STL. **No user action possible.**
No airspeed	Drone can't measure the airspeed (during take-off only).	No airspeed detected.	**Automatic response:** Drone will abort the take-off and land directly. **No user action possible.**
Imminent ground impact	Drone will impact the ground within 1s.	Imminent ground impact.	**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.	IMU failure.	**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	More than a single sensor are in a failure state.	Multiple sensors failure.	**Automatic response:** Drone will cut motor, with elevators up to limit the speed of the drone until reaching the ground. **No user action possible.**
Internal communication failure	Communication failure with critical autopilot component.	Autopilot internal error	**Automatic response:** Drone will cut motor, with elevators up to limit the speed of the drone until reaching the ground. **No user action possible.**

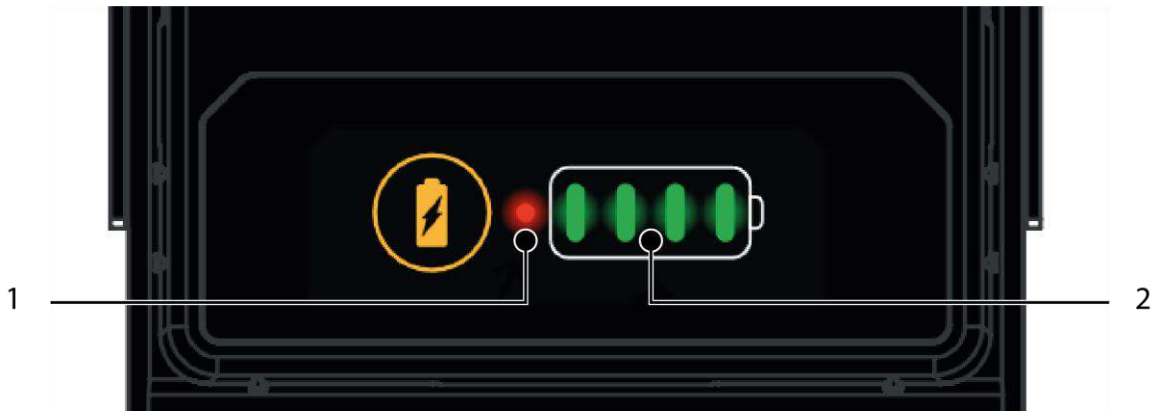
7.2 In-flight emergency actions

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

7.3 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

7.4 Understanding the battery's LED



(1) The red LED indicates an issue.

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

8 Legal

Read all user manual carefully before using a SenseFly SA product.

SenseFly SA 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 SenseFly SA User Manuals.

8.1 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.

8.2 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.

8.2.1 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'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 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.

8.2.2 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.

8.3 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.

8.4 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.

8.5 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.

8.6 Copyrights

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8.7 Technical support

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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/.